

THE AMERICAN SOCIETY OF BREAST SURGEONS

ANNUAL 15TH MEETING

APRIL 30 – MAY 4, 2014, LAS VEGAS, NV



2014 ANNUAL MEETING

OFFICIAL PROCEEDINGS, Volume XV

Scientific Session Abstracts



THE AMERICAN SOCIETY OF BREAST SURGEONS

ANNUAL **15**TH MEETING

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Scientific Session Awards

Abstracts presented at the Society's annual meeting will be considered for the following awards:

- The **George Peters Award** recognizes the best presentation by a breast fellow. In addition to a plaque, the winner receives \$1,000. The winner is selected by the Society's Publications Committee.

The award was established in 2004 by the Society to honor Dr. George N. Peters, who was instrumental in bringing together the Susan G. Komen Breast Cancer Foundation, The American Society of Breast Surgeons, the American Society of Breast Disease, and the Society of Surgical Oncology to develop educational objectives for breast fellowships. The educational objectives were first used to award Komen Interdisciplinary Breast Fellowships. Subsequently the curriculum was used for the breast fellowship credentialing process that has led to the development of a nationwide matching program for breast fellowships.

- The **Scientific Presentation Award** recognizes an outstanding presentation by a resident or fellow. The winner of this award is also determined by the Publications Committee. In addition to a plaque, the winner receives \$500.
- All presenters are eligible for the **Scientific Impact Award**. The recipient of the award, selected by audience vote, is honored with a plaque.

All awards are supported by The American Society of Breast Surgeons Foundation.

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Oral Presentations

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Increasing Mastectomy Rates: The Role of the Health-Care Milieu. A Comparative Analysis Between Canada & the United States

Andrea M. Covelli^{1,2,3}, Nancy Baxter^{1,2,4}, Marg Fitch^{5,6}, Frances C. Wright^{1,2,3}

¹Surgery, University of Toronto, Toronto, Ontario, Canada, ²Health Policy, Management and Evaluation, University of Toronto, Toronto, Ontario, Canada, ³Surgery and Odette Cancer Research Center, Sunnybrook Health Sciences Centre, Toronto, Ontario, Canada, ⁴Surgery and Li Ka Shing Knowledge Institute, St. Michael's Hospital, Toronto, Ontario, Canada, ⁵Nursing, University of Toronto, Toronto, Ontario, Canada, ⁶Odette Cancer Research, Sunnybrook Health Sciences Centre, Toronto, Ontario, Canada

Objective Rates of both unilateral mastectomy (UM) and contralateral prophylactic mastectomy (CPM) for average risk, early-stage breast cancer (ESBC) have been increasing since 2003. A number of etiological factors have been suggested as a cause including increasing use of MRI, access to reconstruction and women playing an active role in their decision-making. We wanted to understand how surgeons might be influencing the increasing mastectomy rates, and if there are differences between Canadian and American surgeons.

Methods We conducted a qualitative study to explore the surgeons' current approach to treatment of ESBC, as well as their experience with women requesting mastectomy. Purposive sampling was used to identify surgeons across Ontario, Canada, and across the United States (U.S.) who varied in length/location of practice, extent of training, and gender. Data were collected through semi-structured interviews. Constant comparative analysis identified key concepts and themes.

Results Data saturation was achieved after 45 one-on-one telephone interviews. Surgeons were equally sampled across Canada (23) and the U.S. (22), practice locations (22 were academic and 23 were community) and gender (23 male and 22 female). Twenty-nine had subspecialty training. Median length of practice was 15 years. "The effect of external factors on rising mastectomy rates" was the dominant theme. All surgeons described breast-conserving therapy (BCT) and UM as surgical treatment for ESBC with equivalent survival. State and/or federal legislation require U.S. surgeons to present all treatment options for ESBC, including BCT, UM with or without reconstruction, and balancing procedures on the contralateral side; U.S. surgeons rarely made a direct recommendation regarding extent of surgery. In contrast, Ontario surgeons presented both BCT and UM, but often recommended BCT. Neither U.S. nor Canadian surgeons recommended the use of UM + CPM in average-risk ESBC. Ontario surgeons strongly attempted to dissuade patients who requested CPM, often recommending they initially treat only the index cancer, whereas U.S. surgeons did not advise as strongly against this request--risks and benefits were discussed but it was often left up to the woman's choice. Access to reconstruction and MRI vary considerably between the U.S. and Canada; the U.S. surgeons had more ready-access to MRI and breast reconstruction. MRI use within Ontario is predominately regulated by the treating surgeon whereas U.S. patients often had an MRI completed prior to surgical consultation. Not infrequently, our U.S. surgeons experienced patients requesting UM + CPM after consulting with the reconstructive surgeon, especially regarding concerns about balance. All surgeons describe the discussion for UM + CPM as being initiated by the patient. However, decision-making by patients within the U.S is more affected by strong external factors, including MRI results, reconstruction options, and legislation.

Conclusion While both Canadian and U.S. surgeons describe the same surgical options for ESBC (BCT and UM), the external environment in which surgeons work appears to influence patient decision-making regarding extent of surgery. These findings are important as the effects of MRI, reconstruction, and legislation appear to influence the surgical consultation process and, in turn, a women's choice for mastectomy.

Prospective Randomized Trial of Drain Antisepsis to Reduce Bacterial Colonization of Surgical Drains After Mastectomy With Immediate Expander/Implant Reconstruction

Amy C. Degnim¹, Rushin Brahmhatt¹, Tanya L. Hoskin², Anne W. Peled³, Judy C. Boughey¹, Tina J. Hieken¹, Steven R. Jacobson¹, Valerie Lemaine¹, James W. Jakob¹, Chetan Irwin³, Robert D. Foster³, Hani Sbitany³, Michel Saint-Cyr¹, Margie D. Loprinzi¹, Erin Duralde³, Sheri A. Ramaker¹, Robin Chin³, Jeffrey S. Scow¹, Robin Patel⁴, Karla Ballman², Larry Baddour⁵, Laura J. Esserman³

¹Surgery, Mayo Clinic, Rochester, Minnesota, United States, ²Health Science Research, Mayo Clinic, Rochester, Minnesota, United States, ³Surgery, University of California San Francisco, San Francisco, California, United States, ⁴Laboratory Medicine and Pathology, Mayo Clinic, Rochester, Minnesota, United States, ⁵Infectious Disease, Mayo Clinic, Rochester, Minnesota, United States

Objective Bacterial colonization of surgical drains after breast and axillary surgery may contribute to surgical site infection (SSI). In the setting of implant-based immediate breast reconstruction, SSI can result in reconstruction failure. We designed a randomized trial to investigate the efficacy of antiseptic drain care in reducing bacterial colonization of surgical drains placed at mastectomy with immediate expander/implant reconstruction.

Methods With IRB approval, patients undergoing bilateral mastectomy and immediate tissue expander or implant-based breast reconstruction were randomly assigned to standard drain care (control) for one side, and drain antisepsis (treatment) for the other side. Thus, the design was a paired, within-patient comparison of the treated and control sides. For standard drain care (control), the exit site was cleaned twice daily with alcohol and covered with sterile gauze. Antisepsis drain care (treatment) included: (1) a chlorhexidine disc and occlusive dressing at the drain exit site, and (2) irrigation of the drain bulb twice daily with dilute sodium hypochlorite solution. Drain bulb fluid was collected at 1 week for bacterial culture (primary endpoint). At drain removal, both subcutaneous drain tubing and drain bulb fluid were also cultured. Primary analysis was modified intent-to-treat. A side was classified as positive for colonization if any of the drains on that side demonstrated positive cultures (1+ or greater growth in drain fluid; >50 CFU for drain tubing). Colonization and SSI outcomes were compared between sides within patients using the exact sign test for paired proportions.

Results Overall, 104 patients across 2 institutions were included and 101 (97%) had results for the primary endpoint. Cultures of drain bulb fluid at 1 week were positive in 20.8% (21/101) of control sides, compared to 9.9% of treatment sides (10/101), ($p = 0.03$). Among 45 patients whose drains were removed after the 1-week visit, positive cultures of drain bulb fluid at removal were also more frequent among control sides as compared to treatment sides, 47% (21/45) vs 27% (12/45), $p = 0.02$. Drain tubing cultures demonstrated >50 CFU in 5.9% (6/101) of control drains vs 0% of treated drains ($p = 0.03$). SSI was diagnosed within 30 days for 3 sides in 3 patients; these infections all occurred on the control side, for a frequency of 2.9% (3/104) of control sides vs 0% of antisepsis sides ($p = 0.25$). Including all infections within 1 year, infections occurred in 5/104 (4.8%) of control sides, as compared to 3/104 (2.9%) of antisepsis sides ($p = 0.69$). The sides with colonization of either tubing or bulb fluid at any timepoint showed a subsequent infection rate of 8.1%, as compared to 1.4% infection rate on sides without colonization of bulb fluid or tubing ($p = 0.04$).

Conclusion Simple and inexpensive local antiseptic interventions with a chlorhexidine disc and hypochlorite solution reduce bacterial colonization of drains, and reduced colonization is associated with fewer SSIs. Drain antisepsis techniques warrant further study toward reducing SSI in immediate tissue expander/implant breast reconstruction.

Axillary Lymph Node Dissection vs Axillary Radiotherapy: A Detailed Analysis of Morbidity

Mila Donker¹, Emiel Rutgers¹, Cornelis van de Velde², Robert Mansel³, A. Helen Westenberg⁴, Lorenzo Orzalesi⁵, Leen Slaets⁷, Jan Bogaerts⁷, Geertjan van Tienhoven⁶

¹Surgical Oncology, Netherlands Cancer Institute - Antoni van Leeuwenhoek Hospital, Amsterdam, Netherlands, ²Surgery, University Medical Centre, Leiden, Netherlands, ³Surgery, Cardiff University, Cardiff, Wales, United Kingdom, ⁴Radiation Oncology, Institute for Radiation Oncology Arnhem, Arnhem, Netherlands, ⁵Breast Unit, Careggi University Hospital, Florence, Italy, ⁶Radiation Oncology, Academic Medical Centre, Amsterdam, Netherlands, ⁷Statistics, European Organisation for Research and Treatment of Cancer, Brussels, Belgium

Objective The AMAROS (After Mapping of the Axilla: Radiotherapy or Surgery?) trial was an international, prospective, multicenter trial randomizing breast cancer patients with a positive sentinel node (SN) between axillary lymph node dissection (ALND) or axillary radiotherapy (ART), including the medial part of the supraclavicular fossa. The current study analyzed the morbidity, including the predictive value of treatment factors.

Methods Of all 4,806 patients enrolled between 2001 and 2010, patients with a positive SN who received axillary treatment were included in this analysis. The incidence of surgical complications (infection, hemorrhage, early edema, and persistent seroma) was analyzed, as well as the presence of paraesthesia of the arm. Lymphedema and shoulder mobility were analyzed at 1 and 5 years' follow-up, by treatment received (at 1 year for edema: ART n = 406, ALND n = 387, or ALND+ART n = 27). Lymphedema was analyzed as reported by the investigator (yes/no). Shoulder mobility was analyzed using the range of motion (anteversion, retroversion, abduction, and adduction), comparing the ipsilateral side to the contralateral side. The predictive value of patient-related factors, as well as treatment factors (extent of ALND, the addition of radiation to ALND), was analyzed in a multivariate model.

Results Surgical complications were observed in 23% of the patients in the ALND group vs 9% in the ART-group ($P < 0.001$). Paraesthesia of the arm was observed in 10% of the patients in the ALND group and 9% in the ART group. Lymphedema at 1-year post treatment in patients treated with ART, ALND, and ALND+ART was recorded in 15%, 25% ($p < 0.001$ vs ART), and 59% ($P < 0.001$ vs ART) of the patients, respectively. After 5 years these rates were 10%, 21% ($P < 0.001$ vs ART), and 58% ($P < 0.001$ vs ART). Independent risk factors for the development of lymphedema within the first year were treatment with ALND (vs ART; OR, 2.2) or ALND+ART (vs ART; OR, 7.6), a BMI > 25 , premenopausal status and treatment on the dominant side. Shoulder mobility decreased temporarily, in particular during the first year in both treatment arms. Independent risk factors for reduced abduction, anteversion, and/or retroversion at 1 year post treatment were the addition of isolated supraclavicular radiotherapy after ALND, and a more extensive ALND (level I+II+III). An ALND level I+II-only showed a better shoulder function compared to ART after 1 year.

Conclusion Postoperative complications and lymphedema were significantly higher after ALND than after ART. Combining ALND and ART further increased the risk of lymphedema. Patient-related factors contributed to a higher risk of lymphedema, but not to reduced shoulder mobility. The latter was influenced by the type and extent of the axillary treatment. Considering overall morbidity, ART is the preferred treatment over ALND in patients with a positive SN. Since the combination of axillary surgery and radiation increases morbidity, this should, if possible, be avoided.

Prospective Multicenter Trial Results of Excision Followed by Radiofrequency Ablation to Extend Intraoperative Margins

Kristalyn Gallagher¹, Sheldon Feldman², Julie Barone³, Marilee K. McGinness⁵, Daniela Ochoa¹, Julie E. Lang⁴, Joshua M. Mammen⁵, Robert Barone³, Rebecca Viscusi⁴, Jeanette Lee¹, Laura Adkins¹, Matthew Hardee¹, Sohelia Korourian¹, V. Suzanne Klimberg¹

¹University of Arkansas for Medical Sciences, Little Rock, Arkansas, United States, ²Columbia University College of Physicians and Surgeons, New York, New York, United States, ³Sharp Healthcare, San Diego, California, United States, ⁴University of Arizona Cancer Center, Tucson, Arizona, United States, ⁵Kansas University Medical Center, Kansas City, Kansas, United States

Objective Excision followed by radiofrequency ablation (eRFA) is an intraoperative method that utilizes intracavitary hyperthermia to create an additional tumor-free zone around the lumpectomy cavity in breast cancer patients similar to partial breast irradiation. We report on a multicenter prospective trial that tests feasibility of eRFA to reduce the need for re-excision for close margins while maintaining local control after lumpectomy without the need for radiation.

Methods This prospective phase II institutional review board (IRB)-approved multi-institutional registry was conducted from September 2010 to October 2013. A standard lumpectomy was performed and the RFA probe was deployed 1 cm circumferentially into the lumpectomy cavity. The cavity was heated to 100°C for 15 minutes. Validated Doppler sonography was used intraoperatively to monitor the ablation zone and assess the adequacy of ablation.

Results One hundred forty-two patients were accrued to the trial. Average age: 65 ± 9.1 years. The stages were Tis (n = 45), T1mic (n = 3), T1a (n = 22), T1b (n = 24), T1c (n = 34), T2 (n = 13), T3 (n = 1). Grades were 1 (n = 45), 2 (n = 59), 3 (n = 25). The two end-points evaluated were need for re-excision and local recurrence. Number with negative margins (n = 93); close margins (< 2 mm) (n = 39); focally positive margins (n = 2); positive margins (n = 8). A total of 5 of 142 (3.5%, CI 1.15% to 8.03%) underwent re-excision. Twenty-three patients received XRT in addition to eRFA due to preference or positive nodes. During the study follow-up period of 16 months ± 9 months in nonirradiated patients, there were no ipsilateral breast recurrences (6-42 month follow-up). Nine (6%) patients had postoperative complications.

continues

Conclusion Short-term follow-up suggests that eRFA may reduce the need for re-excision in breast cancer patients. eRFA may be beneficial for patients that desire lumpectomy who either cannot or do not wish to undergo radiation therapy.

Reasons for Re-Excision After Lumpectomy for Breast Cancer Can Be Identified in the American Society of Breast Surgeons (ASBrS) MasterySM Program

Jeffrey Landercasper^{1,2}, Eric B. Whitacre³, Amy C. Degnim⁴, Mohammed Al-Hamadani⁵, Sharon Grutman⁶

¹Surgery, Gundersen Health System, La Crosse, Wisconsin, United States, ²Norma J. Vinger Center for Breast Care, Gundersen Health System, La Crosse, Wisconsin, United States, ³Breast Center of Southern Arizona, Tucson, Arizona, United States, ⁴Surgery, Mayo Clinic, Rochester, Minnesota, United States, ⁵Medical Research, Gundersen Health System, La Crosse, Wisconsin, United States, ⁶The American Society of Breast Surgeons, Columbia, Maryland, United States

Objective There is strong evidence of marked variability of re-excision rates after initial lumpectomy for breast cancer. Reasons for re-excision have not been well documented. Recent research suggests some re-excisions are performed unnecessarily due to differences in surgeon opinion regarding adequacy of margin width. We hypothesized the ASBrS MasterySM Program can identify variation in re-excision rates and reasons for re-excision to aid the development of performance improvement strategies to reduce secondary breast operations.

Methods In the ASBrS MasterySM Program, surgeons can enter information on patient demographics, surgical procedures, and quality measures with immediate peer performance comparison as a method of performance assessment and improvement. Data from January 1 to November 5, 2013, were evaluated to determine re-excision lumpectomy rate (RELR). On June 1, 2013, a dropdown menu was added to the MasterySM data collection tool to track reasons for re-excision. RELR was defined as the number of patients undergoing re-excision after lumpectomy divided by the number of patients having initial lumpectomy for cancer. Variation in re-excision rates by surgeon and patient characteristics was performed by chi square for univariate analysis.

Results Three hundred twenty six surgeons reported on 6,523 unique patients who had undergone initial lumpectomy for cancer, with 1458 (22.4%) undergoing 1 or more re-excisions. Two hundred thirteen surgeons reported at least 10 lumpectomies (range, 10-163) during the queried period. For patients having re-excision by these surgeons, the number of re-excisions ranged from 1 to 4 (mean, 1.1). Re-excision rates were higher in non-Caucasian (p = 0.006) and Hispanic (p = 0.008) patients, were lower in surgeons who had been in practice longer (p < 0.001), and were no different according to primary insurance type (p = 0.15). Reasons for re-excision were documented in 1575 re-excision procedures and are detailed in the table below. The most common reasons were an ink-positive margin (49.7%) or a margin <1 mm (34.3%).

Conclusion The ASBrS MasterySM Program provides a rapid, contemporary, and valuable source of data on specific reasons for re-excision lumpectomy. Variability of re-excision by surgeon and patient characteristics was identified. Most re-excisions are performed for margins that are positive or <1 mm. This information corroborates surgeon survey data regarding reasons for re-excision and provides proof of concept the MasterySM Program can measure re-excisions in real time, providing a method for monitoring during future performance initiatives.

Reasons for Re-excision Lumpectomy Procedures

Reason	N	Percent
Ink-positive margin	783	49.7%
Margin <1 mm	540	34.3%
Margin 1-2 mm	114	7.2%
Postlumpectomy imaging demonstrated evidence of residual disease	38	2.4%
Prior surgery elsewhere, margin status uncertain	25	1.6%
Margin >2 mm, but desire wider margins	16	1.0%
Tumor board recommended wider margins	6	0.4%
Fragmented specimen, margin status uncertain	3	0.2%
Radiation oncologist recommended wider margins	2	0.1%
Other	48	3.1%
<i>Total procedures</i>	1,575	100%

Contralateral Prophylactic Mastectomy Provides No Survival Benefit in Young Women With Estrogen Receptor Negative Breast Cancer

Catherine Pesce¹, Erik Liederbach¹, Chi Wang², Brittany Lapin², David J. Winchester¹, Katharine Yao¹

¹Department of Surgery, NorthShore University HealthSystem, Evanston, Illinois, United States, ²Center for Biomedical Research Informatics, NorthShore University HealthSystem, Evanston, Illinois, United States

Objective Several studies have shown that contralateral prophylactic mastectomy (CPM) provides a disease-free and overall survival benefit in young women with unilateral breast cancer that is estrogen receptor (ER) negative. We utilized the National Cancer Data Base to evaluate CPM's survival benefit for young women with early-stage breast cancer in the years that ER status was available.

Methods We selected women <45 years old with AJCC Stage I-II breast cancer who underwent unilateral mastectomy or CPM from 2004-2006. Five-year overall survival (OS) was compared between those who had unilateral mastectomy and CPM using the Kaplan-Meier method and Cox regression analysis. Median follow-up was 5.9 years.

Results A total of a 393,582 women fulfilled eligibility criteria. 84.3% of women underwent unilateral mastectomy and 15.7% of women underwent CPM. 58.2% of women had stage 1 disease vs 41.8% with stage 2 disease. 79.7% were ER-positive and 20.3% ER-negative. Of all women <45 years old who underwent CPM, there was no improvement in OS compared with women who underwent unilateral mastectomy (HR = 1.183; 95% CI, 0.985-1.422) after adjusting for patient age, race, insurance status, year of diagnosis, ER status, tumor size, nodal status, grade, histology, facility type, facility location, co-morbidities, use of adjuvant radiation, and chemohormonal therapy. When women <45 years old with T1N0 tumors were examined, there was also no improvement in OS compared with women who underwent unilateral mastectomy (HR = 1.317, p = 0.2071) after adjusting for the aforementioned factors. Among women <45 years old with ER-negative tumors who underwent CPM, there was no improvement in OS compared with women who underwent unilateral mastectomy (HR = 0.947, p = 0.6922) adjusting for the same aforementioned factors for both stage I and II disease.

Conclusion CPM provides no survival benefit to young patients with early-stage breast cancer and no benefit to ER-negative patients. Future studies with longer follow-up are required to determine if CPM will provide a survival benefit in this cohort of patients.

A Phase II Trial Exploring the Success of Cryoablation Therapy in the Treatment of Invasive Breast Carcinoma: Results From ACOSOG (Alliance) Z1072

Rache Simmons¹, Karla Ballman², Charles Cox³, Ned Carp⁴, Jennifer Sabol⁴, Rosa Hwang⁵, Deanna Attal⁶, Michael Sabel⁷, David Nathanson⁸, Andrew Kenler⁹, Linsey Gold¹⁰, Cary Kaufman¹¹, Linda Han¹², Aaron Bleznak¹³, J. Stanley Smith¹⁴, Dennis Holmes¹⁵, Lorraine Taft¹⁶, Marla Dudak¹⁷, Susan Weinberg¹⁸, Michael Kinney¹⁹, Bruno Fornage²⁰, Carisa Le-Petross²⁰, Syed Hoda²¹, Thomas Buchholz²², Janice Cormier²³, Wendy Lindeman², Linda McCall²⁴, Mark Watson²⁵, Bettye Green²⁶, Kelly Hunt⁵

¹Surgery and ²¹Pathology, Weill Medical College of Cornell University, New York, New York, United States, ²Alliance Statistics and Data Center, Mayo Clinic, Rochester, Minnesota, United States, ³Surgery, University of South Florida, Tampa, Florida, United States, ⁴Surgery, Lankenau Medical Center, Wynnewood, Pennsylvania, United States, ⁵Surgical Oncology, ²⁰Diagnostic Radiology, and ²²Radiation Oncology, ²³MD Anderson Cancer Center, Houston, Texas, United States, ⁶Surgery, Providence St Joseph Medical Center, Burbank, California, United States, ⁷Surgery, University of Michigan Hospital, Ann Arbor, Michigan, United States, ⁸Surgery, Henry Ford Hospital, Detroit, Michigan, United States, ⁹Surgery, Bridgeport Hospital, Trumbull, Connecticut, United States, ¹⁰Surgery, Genesys Regional Medical Center, Grand Blanc, Michigan, United States, ¹¹Surgery, Bellingham Breast Center, Bellingham, Washington, United States, ¹²Surgery, Indiana University Hospital, Indianapolis, Indiana, United States, ¹³Surgery, Lehigh Valley Hospital, Bethlehem, Pennsylvania, United States, ¹⁴Surgery, Penn State Milton S. Hershey Medical Center, Hershey, Pennsylvania, United States, ¹⁵Surgery, University of Southern California, Los Angeles, California, United States, ¹⁶Surgery, Anne Arundel Medical Center, Annapolis, Maryland, United States, ¹⁷Surgery, Bethesda Memorial Hospital, Boca Raton, Florida, United States, ¹⁸Surgery, Bethesda North Hospital, Cincinnati, Ohio, United States, ¹⁹Surgery, Northwest Community Hospital, Arlington Heights, Illinois, United States, ²⁴Division of Biomedical Statistics, Duke University, Durham, North Carolina, United States, ²⁵Alliance Central Specimen Bank, Washington University, St. Louis, Missouri, United States, ²⁶Saint Joseph Regional Medical Center, South Bend, Indiana, United States

Objective Cryoablation is a well-established technique for treatment of fibroadenomas. Pilot studies suggest this could be an effective nonsurgical treatment for breast cancer. ACOSOG Z1072 is a phase II trial exploring the effectiveness of cryoablation in the treatment of early-stage invasive ductal breast cancers (IFDC).

Methods Z1072 was a single-arm, phase II trial with a target accrual of 99 patients. A total of 19 centers contributed 99 patients; 86 patients (87 breast cancers) were evaluable for data analysis. A cryoprobe was inserted percutaneously under ultrasound guidance into the targeted lesion. Patients underwent ablation using a freeze-thaw-freeze cycle lasting approximately 6-10-6 or 8-10-8 minutes, respectively. The primary endpoint was the rate of complete tumor ablation, with complete tumor ablation defined as no remaining IFDC or ductal carcinoma in situ (DCIS) present on pathological examination of the targeted lesion. A secondary objective was to evaluate the negative predictive value of MRI in the postablation setting to determine residual IFDC or DCIS.

Results Of the 87 cancers treated with cryoablation and eligible for evaluation, pathologic assessment revealed successful cryoablation in 60 (69.0%) cancers and residual IFDC and/or DCIS in 27 (31.0%). The 90% confidence interval for the estimate of successful cryoablation is 59.8% to 77.1%, with the one-sided, lower sided 90% CI of 61.8%. There were 70 (80.5%) cancers that showed successful cryoablation when defined as no residual IFDC and 17 (19.5%) failures, with the one-sided, lower bound 90% confidence interval for successful ablation of 73.9%. The negative predictive power of post-ablation MRI to predict residual IFDC was 85.9% (90% CI, 76.7% to 92.5%). The negative predictive power of post-ablation MRI to predict residual IFDC or DCIS was 48/64 or 75.0% (90% CI, 64.5% to 83.7%). There were 66 (75.9%) breasts that underwent successful cryoablation, as defined as no residual IFDC/DCIS or enhancement on the post-ablation MRI. Using this same definition, there were 21 (24.1%) failures due to the existence of residual IFDC/DCIS and no post-ablation MRI enhancement. The 90% confidence interval for the estimate is 67.1% to 83.2%. The one-sided, lower-sided 90% CI is 69.0%.

Conclusion In highly selected patients with early-stage IFDC undergoing cryoablation followed by surgical resection, 69.0% had complete ablation. Including the MRI findings, 75.9% had residual IFDC/DCIS predicted by MRI or a complete ablation. Further studies with modifications in technique could be considered to evaluate the role for cryoablation as a nonsurgical alternative for breast cancer treatment.

Initial Experience With Genomic Profiling of Breast Cancers

Edgar D. Staren¹, Maurie Markman², Donald Braun³, Bradford Tan³, Kim D. Kramer³, Roxana Geana³

¹Cancer Treatment Centers of America, Goodyear, Arizona, United States, ²Cancer Treatment Centers of America, Philadelphia, Pennsylvania, United States, ³Cancer Treatment Centers of America, Zion, Illinois, United States

Objective Rapidly evolving advances in the understanding of theorized unique “driver mutations” within individual patient’s cancers, as well as dramatic reduction in the cost associated with obtaining genomic profiles, have stimulated major interest in the role of such testing in routine clinical practice.

Methods Over the past 11 months, patients with primary or recurrent breast cancer managed at any one of our 5 regional hospitals, whose malignancy had failed to respond to or progressed on all recognized “standard-of-care” options, were offered the opportunity to have their cancer undergo next-generation sequencing genomic profiling (FoundationOne™ testing from Foundation Medicine®). The analysis could have involved either the original breast tumor or cancer in a metastatic site. Where clinically appropriate in recurrent disease patients, a biopsy was obtained for genomic profiling following completion of the most recent treatment.

Results To date, 102 patients (median age, 50; range, 24-73) have had results reported to the treating physician. Of this population, 97% had at least 1 specific genomic alteration identified. A total of 473 different somatic genetic abnormalities were revealed in this group of patients. Not unexpectedly, considering the population being examined, 52% of patients (51 of 99 with an identified genetic alteration) were found to have an abnormality for which an “FDA-approved drug was available” (eg, trastuzumab; lapatinib). However, as previously noted, essentially all patients undergoing testing had already received clinically appropriate “standard of care” medications. More interesting in this particular setting is the finding that 69% of patients had an “FDA-approved agent for an indication other than breast cancer” where a plausible argument could be advanced (based on existing data in the oncologic literature – peer-reviewed or published abstracts) for the potential biological and clinical relevance of such mutations to the individual’s malignancy. Examples of identified genomic alterations of potential clinical consequence (and the percentage of individuals demonstrating the abnormality) included the following: AKT (11%), FGFR1 (16%), PI3K (24%), JAK2 (6%), EGFR (2%), PTEN (10%), and RET (3%). Of further interest in this preliminary report were several suggested patterns of expression. For example, the cancers of all 6 patients with a JAK2 abnormality were triple-negative on presentation and also had a TP53 mutation. A number of patients have had a novel treatment plan initiated based on the observed genomic profiling. The results of such clinical interventions are pending.

Conclusion This experience provides evidence that almost all advanced breast cancers possess at least 1 well-characterized genomic alteration that might be “actionable” at the clinical level (FDA-approved drug or active clinical trial). Further, in the majority of cases (69%) in this series, a plausible argument can be advanced for the potential biological and clinical relevance of an FDA-approved, anti-neoplastic agent not currently indicated in the treatment of breast cancer. Carefully defining the actual clinical relevance of these genetic alterations will be a critical next step in this evaluation process.

Metachronous Contralateral Breast Cancer Is Associated With Survival Only When Advanced Stage and/or Estrogen Receptor-Negative: A SEER-Based Study

Courtney Vito¹, Carolyn Behrendt², Steven L. Chen¹

¹Surgical Oncology, City of Hope National Medical Center, Duarte, California, United States, ²Biostatistics and Epidemiology, Division of Information Sciences, City of Hope National Medical Center, Duarte, California, United States

Objective Breast cancer patients are increasingly undergoing contralateral prophylactic mastectomy (CPM) to prevent contralateral breast cancer (CBC). Whether all metachronous CBCs (mCBC) are associated with inferior survival remains unclear. We hypothesize mCBC rarely, if ever, affects overall survival.

Methods Subjects were women age 20-80 diagnosed during 1998-2008 with a first unilateral, stage I-III breast cancer treated with mastectomy but not CPM. Primary risk factor was metachronous CBC (diagnosed at least 6 months after first primary), a time-dependent variable categorized by stage, estrogen receptor (ER) status, and timing. Follow-up for survival began at 6-month landmark and continued through 2010 or until non-mCBC second primary, loss to follow-up, or 85th birthday. Logistic regression identified correlates of advanced (stage IIB/III/IV) vs early (I/IIA) and ER-negative vs ER-positive mCBC.

Results Of 107,108 subjects (age 58.9 [+12.6] at first primary), 2,199 developed mCBC. Independent of patient and first primary characteristics, overall survival was associated ($p < 0.0001$) with mCBC of advanced (hazard ratio,

3.10; 95% CI, 2.68-3.60) or unknown stage (HR, 1.88; 1.48-2.39) and with ER-negative/ER-unknown mCBC, more so when diagnosed within 24 months (HR, 2.19; 1.68-2.87) than when diagnosed later (HR, 1.40; 1.19-1.65). Early-stage, ER-positive mCBC was unassociated with survival and thusly nonhazardous. At 12.5 years beyond landmark, cumulative incidence of nonhazardous mCBC was 1.65%, all other mCBC 1.95%, non-mCBC second primary 7.98%, and death without such events 31.9%. Hazardous mCBCs are more likely advanced-stage or ER-negative in younger, African-American, or Hispanic patients; advanced stage of mCBC is associated with first primary's positive-node count, size, and extent, while ER status of mCBC is associated with first primary's ER status, grade, and stage (see table). These patient and first primary characteristics portend inferior survival even without mCBC. **Conclusion** mCBCs are rare events, and only a small minority are associated with inferior survival. Those that do so disproportionately affect minority women and women who initially present with more advanced and aggressive disease. Thusly, mCBCs that do associate with survival may merely signal, rather than cause, impending mortality. If so, CPM to preempt CBC is not likely to improve survival after breast cancer.

Factors Distinguishing Advanced-Stage or ER-Negative mCBC From Other mCBC

Characteristics at Diagnosis of First Primary Breast Cancer	Model 1: Advanced (N = 592) vs Early-Stage (N = 1,417) mCBC			Model 2: ER-Negative (N = 574) vs ER-Positive (N = 1,319) mCBC		
	Odds Ratio	95% CI	P*	Odds Ratio	95% CI	P*
Number of Positive Lymph Nodes 4 or more 1-3 or unknown 0	2.44 1.00 0.68	1.85-3.23 0.53-0.88	 0.003			
Extent of Tumor Very extensive (invading more than subcutaneous or pectoral tissue) Less extensive or confined to breast	2.11 1.00	1.45-3.08	<0.0001			
Per increase in size, from 5 cm or unknown	1.68	1.42-1.98	<0.0001			
ER/PR Status ER-PR- ER+PR+ Other or unknown				2.16 0.69 1.00	1.64-2.83 0.53-0.90	 0.003
Grade Poorly differentiated Other				1.64 1.00	1.30-2.05	<0.0001
Per Increase in Stage, From I/IIA to IIB/IIIA to IIIB or Higher				1.31	1.14-1.52	0.0002
Per (Log)Year of Age at Diagnosis				0.41	0.26-0.66	0.0002
Race/Ethnicity African American or Hispanic White Other	1.74 1.00	1.38-2.20		1.50 1.00	1.18-1.91	0.001
Countywide Use of Mammography At least 65%	1.36 1.00	0.99-1.86	0.05			

Risk factors that are shown without odds ratios were dropped from the model for lack of contribution to its fit.

*Models are exploratory; thus, p values are unadjusted for multiple hypothesis testing.

Total Skin-Sparing Mastectomy and Immediate Breast Reconstruction: An Evolution of Technique Over 986 Cases

Frederick Wang, Anne W. Peled, Elisabeth Garwood, Hani Sbitany, Robert D. Foster, Michael Alvarado, Cheryl Ewing, Shelley Hwang, Laura J. Esserman

Department of Surgery, University of California, San Francisco, San Francisco, California, United States

Objective Total skin-sparing mastectomy (TSSM) with complete preservation of the breast and nipple-areolar complex (NAC) skin and excision of nipple tissue was developed to improve aesthetic outcomes for treatment of early-stage breast cancer or for prophylactic indications. Over the past 12 years, TSSM has been offered for a wider range of indications as NAC preservation rates improved and as locoregional recurrence rates were shown to be similar to other mastectomy techniques. We aim to demonstrate that the technique of TSSM has developed into a feasible standard for mastectomy.

Methods We reviewed our experience of TSSM and immediate breast reconstruction from October 2001 to December 2012. Cases were divided into several learning cohorts defined by intentional changes in technique and management, which led to serial improvements in outcomes. The initial cohort focused on defining the appropriate placement of incisions for TSSM to maximize NAC survival. Subsequent improvements included increasing the minimum time from completion of radiation therapy to expander-implant exchange from 3 months to 6 months, switching from cephalosporins to trimethoprim-sulfamethoxazole for standard postoperative antibiotic prophylaxis unless contraindicated, and examining the utility of acellular dermal matrix in tissue expander/implant reconstruction. Postoperative complications and outcomes were obtained via retrospective chart review from 2001-2005 and gathered prospectively from 2005-2012.

Results A total of 640 patients underwent 986 cases of TSSM with mean follow-up time of 25 ± 20 months. The mean age at mastectomy was 47 ± 10 years. 32.5% of patients underwent neoadjuvant chemotherapy and 16.4% underwent adjuvant chemotherapy for breast cancer treatment. Comorbidities among patients included diabetes (1.6%), current or prior smoking (16.6%), and prior radiation history (7.7%). Of all TSSM cases, 35.0% were performed for prophylactic indications, while therapeutic cases included stage 0 (35.9%), stage 1 (28.9%), stage 2 (23.4%), stage 3 (10.9%), and stage 4 (0.9%) disease. Postmastectomy radiation therapy was performed in 18.9% of the therapeutic cases. Immediate breast reconstruction was performed in all cases with either tissue expander placement (85.1%), pedicle TRAM (6.3%), free TRAM (4.8%), permanent implant (3.0%), or latissimus flap (0.4%). Postoperative complications included the development of serious infection requiring IV antibiotics or operative intervention (9.8%), partial nipple necrosis (0.6%), complete nipple necrosis (1.0%), skin flap necrosis (8.4%), and expander/implant loss (8.4%). Radiation therapy was shown to increase the risk for developing serious infections (RR, 2.7; $p < 0.05$), major skin flap necrosis (RR, 2.1; $p < 0.05$), and expander/implant loss (RR, 3.6, $p < 0.05$) but had no significant effect on partial or complete NAC necrosis. Smoking history was shown to increase the risk of serious infection (RR, 1.9; $p < 0.05$), skin necrosis (RR, 1.6; $p < 0.05$), and expander/implant loss (RR, 1.8; $p < 0.05$). The 5-year cumulative incidence of locoregional recurrence was 3.0%, and the 5-year disease-free survival was 92.2%.

Conclusion Our technique of TSSM and immediate breast reconstruction has undergone substantial development since 2001. We have improved outcomes and decreased postoperative complications through a systematic series of learning cohorts. Serial improvements in technique and emerging data on longer term oncologic safety make this surgical approach feasible as a standard for mastectomy.

“Quickshot” Presentations

Listed in alphabetical order by presenter’s last name. Underscore indicates presenting author.

A National Snapshot of Satisfaction With Breast Cancer Procedures

Dunya M. Atisha¹, Charles E. Cox¹, Christel N. Rushing³, Greg P. Samsa³, Andrea L. Pusic⁴, Amy P. Abernethy²

¹Surgery, University of South Florida, Morsani College of Medicine, Tampa, Florida, United States,

²Hematology/Oncology, Duke University Medical Center, Durham, North Carolina, United States, ³Biostatistics, Duke University, Durham, North Carolina, United States, ⁴Plastic and Reconstructive Surgery, Memorial Sloan Kettering Cancer Center, Durham, New York, United States

Objective This year, greater than 280,000 women will be faced with the complex decision to undergo 1 of 3 equally effective oncologic surgical strategies for breast cancer: breast conservation surgery with radiation (BCS), mastectomy (M), or mastectomy with breast reconstruction (BR). Although BR may improve satisfaction with breast cancer care, the option to undergo BR is often left out of the informed consent and there are inadequate comparative effectiveness studies evaluating satisfaction with BR relative to other surgical options.

Methods The Dr. Susan Love/Army of Women (AOW) comprises over 360,000 women who voluntarily participate in breast cancer research. After approval by the IRB and the AOW Scientific Advisory Committee, women with a history of breast cancer surgery were recruited to take electronically administered condition-specific surveys, including the BREAST-Q[®], the PTSD checklist, the Impact of Cancer scale, and a demographic survey. Regression analysis was used to evaluate the effect of procedure type, treatment, and patient demographics on mean breast satisfaction score.

Results 9,289 women responded to the “call-to-action” e-mail and 7,619 completed all questionnaires (83%). 3507 had a history of BCS (43%), 1269 had M (16.67%), 2328 underwent BR (30.6%), and 515 had a complex surgical history with multiple procedures (C) (6.8%). The mean time since surgery was 6.7 years (SD = 5.9). When all other variables were held constant, regression analysis revealed that the average breast satisfaction score for women with abdominal flaps scored 5.6 points higher than BCS ($p < 0.0001$) and women with buttock or thigh flaps scored 14.4 points higher than BCS, ($p = 0.027$) (see table). There was no difference in breast satisfaction scores in women with latissimus dorsi flaps and BCS, however women with implant reconstruction reported scores that were 8.6 points lower than BCS ($p < 0.0001$). Women with mastectomies alone or complex surgical histories reported scores that were an average of 10 points lower than BCS ($p < 0.0001$, $p < 0.0001$, respectively).

Conclusion The ability to recruit a large number of women through the AOW resulted in the largest study to date to evaluate patient reported outcomes following breast cancer surgery. The highest level of satisfaction occurred in patients with autologous tissue reconstruction and the lowest satisfaction was in those with mastectomy alone. This data suggest that a discussion of mastectomy with breast reconstruction in the informed consent process is justified to guide surgical decision-making and to optimize access to surgical procedures most likely to positively impact patient satisfaction.

Linear Regression Analysis Demonstrating Factors Associated with Satisfaction with Breasts.

variable	Estimate	p-value	95% Confidence Limits	
Intercept	67.0999856	<.0001	60.2261471	73.9738242
Unknown Reconstruction Type vs Lumpectomy	-13.1018471	<.0001	-17.5368763	-8.6668178
Latisimus vs Lumpectomy	-0.8408766	0.6077	-4.0516654	2.3699122
No Recon (Mastectomy Alone) vs Lumpectomy	-10.1048156	<.0001	-11.6867297	-8.5229015
Other / Autologous Groups vs Lumpectomy	14.4851069	0.0273	1.6374399	27.3327739
TRAM Flap vs Lumpectomy	5.6132446	<.0001	3.6889095	7.5375796
Complex vs Lumpectomy	-10.0258366	<.0001	-12.4896123	-7.5620608
Implants vs Lumpectomy	-8.5765543	<.0001	-10.2216065	-6.9315022
Unreported vs Lumpectomy	-15.0824776	0.2785	-42.3653128	12.2003575
Chemo Y vs N	-1.4749605	0.0127	-2.6355095	-0.3144116
Hormone Therapy Y vs N	0.4661096	0.3830	-0.5811700	1.5133893
Radiation Y vs N	-4.4165738	<.0001	-5.7661366	-3.0670110
unspecified stage vs Stage 1	-1.9109641	0.1148	-4.2862720	0.4643438
Stage 0 vs Stage 1	-0.3937591	0.5454	-1.6701490	0.8826307
Stage 2 vs Stage 1	-2.4774109	0.0002	-3.7671316	-1.1876903
Stage 3 vs Stage 1	-3.6442186	0.0001	-5.5001428	-1.7882943
Stage 4 or metastatic vs Stage 1	0.9733421	0.6361	-0.3590271	5.0057113
Major Complication Y vs N	-2.5808803	0.0138	-4.6339947	-0.5277659
Minor Complication Y vs N	-6.6368524	<.0001	-7.6924005	-5.5813042
Time Since Surgery (continuous)	-0.1598874	0.0004	-0.2485331	-0.0712417
BMI at time of survey	-0.5250057	<.0001	-0.6082821	-0.4417293
Age	0.0399721	0.2365	-0.0262214	0.1061655
2 or More Races vs White	-0.9191764	0.5822	-4.1943702	2.3560174
American Indian or Alaskan Native vs White	7.5370044	0.2773	-6.0620099	21.1360098
Asian or Pacific Islander vs White	0.3596167	0.8781	-4.2361262	4.9553596
Black or African American vs White	-1.6299196	0.3654	-5.1600899	1.9002506
Other vs White	3.9628894	0.1917	-1.9868344	9.9126132
Hispanic/Latino Ethnicity vs Not Hispanic/Latino	-2.8102524	0.1102	-6.2589332	0.6384284
\$15000-\$24999 vs \$50000-\$74999	-2.2279806	0.0876	-4.7841880	0.3282269
\$35000-\$49999 vs \$50000-\$74999	0.2745906	0.7694	-1.5617177	2.1108988
less than \$15000 vs \$50000-\$74999	-0.9868503	0.5669	-4.3650449	2.3913442
\$25000-\$34999 vs \$50000-\$74999	0.7025022	0.5454	-1.5747204	2.9797249
\$75000-\$99999 vs \$50000-\$74999	0.9819375	0.2010	-0.5234048	2.4872798
\$100000 and over vs \$50000-\$74999	1.9822280	0.0034	0.6568726	3.3075834
unreported vs \$50000-\$74999	4.1957932	0.0006	1.8131324	6.5784540
Divorced vs Married	-0.6672934	0.4053	-2.2391002	0.9045134
Separated vs Married	-2.9034184	0.1942	-7.2870545	1.4802176

variable	Estimate	p-value	95% Confidence Limits	
Living with significant other vs Married	-0.9481306	0.3737	-3.0372935	1.1410322
Single, never married vs Married	1.1957353	0.2261	-0.7405239	3.1318944
Widowed vs Married	1.5042814	0.1974	-0.7830139	3.7915766
Employed Part Time vs Employed Full Time	0.0044615	0.9951	-1.4249665	1.4378795
Homemaker vs Employed Full Time	-0.6862162	0.4581	-2.4989232	1.1264868
Other vs Employed Full Time	-2.3071899	0.0307	-4.3991739	-0.2152058
Retired vs Employed Full Time	0.4536136	0.5356	-0.9818082	1.8890354
Student vs Employed Full Time	-1.0151313	0.7621	-7.5887299	5.5584673
Unable to work/Disabled vs Employed Full Time	-5.0459182	0.0006	-7.9261662	-2.1656701
Unemployed/seeking employment vs Employed Full Time	-0.3204853	0.8441	-3.5153136	2.8743430
Voluntary work vs Employed Full Time	2.8979554	0.0184	0.4896376	5.3062732
College, trade, or university diploma vs High School Diploma	2.0780929	0.0685	-0.1578391	4.3140248
Master/Doctoral degree vs High School Diploma	4.0816093	0.0005	1.7878625	6.3753560
Some Master/Doctoral degree vs High School Diploma	2.8933899	0.0335	0.2260176	5.5607622
Some College, trade, or university vs High School Diploma	-0.9909887	0.4056	-3.3268086	1.3448313
Some high school vs High School Diploma	-9.5634146	0.2009	-24.2192843	5.0924551
Currently Being Treated Y vs N	1.3924589	0.0159	0.2607291	2.5241898
Second Cancer Diagnosis Y vs N	-1.0696993	0.2676	-2.9619657	0.8225670
Recurrence Y vs N	-3.0886310	0.0043	-5.2083572	-0.9688048

Significant with comments about sample size: Other Autologous group contains 9 people.

The reference group is patients who underwent a Lumpectomy, received no chemo, no radiation, no hormone therapy, are stage 1, had no major complications, no minor complications, are white, non-Latino, married, employed full time with an income in the 50,000 to 74,999 range, highest education is HS Diploma, are not currently being treated, did not have a second cancer diagnosis and no recurrence. Any departure from this list of characteristics is measured in the model. The estimates represent the difference in average breast satisfaction score for the stated characteristic compared to the reference group. For example, with all other variables held constant, the average score for those currently being treated is 1.39 points higher than for those not currently being treated. As another example, the average score for those who received radiation therapy is 4.42 points lower than for those who had not, all other variables held constant.

Breast Imaging Second Opinions at a Tertiary Care Center: Impact on Clinical and Surgical Management

Kjirsten Carlson¹, Tara L. Spivey¹, Peter Jokich¹, Thomas Witt¹, Imke Janssen², Andrea Madrigano¹

¹General Surgery, Rush University Medical Center, Chicago, Illinois, United States, ²Preventative Medicine, Rush University Medical Center, Chicago, Illinois, United States

Objective Breast surgeons often see women for second opinions for abnormalities found on breast imaging. For second opinions, these images are submitted for review and interpretation by dedicated breast imagers. This study aims to evaluate the conformity of results among interpretation of imaging submitted from outside hospitals both from tertiary care centers as well as community programs, in an attempt to evaluate the utility of this practice for the sake of clinical management and resource utilization.

Methods A retrospective chart review was conducted on all breast patients who submitted outside imaging films for the years 2011 to 2013 at our University Medical Center (UMC). The radiologic diagnosis and each patient’s proposed management plan was collected and evaluated for concordance between the outside institutions and UMC.

Results A total of 380 patients who presented for second opinions with an interpretation of outside exams were evaluated. In 47.4% (95% confidence interval [CI], 42.4–52.4%) of cases, there was distinct variance in radiologic impression. For 53.5% (95% CI, 48.4–58.5%) of patients there was a change in recommended management plan which included recommendations for either additional imaging or need for additional biopsy. In total, this changed the overall surgical management in 27.1% (95% CI, 22.8–31.9%) of cases. In 5 patients, the re-interpretation of outside imaging detected new malignancies not previously identified. Overall, 83.7% (95% CI, 79.7–87.1%) of patients who submitted imaging from outside institutions chose to complete the remainder of their treatment at UMC.

continues

Conclusion The practice of submission of outside imaging to a dedicated breast imager is a common practice and the impact was evaluated in terms of radiologic concordance among institutions, differences in recommended workup, and how the second opinion ultimately affected definitive management. Review by a dedicated breast imager at our specialized center (UMC) resulted in an increased number of breast abnormalities detected. Second-opinion review also resulted in a spectrum of additional workup, including further mammographic views, different imaging modalities (ultrasound and/or MRI), and, in some cases, additional biopsies. In rare cases, the re-interpretation of imaging reported benign findings when additional workup was recommended by the outside institution. Overall definitive management was changed based on the second opinions at our specialty center in more than 1 in 4 cases. Most importantly, the review identified 5 previously unrecognized malignancies. For every 100 images submitted for review, 1.3 new malignancies were identified. Given this data, the practice of second opinions and interpretation of outside exams should continue despite the additional resources required.

The Impact of Extranodal Extension of Lymph Node Metastasis on Breast Cancer Outcomes

Audrey Choi, Samuel Rodriguez, Matthew Surrusco, Sharon Lum, Maheswari Senthil

Department of Surgery, Loma Linda University Medical Center, Loma Linda, California, United States

Objective Extranodal extension (ENE) of sentinel lymph node (SLN) metastasis is a strong predictor of non-sentinel node tumor involvement. For this reason the recent randomized controlled trial, ACOSOG Z0011, which investigated the omission of axillary lymph node dissection in patients with SLN metastasis undergoing breast-conserving therapy, excluded patients with ENE. ENE has also been recognized as a marker of aggressive tumor biology. We sought to investigate the impact of ENE on disease recurrence and survival in breast cancer patients with axillary nodal metastasis.

Methods A retrospective review of breast cancer patients who underwent an axillary staging procedure at a single tertiary cancer center from 2005-2012 was performed. Demographic characteristics, disease recurrence, and overall survival were compared between patients with and without ENE identified in axillary lymph nodes.

Results A total of 787 patients underwent sentinel lymph node dissection (SLND) and/or axillary lymph node dissection (ALND) during the study period. Their mean age was 55 years (range, 26-91 years). Median follow-up time was 34 months (range, 2-99 months). Of the 787 patients who underwent an axillary staging procedure, 494 (62.8%) patients had no axillary nodal metastasis and 293 (37.2%) patients had at least 1 lymph node involved with metastasis. Of the patients with axillary nodal metastasis, 118 (40.3%) had documented ENE on pathology, while 175 (59.7%) patients did not. Presence of ENE was significantly associated with a greater number of tumor-involved axillary nodes (5.8 vs 2.5, $p < 0.001$). Disease recurrence was significantly higher in patients with ENE, 22/118 (19.1%), as compared to 7/175 (4.1%) in patients without ENE ($p < 0.001$). There were more distant recurrences in the ENE group than in the group without ENE (72.7% vs 57.1%). After adjusting for systemic therapy, radiation therapy, and tumor size, the group with ENE demonstrated increased risk of disease recurrence (OR, 3.59; 95% CI, 1.39-9.28). The overall survival was also significantly lower in the ENE group (78.8% vs 93.7%, $p < 0.001$).

Conclusion In this retrospective study, ENE was significantly associated with increased nodal disease burden. More importantly, it was associated with increased disease recurrence and decreased overall survival. The presence of ENE should be considered a strong negative prognostic indicator, and its impact on disease recurrence and survival may be as relevant to patient outcomes as non-sentinel lymph node tumor involvement.

Is Breast Surgery for Metastatic Breast Cancer Safe? An Analysis of the NSQIP Database

Erin D. Cordeiro^{1,2}, Timothy Jackson^{1,2}, Ahmad Elnahas¹, Tulin Cil^{1,2,3}

¹Department of Surgery, University of Toronto, Toronto, Ontario, Canada, ²Division of General Surgery, University Health Network, Toronto, Ontario, Canada, ³Department of Surgery, Women's College Hospital, Toronto, Ontario, Canada

Objective Approximately 3.5% of all newly diagnosed breast cancer patients will present with metastatic disease. There is some ambiguity regarding the proper surgical management of patients with stage IV disease, with many still believing that the only role for primary breast surgery is for palliation. There have been some conflicting retrospective reports of improved survival with breast surgery in the metastatic setting, however, no one has examined whether these patients are at higher risk of postoperative complications. The purpose of this study was to determine the morbidity and mortality associated with breast surgery in the metastatic setting.

Methods We performed a matched cohort study by analyzing the National Surgical Quality Improvement Program (NSQIP) participant use files (PUF), a prospectively collected database of 30-day inpatient and outpatient morbidity

and mortality. Records from 2005-2011 were searched for patients with a primary diagnosis of metastatic breast cancer, with a breast surgical procedure as their primary surgery. Those with a bleeding disorder, on dialysis, paralyzed, or pregnant were excluded, as were men and ASA class 5 patients. We also excluded patients undergoing bilateral breast surgery, and those with concurrent surgery that was not breast and/or reconstruction related. Control nonmetastatic breast cancer patients were then matched based on primary surgery performed, ASA class, age, and year of surgery. We then analyzed morbidity and mortality outcomes, including composite outcomes of morbidity. Univariable and multivariable logistic regression analyses were performed to identify significant predictors of postoperative morbidity.

Results We identified 777 patients with a diagnosis of metastatic breast cancer who underwent a unilateral breast procedure. The number of patients with metastatic disease undergoing breast surgery increased from 22 in 2005 to a high of 170 in 2010. The mean age was 58. The most common surgical procedure with 306 patients (39.4%) was a modified radical mastectomy (MRM), 192 (24.7%) underwent simple mastectomy (SM), and 111 (14.3%) had a partial mastectomy with no axillary surgery (BCS). The 30-day mortality in the metastatic cohort was 1.54%, which was significantly higher than in the matched nonmetastatic cohort (0.2%, $p < 0.05$). Similarly, 30-day overall morbidity was higher in the metastatic cohort (6.7%) as compared to the nonmetastatic cohort (4.5%), although this did not reach statistical significance ($p = 0.06$). Within the metastatic cohort the subgroups with the highest overall 30-day morbidity were those who underwent an MRM (8.8%), SM (7.8%), and BCS (6.3%). On multivariable analysis, the only factor that significantly predicted postoperative morbidity was total operative time ($p < 0.05$).

Conclusion This is the first study to document the morbidity and mortality associated with breast surgery in the setting of metastatic breast cancer. We found that breast surgery in these patients has been occurring at an increasing rate within North America. Furthermore, the 30-day mortality and morbidity rates following breast surgery in the metastatic setting is significantly higher than in patients with stage I-III disease. This data may have implications for surgical management in this patient population.

For High-Risk Lesions, Excisional Breast Biopsy Specimen Volume Is Reduced in Radioactive Seed Localization vs Needle Localization With No Change in Operative Time or Upstage Rate

Emilia Diego¹, Priscilla McAuliffe¹, Atilla Soran¹, Kandace McGuire¹, Corinne Costello², Marguerite Bonaventura¹, Ronald Johnson¹, Gretchen Ahrendt¹

¹Surgical Oncology, UPMC-Magee Womens Hospital, Pittsburgh, Pennsylvania, United States, ²General Surgery, Garden City Hospital, Garden City, Michigan, United States

Objective Needle-localized (NL) excisional breast biopsy (EBB) is standard-of-care for surgical removal of non-palpable, high-risk lesions (HRL), including radial scar (RS), papilloma, atypical hyperplasia (AH) and lobular carcinoma in situ (LCIS). Potential pitfalls include wire displacement or transection, limitations in incision planning, patient discomfort from external component of wire and delays in surgery start. Specimen volume (SV) depends on accurate estimation of wire tip location. Radioactive seed localization (RSL) may eliminate some of these issues and has been used at our institution in place of NL almost exclusively since May 2011. The aim of this study was to compare SV, operative (OR) time, and upstage rate between the 2 procedures.

Methods After approval from the Quality Improvement Review Board, all single-site EBBs for HRL on core biopsy performed by 4 breast surgeons were retrospectively reviewed during October 2010-September 2011 for NL and October 2011-September 2012 for RSL. These time periods were chosen to eliminate the learning curve for RSL during program implementation. All patients with core biopsy demonstrating cancer were excluded. Information collected included age, pathology of diagnostic core biopsy and surgical specimen, SV (cm³), additional tissue taken after specimen radiograph, OR time, OR first assistant, and upstage rate. Data are reported as mean \pm standard deviation. Associations between factors were analyzed with ANOVA and chi-square using SPSS software (version 21.0). p values of <0.05 were statistically significant.

Results Three hundred twenty-seven EBBs for HRL were performed: 199 by NL, 129 by RSL. Core biopsies in 123 (62%) of NL and 88 (68%) of RSL were AH. The remaining core biopsies in both groups were RS, papilloma, or LCIS. For both groups, age was 54 ± 9 years. SV was 36.9 ± 32.8 cm³ and 25.2 ± 22.1 cm³ in the NL and RSL group, respectively ($p = 0.001$). OR time was 26.9 ± 6 minutes for NL and 26.6 ± 5 minutes for RSL ($p = 0.7$). After specimen radiograph, additional margins were obtained in 5 NL and 4 RSL cases. Ten (5%) patients in the NL group and 6 (5%) in the RSL group were upstaged to carcinoma. A trainee assisted in 89 (44%) of NL and 91 (70%) of RSL cases ($p = 0.001$).

Conclusion SV is significantly smaller in EBBs for HRL utilizing RSL vs NL. OR time and upstaging were

equivalent. Cases with trainees involved did not appear to affect OR time. Future studies will evaluate cosmetic implications of the reduced SV in RSL compared to NL.

	Needle Localization N = 199	Radioactive Seed Localization N = 129	p value
Specimen volume (cm ³)	36.9 ± 32.8	25.2 ± 22.1	0.001
Operative time (minutes)	26.9 ± 6	26.6 ± 5	0.7
Case done with trainee	89 (44%)	91 (70%)	0.001
Upstage to carcinoma	10 (5%)	6 (5%)	0.5
Additional tissue removed after specimen radiograph	5 (3%)	4 (3%)	0.5

Marking the Axillary Lymph Node Metastasis With Radioactive Iodine Seeds for Axillary Staging After Neoadjuvant Systemic Treatment in Breast Cancer Patients: the MARI Procedure

Mila Donker¹, Marieke Straver¹, Jelle Wesseling², Claudette Loo³, Margaret Schot⁴, Caroline Drukker¹, Harm van Tinteren⁵, Gabe Sonke⁴, Emiel Rutgers¹, Marie-Jeanne Vrancken Peeters¹

¹Surgical Oncology, Netherlands Cancer Institute - Antoni van Leeuwenhoek Hospital, Amsterdam, Netherlands, ²Pathology, Netherlands Cancer Institute - Antoni van Leeuwenhoek Hospital, Amsterdam, Netherlands, ³Radiology, Netherlands Cancer Institute - Antoni van Leeuwenhoek Hospital, Amsterdam, Netherlands, ⁴Medical Oncology, Netherlands Cancer Institute - Antoni van Leeuwenhoek Hospital, Amsterdam, Netherlands, ⁵Statistics, Netherlands Cancer Institute - Antoni van Leeuwenhoek Hospital, Amsterdam, Netherlands

Objective An important proven benefit of neoadjuvant systemic treatment (NST) in breast cancer patients is downstaging of the primary tumor to enable more conservative treatment. Downstaging of lymph node metastases occurs as well; a pathological complete response (pCR) of the axillary nodes is found in about 30% of the patients depending on the breast cancer subtype. The question arises as to whether an axillary lymph node dissection (ALND) is needed in all patients with proven N1-2-3 disease prior to NST, or whether less invasive surgery can reliably identify which patients have residual disease in the lymph nodes and which patients have a pCR. Recent trials (ACOSOG Z1071 and SENTINA) have shown that sentinel node biopsy (SNB) after NST in patients with proven metastatic lymph nodes prior to NST is far less accurate than SNB in primary surgery. We assessed a new minimal invasive surgical method to provide axillary lymph node staging after NST using a radioactive iodine (I-125) seed: the MARI procedure = Marking the Axillary lymph node with Radioactive Iodine seeds.

Methods Prior to NST, proven tumor-positive axillary lymph nodes were marked by ultrasound-guided insertion of an I-125 seed. This marked node is the so-called MARI-node. During the surgical procedure after NST, the MARI-node was selectively excised using a gamma-detection probe. A complementary ALND was performed to assess whether the pathological response in the MARI-node was indicative for the pathological response in the additional lymph nodes.

Results In 103 patients a tumor-positive axillary lymph node was marked with an I125 seed. The baseline characteristics are outlined in Table 1. Three patients were excluded due to M1 disease (n = 2) or switch to primary surgery (n = 1). In the remaining 100 patients, the MARI-node was successfully identified and excised in 97 patients (identification rate, 97%; 95%CI: 91-99). Two of the 97 patients did not undergo subsequent ALND, leaving 95 patients for further analysis. The MARI-node contained residual tumor cells in 65 of these 95 patients. In the remaining 30 patients, a pCR was observed in the MARI-node. In 25 of these 30 patients, the MARI-node was indicative for the pathological response in the axilla since a pCR was also observed in the additional nodes. In 5 patients, residual tumor cells were found in the additional lymph nodes despite a negative MARI-node. Thus, the MARI-procedure correctly identified 65 of 70 patients with residual axillary tumor (false negative rate, 5/70 = 7%; 95% CI: 2-16).

Conclusion This study shows that marking proven metastatic lymph nodes with an I-125 seed before NST and selectively removing these nodes after NST is feasible. The MARI-procedure had a high identification rate and a low false-negative rate and can thus be used to identify patients with residual disease or with a pCR in the axillary lymph nodes. This procedure helps to optimize patient-tailored axillary treatment after NST.

Table 1

Patient- and tumor-related characteristics (n=103)

Median age in years (range)	49 (24-67)
Radiological tumor stage prior to systemic treatment	
T0	1 (1%)
T1	24 (23%)
T2	51 (50%)
T3	20 (19%)
T4	7 (7%)
Clinical lymph node stage prior to systemic treatment	
N1	62 (60%)
N2	13 (13%)
N3	28 (27%)
Tumor histopathology	
Ductal carcinoma	88 (85%)
Lobular carcinoma	8 (8%)
Adenocarcinoma NOS	7 (7%)
Receptor-based subtype*	
ER- / PgR- / Her2-	22 (21%)
ER+ / Her2-	54 (52%)
Her2+	27 (26%)
Neoadjuvant systemic treatment regimen	
ddAC ¹	72 (70%)
CD ²	3 (3%)
PTC ³	24 (23%)
Other	4 (4%)

*Receptor-based subtype as established on histological biopsy prior to neoadjuvant systemic treatment

ER: estrogen receptor, PgR: progesterone receptor, Her2: human epidermal growth factor receptor

¹Doxorubicine 60 mg/m² and Cyclophosphamide 600 mg/m² q 2 weeks x 6

²Docetaxel 75 mg/m² and Capecitabine 2 x dd 1,000 mg/m² orally during 14 days, q 3 weeks x 6

³Paclitaxel 70 mg/m², Trastuzumab 2 mg/m² and Carboplatin AUC=3 mg/ml/min on days 1, 8, 15, 22, 29, 36 q 8 weeks x 3

Use of Prophylactic Postoperative Antibiotics During Surgical Drain Presence Following Mastectomy

Brandy L. Edwards¹, George Stukenborg², David Brenin¹, Anneke Schroen¹

¹General Surgery, University of Virginia, Charlottesville, Virginia, United States, ²Public Health, University of Virginia, Charlottesville, Virginia, United States

Objective Recent national clinical guidelines recommend a single dose of preoperative (pre-op) antibiotics (ABX) for breast procedures. Similarly, the ASBS position paper on ABX use discourages continuation of ABX postoperatively (post-op) without a “specific clinical indication.” However, reported skin and soft tissue infection (SSI) rates after mastectomy range from 2%-28%, higher than rates typical for clean cases. An increased risk of SSI has been demonstrated with longer duration of surgical drains, which are routinely placed with mastectomy. Utility of routine or selective post-op ABX use for the duration of drain presence following mastectomy remains uncertain.

Methods All female patients who underwent mastectomy without immediate reconstruction at our institution between 2005 and 2012 were retrospectively identified. Patients without documentation of post-op evaluation were excluded. SSI was defined using CDC criteria or a clinical diagnosis of cellulitis. Association between SSI and the use of post-op prophylactic ABX beyond the perioperative period, patient clinical factors (including diabetes, corticosteroid use, smoking status, BMI, prior ipsilateral breast surgery, neoadjuvant chemotherapy, prior ipsilateral chest radiation therapy), surgery type, procedure length, length of hospital stay, and drain duration was evaluated.

Results Four hundred eighty patients who underwent mastectomy without reconstruction were identified. All patients received pre-op ABX in the operating room. Fifty-five patients were excluded due to insufficient post-op documentation. Of 425 eligible patients, 268 were prescribed post-op ABX (63%) at time of discharge. An overall SSI rate of 7.30% was observed, with 14% of patients without ABX developing an SSI compared to 3.4% of patients with ABX ($p < 0.0001$). Certain clinical factors were independently associated with SSI, including current smoking status and advanced age (see table). Diabetes, steroid use, BMI, prior ipsilateral breast surgery, neoadjuvant chemotherapy, prior radiation therapy, surgery type (\pm axillary surgery), length of stay, and drain duration were not associated with increased SSI rates.

Conclusion SSI rate among patients who did and did not receive post-op ABX was significantly different and was most pronounced among smokers and women of advanced age. These patient subgroups may warrant special consideration for post-op ABX during drain presence. Further prospective studies are needed to determine if exceptions to the current recommendation of foregoing post-op ABX after mastectomy are warranted.

Analysis of Relationship Between Postoperative Infections and Prophylactic Antibiotic Use

	Study Population (Percent or Mean)	Bivariable Analysis (Unadjusted)		Multivariable Analysis (Adjusted)	
Postoperative infection	7.30%	---	---	---	---
Covariate	---	Odds Ratio	Odds Ratio 95% Confidence Interval	Odds Ratio	Odds Ratio 95% Confidence Interval
Prophylactic post-op ABX use	63.10%	0.21	(0.10 to 0.48)	0.19	(0.08 to 0.47)
Current smoker	13.40%	5.75	(2.64 to 12.52)	10.15	(4.02 to 25.60)
Age, in years	59.6	1.03	(1.00 to 1.07)	1.05	(1.01 to 1.09)
Procedure length, in minutes	164.3	1.00	(1.00 to 1.01)	1.01	(1.00 to 1.01)

Screening Mammography Following Autologous Breast Reconstruction: An Unnecessary Effort?

Mary E. Freyvogel, Shilpa Padia, Kelsey Larson, Jill Dietz, Stephen Grobmyer, Stephanie Valente

General Surgery; Breast Services, The Cleveland Clinic Foundation, Cleveland, Ohio, United States

Objective Currently, no standard guidelines exist regarding routine screening imaging in breast cancer patients undergoing autologous reconstruction. Concern over nonpalpable chest wall recurrence has prompted many to pursue screening imaging in this population. We analyzed the pattern of locoregional recurrence (LRR) and the yield of screening imaging studies in these patients.

Methods We performed a retrospective chart review of all patients who had mastectomy with autologous breast reconstruction between 2000 and 2009 at our institution. Time and presentation of LRR, as well as results and sequelae of imaging studies, were recorded and analyzed. Screening mammography was performed at the discretion of the treating physicians. Patients without postoperative follow-up were excluded.

Results A total of 615 patients were identified and follow-up data was available for 542 patients who form the basis of our analysis. Median follow-up from time of reconstruction for patients in this series was 7 years. Immediate reconstruction was performed in 427 patients (78.8%) and delayed reconstruction in 115 (21.2%). Among patients screened with mammography (n = 428), an abnormality on imaging led to biopsy in 5.8%, and 8% were malignant. Among patients receiving routine clinical exam (n = 538), an abnormality on exam led to biopsy in 12.2%, and 38.2% were malignant. Twenty-seven patients developed an LRR after autologous reconstruction (5.0%). The median time from cancer surgery to local recurrence was 2.6 years. LRR was detected on clinical exam in 24/27 patients (88.9%). Screening mammography detected 2 recurrences, which were also found to be palpable on follow-up exam. One patient had an incidental finding of chest wall recurrence on PET/CT. In summary, 26/27 patients had a clinically detectable LRR (96.3%).

Conclusion Diligent postoperative surveillance with clinical exam is a reliable method of detecting LRR after autologous reconstruction, identifying 96.3% of recurrences in our study. Our results do not support routine mammographic screening in patients following autologous reconstruction.

ACOSOG Z0011 Trial Results Led to Marked Changes in Surgical Treatment of the Axilla Among Patients With Breast Cancer: A Population-Based Study

Nicole Hodgson^{1,2,3}, Sylvie D. Cornacchi^{1,4}, Marko Simunovic^{1,2,3}, Lehana Thabane^{5,6}, Mary Ann O'Brien⁷, Susan Reid^{1,3}, Barbara Heller^{1,2,4}, Peter J. Lovrics^{1,4}

¹Department of Surgery, McMaster University, Hamilton, Ontario, Canada, ²Department of Surgical Oncology, Juravinski Cancer Centre, Hamilton, Ontario, Canada, ³Department of Surgery, Hamilton Health Sciences, Hamilton, Ontario, Canada, ⁴Department of Surgery, St. Joseph's Healthcare, Hamilton, Ontario, Canada, ⁵Biostatistics Unit, St. Joseph's Healthcare, Hamilton, Ontario, Canada, ⁶Department of Clinical Epidemiology and Biostatistics, McMaster University, Hamilton, Ontario, Canada, ⁷Department of Family and Community Medicine, University of Toronto, Toronto, Ontario, Canada

Objective The American College of Surgeons Oncology Group (ACOSOG) Z0011 trial demonstrated no difference in locoregional recurrence or overall survival rates between patients with clinical T1-T2 tumors with 1-2 positive sentinel lymph nodes (SLN+) who underwent breast-conserving surgery (BCS) with postoperative irradiation randomly selected to have completion axillary lymph node dissection (CALND) vs no further surgery. Several recent studies have suggested variable uptake of these results. This study examines the impact of ACOSOG Z0011 results on the surgical management of the axilla in a population-based cohort of patients with BC treated in the Local Health Integration Network 4 (LHIN4) region of Ontario (population, 1.4 million).

Methods Consecutive cases undergoing surgery for invasive BC were reviewed at 12 hospitals in LHIN4. Data were collected for 1 time period before the dissemination of the Z0011 results (May-October 2006) and for 2 time periods after Z0011 was published (Jan-April 2011 and July-October 2012). Cases with locally advanced BC receiving neoadjuvant therapy, surgery for recurrence, benign breast disease, or ductal carcinoma in situ were excluded. Data were collected for patient age, tumor characteristics, type of breast surgery (BCS or mastectomy), type of lymph node surgery, number of positive SLNs, the size of SLN metastases (micro- or macrometastases), CALND rate, cases with positive nodes on cALND, and receipt of adjuvant therapies.

Results The following table depicts the change in lymph node surgery over a 7-year period. Sentinel lymph node biopsy (SLNB) rate increased from 22% in 2006 to 75% in 2012 and the number of hospitals performing SLNB increased from 58% to 100%. All but 2 cases with SLN+ in 2006 had CALND (89%). Following Z0011 dissemination in September 2010, the CALND rate decreased to 56% in 2011 and to 30% in 2012. In 2011, 23% of cases with micromets had cALND, while in 2012 no cases with micromets had CALND. In 2012, 9 SLN+ cases with macromets had CALND and, of these, 5 (55%) met Z0011 eligibility criteria and could have been spared CALND. Of the 11 cases with SLN+ with macromets without CALND, 3 (27%) did not meet Z0011 criteria and should have had CALND (ie, mastectomy cases).

Conclusion Since dissemination of the ACOSOG Z0011 results, there has been a significant reduction in patients receiving CALND in the LHIN4 region. These results suggest that limited but high-quality evidence can lead to rapid population-based changes in cancer surgery practice.

continues

Completion Axillary Lymph Node Dissection (CALND) Results

	2006	2011	2012
Number of invasive breast cancer cases	370	283	234
SLNB rate	81/370 (22)	197/283 (70)	176/234 (75)
Rate SLNB(+) positive	18/81 (22)	41/197 (21)	30/176 (17)
SLNB(+) with micrometastasis (>0.2 mm and ≤2.0 mm)	3/10 (30)	12/41 (29)	10/30 (33)
SLNB(+) with macrometastasis (>2.0 mm)	7/10 (70)	29/41 (71)	20/30 (67)
SLNB(+) Size not stated	8 cases	--	--
CALND rate for SLNB(+) cases	16/18 (89)*	23/41 (56)	9/30 (30)*

*Indicates significant $p < 0.01$, chi square comparing CALND rate for 2006 and 2012.

Percentages in parentheses.

Chemosensitivity and Endocrine Sensitivity Predicted by MammaPrint and Blueprint in the Prospective Neoadjuvant Breast Registry Symphony Trial (NBRST)

Pat Whitworth¹, Mark Gittleman², Stephanie Akbari³, Lisette Stork-Sloots⁴, Femke De Snoo⁴, Jessica Gibson⁵, Peter Beitsch⁶

¹Department of Surgery, Nashville Breast Center, Nashville, Tennessee, United States, ²Department of Surgery, Breast Care Specialists, Allentown, Pennsylvania, United States, ³Department of Surgery, Virginia Hospital Center, Arlington, Virginia, United States, ⁴Medical Affairs, Agendia NV, Amsterdam, Netherlands, ⁵Medical Affairs, Agendia Inc, Irvine, California, United States, ⁶Department of Surgery, Dallas Surgical Group, Dallas, Texas, United States

Objective Sorlie (PNAS 2001), Glück (BCRT 2013), and others demonstrated that breast cancer molecular subtypes have distinct clinical outcomes. The aim of the prospective NBRST study is to compare a multigene classifier to IHC/FISH subtyping to predict chemosensitivity as defined by pathological complete response (pCR), or endocrine sensitivity as defined by partial response (PR) and metastasis-free survival.

Methods The study includes women with histologically proven breast cancer (ages 18–90), who are scheduled to start neoadjuvant chemotherapy (NACT) or neoadjuvant endocrine therapy (NET), and who provide informed consent. Treatment is at the discretion of the physician adhering to NCCN-approved regimens. pCR is defined as the absence of invasive carcinoma in both the breast and axilla in the surgical specimen, regardless of the presence of carcinoma in situ. Blueprint in combination with MammaPrint classifies patients into 4 molecular subgroups: Luminal (BPLum) (BPLum A, MammaPrint Low Risk; BPLum B, MammaPrint High Risk), HER2-type (BPHER2), and Basal-type (BPBasal).

Results Three hundred seven patients (age range, 22–82), T1–4 N0–3, had definitive surgery.

RECLASSIFICATION: - 30/153 (20%) IHC/FISH ‘Luminal’ (ERPR+/Her2-) patients were re-classified (30 BPBasal). - 38/85 (45%) IHC/FISH Her2 patients were re-classified (23 BPLum and 15 BPBasal). - 4/69 (6%) IHC/FISH triple-negative (TN) patients were re-classified (1 BPLum and 3 BPHER2). **NET RESPONSE:** - Of the 18 BPLum/‘Luminal’ patients who received NET, 8 patients (44%) had a PR. **NACT Response:** - Of 129 BPLum who received NACT, 9 patients (7%) had a pCR (3% in BPLum A and 8% in BPLumB) vs 17/135 (13%) pCR in IHC/FISH ‘Luminal’ patients. - All (50) BPHER2 patients had NACT and 46 also received trastuzumab; 22 (44%) had a pCR vs 30/85 (35%) pCR in IHC/FISH Her2 patients. - Of the 110 BPBasal patients, including the 30 re-classified from the IHC/FISH ‘Luminal’ and the 15 from the IHC/FISH Her2 categories all received NACT; 40 (36%) had a pCR, roughly equivalent to the pCR percentage (35%) seen in the 69 patients originally designated TN by IHC/FISH.

Conclusion Molecular subtyping using Blueprint leads to a reclassification of 23% (72/307) of tumors. BPLum reclassification predicted a lower pCR rate than that seen with IHC/FISH ‘Luminal’, reassigning more responsive patients to the HER2 and basal categories. Blueprint reclassification resulted in a BPHER2 group with a higher pCR rate than that seen with IHC/FISH Her2, reassigning less responsive patients to the BPLum category. Blueprint reclassification enlarged the basal category, while maintaining the pCR rate. These findings suggest the Blueprint multigene classifier more accurately identifies breast cancer subtype and thus may serve as a better guide for neoadjuvant treatment than standard, local IHC/FISH assay.

Posters

Listed in alphabetical order by first author's last name. Underscore indicates presenting author.

T1aN1 Breast Cancers Predict Worse Survival Over T1bN1 Cancers

Shoko E. Abe¹, Yimei Han², Lejla Hadzikadic-Gusic¹, Kendall Carpenter¹, Terry Sarantou¹, Teresa Flippo-Morton¹, Richard L. White¹, James Symanowski², Joshua Hill¹

¹Department of Surgery, Division of Surgical Oncology, Carolinas Medical Center/Levine Cancer Institute, Charlotte, North Carolina, United States, ²Department of Cancer Biostatistics, Carolinas Medical Center/Levine Cancer Institute, Charlotte, North Carolina, United States

Objective The relative incidence of small breast cancers (T1a-c) has increased over the past two decades due to increased mammographic screening. Increased use of sentinel lymph node biopsy (SLNB) has contributed to increased detection of clinically occult nodal metastases. We hypothesize that: (a) the incidence of node-positive small tumors (T1a-b N1-3) has increased in recent years; (b) patients with node-positive small tumors have worse survival than those with larger node-positive tumors; and (c) survival has improved with approval of trastuzumab for treatment of HER2/neu (HER2) amplified, nonmetastatic, node-positive breast cancer in 2006.

Methods We identified 37,232 female patients diagnosed with T1 N1-3 invasive breast cancer between 1990 and 2010 from the Surveillance, Epidemiology and End Results (SEER) registry database. Univariate and multivariate analyses were performed comparing patient and tumor characteristics: age, race, tumor size, histology, lymph node (LN) involvement, and estrogen receptor (ER)/progesterone receptor (PR) status, and diagnosis year (1990-1994, 1995-1999, 2000-2005, 2006-2010). Kaplan-Meier and Cox regression methods were used to analyze disease-specific survival (DSS).

Results There was an increase in the proportion of T1aN1 and T1cN1 breast cancer diagnosed between 1990 and 2010 (74.3% vs.79.5%), with a concurrent reduction in the proportion of T1bN1/N2 cases (25% to 20.1%). Five-year DSS was worse for T1aN1 tumors compared to T1bN1 tumors (94.1% vs 96.2%; hazard ratio (HR), 1.35; 95% confidence interval (CI), 1.08-1.68; $P < 0.001$), but better compared to T1cN1 tumors (94.1% vs. 93.1%; HR, 0.77; 95% CI, 0.63-0.94; $p < 0.001$) (see figure). No significant difference in DSS was seen between T1aN2 and T1bN2 tumors. For all stages, 5-year DSS was worse if diagnosis was prior to 2000 (1990-1994: 91.2%; HR, 1.76; 95% CI, 1.51-2.05; $p < 0.001$; 1995-1999: 92.6%; HR, 1.41; 95% CI, 1.21-1.65; $p < 0.001$), but not significantly worse if diagnosed in 2000-2005 (94.7%; HR, 1.07; 95% CI, 0.92-1.24; $p = 0.4$). In comparing T1aN1 patients to T1bN1 patients, T1aN1 patients were younger (56.3 years vs 59.1 years, $p < 0.001$), and a greater proportion were African American (11.3% vs 8.4%, $p < 0.001$), ER-negative (19% vs 14.6%, $p < 0.001$), and PR-negative (29.9% vs 23.2%, $p < 0.001$).

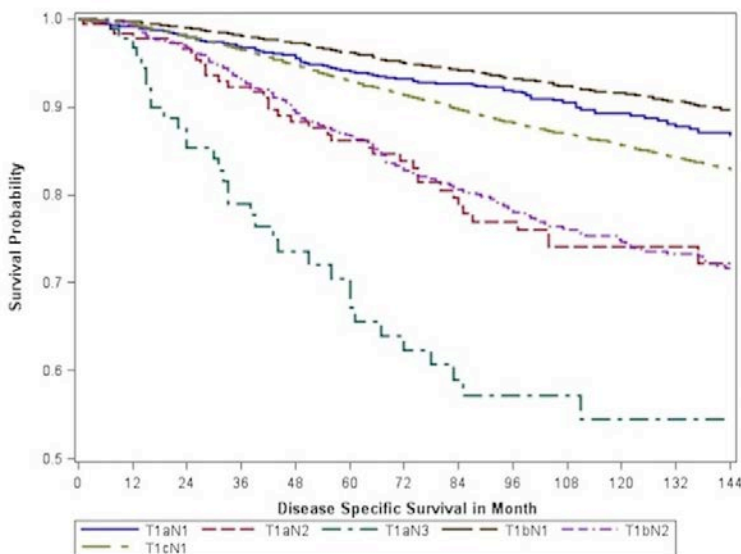


Figure 1. Kaplan Meier curves by stage

continues

Conclusion Patients with T1aN1 tumors had worse survival compared to patients with T1bN1 tumors. This may indicate the aggressive nature of very small tumors with nodal metastases. However, our analysis showed improved survival of T1aN1 tumors over T1cN1 tumors, possibly indicating that when tumors are larger than 1 cm, tumor size remains an important prognostic factor. The significant improvement in survival after 2000 correlates with the numerous advances in adjuvant therapy during that period, including approval of trastuzumab for treatment of early HER2-amplified breast cancer.

High-Risk Lesions Identified Only by MRI Core Needle Biopsy in Newly Diagnosed Breast Cancer Patients: Incidence, Upgrades to Malignancy, and Impact on Surgical Therapy

Samantha M. Alsop¹, Lyndsey J. Kilgore¹, Mark L. Redick², Joshua M. Mammen¹, Marilee K. McGinness¹, Jamie L. Wagner¹, Fang Fan³, Shenequa L. Deas¹, Carol S. Connor¹

¹General Surgery, University of Kansas, Kansas City, Kansas, United States, ²Radiology, University of Kansas, Kansas City, Kansas, United States, ³Pathology, University of Kansas, Kansas City, Kansas, United States

Objective Surgical excision of high-risk lesions (HRLs) on MRI-guided biopsy is often advised due to an upgrade to malignancy of ~10% (papilloma without atypia) to ~20% (atypical ductal hyperplasia). This upgrade is typically extrapolated from CNBs of lesions seen on mammogram and ultrasound. In newly diagnosed breast cancer patients, surgical excision of HRLs can impact surgical treatment of the known cancer. The actual upgrade rate for HRLs seen only on MRI in this population is unknown.

Methods This single-institution, IRB-approved, retrospective review of 188 MRI-guided biopsies between 2007 and 2012 was performed to determine the incidence, upgrade to malignancy, and impact on surgical therapy for HRLs found on MRI alone in newly diagnosed breast cancer patients. HRLs were defined as atypical ductal hyperplasia (ADH), atypical lobular hyperplasia (ALH), lobular carcinoma in situ (LCIS), papilloma with/without atypia, and radial scar.

Results One hundred twenty-eight of 188 (68%) of MRI biopsies were in newly diagnosed breast cancer patients. An HRL was identified in 25/128 (20%). Surgical pathology was available for 22/25 (88%). The 3 patients without surgical pathology (radial scar, LCIS, and papilloma with atypia) were excluded. Clinical characteristics, pathology, and impact on surgical treatment are shown in the following table.

Conclusion HRLs were identified on MRI biopsy in 20% of newly diagnosed breast cancer patients. The only upgrade to malignancy occurred in a patient with ALH. Conversion to mastectomy occurred in 13/22 (59%) patients, including 13% of patients with benign papillomas without atypia. Further investigation is warranted to determine if surgical excision and conversion to mastectomy can be avoided for HRLs without atypia on MRI biopsy in newly diagnosed breast cancer patients.

Clinical Characteristics, Final Pathology and Impact on Surgical Treatment

Parameter	ADH (n = 7)	ALH (n = 2)	LCIS (n = 3)	Papilloma w/o atypia (n = 8)	Papilloma w/ atypia (n = 2)
Age (median)	60.0	59.0	43.0	64.5	56.5
Incidence	7/22 (32%)	2/22 (9%)	3/22 (14%)	8/22 (36%)	2/22 (9%)
Upgrade to malignancy	0	1/2 (50%) IDC Contralateral	0	0	0
HRL Location					
Ipsilateral to known cancer	3/7 (43%)	0	2/3 (67%)	3/8 (38%)	1/2 (50%)
Contralateral to known cancer	4/7 (57%)	2/2 (100%)	1/3 (33%)	5/8 (62%)	1/2 (50%)
Surgical Intervention for HRL					
Excision prior to planned cancer surgery	0	1/2 (50%)	0	2/8 (25%)	0
■Excisional biopsy	0	1/1 (100%)	0	2/2 (100%)	0
Same day as planned cancer surgery	7/7 (100%)	1/2 (50%)	3/3 (100%)	6/8 (75%)	2/2 (100%)
■Excisional biopsy	1/7 (14%)	0	0	5/6 (83%)	0
■Mastectomy	6/7 (86%)	1/1 (100%)	3/3 (100%)	1/6 (17%)	2/2 (100%)
Conversion to mastectomy due to HRL	6/7 (86%)	1/2 (50%)	3/3 (100%)	1/8 (13%)	2/2 (100%)

History of a Prior Benign Breast Biopsy and Hormone Receptor Status of Subsequent Breast Cancer

Amanda L. Amin¹, Subhashini Allu¹, Angela Fought¹, Thomas Kmiecik¹, Megan E. Sullivan², Denise Scholtens¹, Robert Chatterton³, Peter Gann⁴, Seema A. Khan¹

¹Department of Surgery, Northwestern University, Chicago, Illinois, United States, ²Department of Pathology, Northwestern University, Chicago, Illinois, United States, ³Department of Physiology, Northwestern University, Chicago, Illinois, United States, ⁴Department of Pathology, University of Illinois Chicago, Chicago, Illinois, United States

Objective A history of prior benign breast biopsy (BBB) is a known breast cancer risk factor. However, few studies have examined the frequency of prior BBB relative to the hormone receptor (HR) status of subsequent breast cancer. Recent data suggest that atypical hyperplasia (AH) is specifically a risk factor for HR+ disease, which would explain the greater success of tamoxifen prevention in women with atypical lesions. We performed a prospective case control study to examine nipple fluid characteristics and breast cancer risk; we have analyzed the BBB data from the cases recruited to this study to examine the frequency and histology of BBB and HR status of subsequent cancer.

Methods Incident cases of DCIS and invasive breast cancer were recruited at a single institution. All participants completed a detailed survey, documenting breast cancer risk factors, including number and dates of prior BBB; when BBB was performed at our institution, biopsy records were reviewed for date and histology of BBB. HR status and date of subsequent cancer diagnosis was also extracted. Differences between groups were tested using *t* tests for continuous and chi-square tests for categorical variables.

Results A total of 461 patients with known HR status were recruited, 83 (18%) with HR-negative and 378 (82%) with HR-positive breast cancer. Of these, 160 (34.7%) gave a history of prior BBB. Mean age at BBB was 43 years and age at cancer diagnosis was 52 years. The frequency of BBB was similar by HR status (37% and 34%, χ^2 , $p = 0.57$). The breast cancer histology was DCIS in 124 women (35% BBB), invasive ductal in 305 women (33% BBB), invasive lobular in 52 women (42% BBB), $p = 0.22$ between ductal and lobular histology. The interval since BBB was also similar between the 2 groups (14.2 years for HR- and 11.6 years for HR+ breast cancer, $p = 0.22$), but the interval from BBB to ductal malignancies was longer than for lobular carcinoma (13 vs 7 years, $p = 0.08$). The specific histologic diagnosis of the BBB was known in 100 cases; when BBB lesions were characterized as proliferative or not, the distribution was similar between HR+ and HR- cases (13% vs 19%, $p = 0.49$). However, when considering only atypical hyperplasia, 5/6 women with prior AH had HR+ disease.

Conclusion There do not appear to be major differences in the BBB experience of women who develop ER+ versus ER- breast cancer; however, we did observe a trend supporting recent hypotheses that atypical hyperplasia is more specifically associated with subsequent ER+ cancer. We are currently pursuing more complete histologic data on BBB lesions and will present an updated analysis.

Mammographic Breast Density and Call-Backs: Does Breast Density Legislation Affect Reporting?

Kendra Anderson¹, Seyed Pairawan¹, Cherie Cora², Karin Kazanjian², Won Bae², Sharon Lum¹

¹Department of Surgery, Loma Linda University School of Medicine, Loma Linda, California, United States,

²Department of Radiology, Loma Linda University School of Medicine, Loma Linda, California, United States

Objective Increasing levels of breast density have been associated with higher risk of developing breast cancer and decreased sensitivity of mammographic screening to detect breast cancer. For these reasons, recent federal legislation has been introduced in Congress mandating the inclusion of breast density and its associated risks when reporting screening mammogram results to patients. On April 1, 2013, California became 1 of 13 states enforcing breast density notification legislation. The aim of this project was to characterize factors associated with breast density and imaging call-backs, and to determine the impact of breast density legislation on these findings.

Methods We performed a retrospective study of patients undergoing screening mammograms between March 1, 2013, and April 30, 2013, at a single, tertiary-care institution in California. Patient demographic factors, screening mammogram density, reporting radiologist, and number of call-back examinations were recorded. Mammogram density was categorized as high (BI-RADS 3 or 4/heterogeneously or extremely dense) or low (BI-RADS 1 or 2/fatty or fibroglandular). Cases were analyzed by breast density (high vs low), call-back (received vs not received), and date of screening (pre- vs. post-April 1, 2013).

Results During the study period, a total of 1,131 screening mammograms were performed: 536 (47.4%) prior to April 1, 2013, and 595 (52.6%), on or after April 1, 2013. Median patient age was 59 years (28-92). The majority of patients were non-Hispanic white (53.9%), followed by Hispanic (19.1%), non-Hispanic black (9.4%), and Asian (9.0%). Mammogram density was noted as high in 650 (57.5%) cases, low in 452 (40.0%), and not recorded in 29 (2.6%). Overall, 244 (21.6%) patients received at least 1 call-back. On multivariate analysis, increased breast density was associated with age under 50 (OR, 2.29; 95%CI, 1.55-3.39), BMI < 25 (OR, 8.34; 95%CI, 5.66-12.29), Asian race (OR, 2.82; 95%CI, 1.54-5.17), Hispanic ethnicity (OR, 1.73; 95% CI, 1.16-2.57), 1 of 7 individual radiologists (OR, 1.55; 95% CI, 1.03-2.33), and the need for at least 1 call-back exam (OR, 1.83; 95%CI, 1.25-2.67). Receipt of call-back imaging was independently associated with age under 50 (OR, 1.61; 95% CI, 1.09-2.37), high breast density (OR, 1.82; 95% CI, 1.25-2.67), and a different radiologist (OR, 4.28; 95%CI, 2.62-6.99). When compared by dates of imaging pre- or post-April 1, 2013, there were no significant differences in screening mammograms reporting high breast density (57.7% pre- vs 60.2% post-, $p = 0.7$) or number of required callbacks (20.5% pre- vs 22.5% post-, $p = 0.4$).

Conclusion Increased breast density and imaging callbacks are associated with both patient and system factors. Addressing nonmodifiable influences may enhance patient counseling; addressing modifiable influences may lead to measurable quality improvement. In the first month after its implementation, California's breast density notification law has not prompted changes in breast density reporting or number of call-back examinations. Future study is required to realize the full impact of this legislation.

Primary Breast Tuberculosis: Forgotten But Not Gone

Mehdi Asadi¹, Mostafa Mehrabi Bahar¹, Soudabeh Shahid Sales²

¹Surgical Oncology Research Center, School of Medicine, Mashhad University of Medical Sciences, Mashhad, Islamic Republic of Iran, ²Cancer Research Center, School of Medicine, Mashhad University of Medical Sciences, Mashhad, Islamic Republic of Iran

Objective Primary breast tuberculosis is a very rare form of extrapulmonary tuberculosis with different estimated prevalence from 0.2 % to 4 % of all extrapulmonary forms of the disease and between 0.1% and 3% of all breast lesions worldwide. The aim of this study is a comparison between three diagnostic modalities in patients with primary breast tuberculosis, including core needle biopsy (CNB) of breast lesion, surgical biopsy of breast lesion, and CNB of ipsilateral axillary lymphadenopathies.

Methods A retrospective single-institution database was analyzed for patients with primary breast tuberculosis from 2000 to 2010. Patients with incomplete data or evidence of pulmonary or other concurrent extrapulmonary tuberculosis were excluded. Patients were divided into 3 groups according to the diagnostic modality led to their definitive diagnosis. Diagnosis was made upon histopathologic examination of specimen.

Results Fifty-four patients were enrolled in the study. Eleven patients were from Persian race and the other 43 patients were Afghan immigrants. Results are presented in the following table.

Conclusion According to our results, the most accurate diagnostic option is surgical biopsy. Unfortunately when complications come to account, this modality encounters a great and unacceptable disadvantage. CNB of breast lesion and axillary lymphadenopathies are appropriate options. We recommend CNB of axillary lymphadenopathies and breast lesions as first and second steps of diagnosis in any patient with symptoms or signs of probable breast tuberculosis, especially in endemic areas or patients with history of tuberculosis or active tuberculosis. Considering complications, surgical biopsy should be reserved as the last option.

	CNB of Breast Lesion	Surgical Biopsy of Breast Lesion	CNB of Ipsilateral Axillary Lesion
Number of patients	20	26	8
Definitive diagnosis	12	26	6
Nondiagnostic results	8	0	2
Age, mean (years)	37.4 (24-51)	41.0 (29-63)	36.8 (25-48)
Race (Persian/Afghan)	5/7	3/23	3/3
Previous CNB of breast	-	8	0
Previous CNB of axilla	0	2	-
Palpable breast mass	20	26	8
Chronic breast fistulae	3	7	0
Chronic breast ulcer	2	11	1
Chronic mastitis	0	5	1
History of breast abscess	3	9	0
Axillary lymphadenopathy	15	21	8
Iatrogenic chronic wound	0	13	0
Iatrogenic chronic fistulae	2	15	0

#BCSM: Using Social Media to Develop a Novel Breast Cancer Support Community

Deanna J. Attai¹, Michael Cowher², Jody M. Schoger³, Alicia C. Staley⁴

¹Center For Breast Care, Inc, Burbank, California, United States, ²Cleveland Clinic, Cleveland, Ohio, United States,

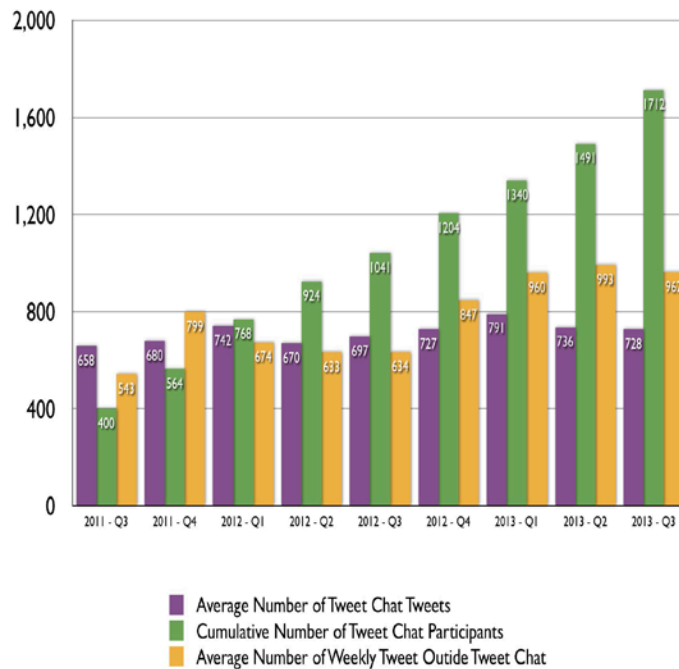
³Women With Cancer, The Woodlands, Texas, United States, ⁴Awesome Cancer Survivor, Charlestown, Massachusetts, United States

Objective Approximately one third of patients diagnosed with breast cancer will take advantage of a support group at some time during their treatment. However, patients frequently do not attend due to inconvenient meeting times, transportation issues, or feeling that their needs are not specifically addressed. In 2011, a Breast Cancer Social Media tweet chat (#BCSM) was created on Twitter and we report on the group's experience to date.

Methods In 2008, two of the authors (JMS and ACS) met on Twitter. They were brought together by their cancer experiences but also recognized that there were no forums dedicated solely to breast cancer. They were also concerned with the quality of information provided via some social media channels. On July 4, 2011, they launched the #BCSM chats, which occur every Monday evening. One of the authors (DJA) was designated a co-moderator in October 2011. The goal of the #BCSM chats is to provide credible, evidence-based information and support for all who are affected by breast cancer. It is clearly stated that specific medical advice is not provided.

Results More than 120 hours of conversation have been logged on various topics, such as breast cancer facts, treatment options and side effects, grief and death, and all aspects of survivorship. In addition, the participating physicians moderate chats covering major breast cancer scientific meetings and clinical trials. The community strongly supports evidence-based approaches to breast cancer treatment, which is aided by the regular presence of physicians who contribute to the chats. The number of participants, including the cumulative number of unique participants, continues to grow (see figure below). Participants include patients, family, friends, advocates, surgeons, medical oncologists, radiation oncologists, clinical psychiatrists, genetic counselors, and physical therapists. Each week, there are an average of 700 tweets over the course of 1 hour, and over 2-3 million impressions (number of tweets x number of followers).

Conclusion #BCSM has made it possible for patients and physicians to come together in an online community and to share credible medical information as well as support for all affected by breast cancer. The chat provides physicians wary of the social media space with an example of positive patient/physician engagement that takes place in real time. The authors are in the process of developing surveys to assess the impact of community participation on the members.



Cumulative growth of #BCSM chats.

Sensitivity and Specificity of 99mTc-tilmanocept, a CD206-Targeted Molecular Sentinel Node Mapping Agent in Breast Cancer

Jennifer L. Baker¹, Ava Hosseini¹, Michael S. Blue³, David R. Vera², Anne M. Wallace¹

¹Surgery, University of California San Diego, San Diego, California, United States, ²Radiology, University of California San Diego, San Diego, California, United States, ³Navidea Biopharmaceuticals, Dublin, Ohio, United States

Objective 99mTc-tilmanocept (Navidea Biopharmaceuticals, Dublin OH), is the first receptor-targeted (CD206) molecular sentinel lymph node (SLN) mapping agent. Two prospective Phase 3 multicenter, open-label, within-patient trials demonstrated that for SLN biopsy in patients with breast cancer, 99mTc-tilmanocept identified more sentinel lymph nodes in significantly more patients than blue dye ($p < 0.0001$) and significantly more pathology-positive lymph nodes than VBD ($p = 0.03$) (Wallace et al. *Ann Surg Oncol.* 2013;20:2590-2599). This retrospective analysis evaluated the sensitivity and specificity, as well as other diagnostic variables, of 99mTc-tilmanocept in women with breast cancer enrolled in the Phase 3 trials.

Methods The per-patient sensitivity of 99mTc-tilmanocept was evaluated relative to patients with pathology-positive lymph nodes. The false-negative rate (FNR), negative predictive value (NPV), positive predictive value (PPV), and overall accuracy were also assessed. The evaluable population included all patients who were injected with 99mTc-tilmanocept, underwent surgery, and had at least 1 lymph node removed with tissue type and pathology confirmed. Estimates were calculated for each of the variables in breast cancer patients in each study and in the pooled population of patients with breast cancer. It was assumed that the 2 studies shared a common effect size, therefore, a weighted least squares (WLS) analysis was used to compute the meta-analysis estimates of the variables.

Results Among 148 patients with breast cancer enrolled in the 2 trials, 33 pathology-positive nodes were obtained from 27 patients. There were 121 patients with true negative findings and 26 patients with true positive findings. One patient had a false-negative finding and there were no false-positive findings (100% specificity).

Conclusion Among patients with breast cancer, 99mTc-tilmanocept displayed a very high rate of both specificity and sensitivity. The high rate of clinical specificity observed in these studies may be due to the CD206 receptor-binding of 99mTc-tilmanocept in lymph nodes.

Variable	Pooled Analysis	Meta-analysis (WLS mean)
Per-patient sensitivity (n = 27 path-positive)	0.9630	0.9987
FNR (n = 27 path-positive)	0.0370	0.0013
NPV ^a (n = 122 false negatives and true negatives)	0.9918	0.9992
PPV ^b (n = 26 true positives and false positives)	1.00	1.00
Overall accuracy ^c (n = 148)	0.9932	0.9991
Average no. SLNs removed/patient (n = 148)	2.16	2.08
Localization rate ^d (n = 148)	0.9865	0.9991
Specificity (n = 121 true negatives and false positives)	1.00	1.00

^aNumber of patients whose lymph nodes are all pathology-negative and have no “hot” non-lymphatic tissue positive for disease.

^bNumber of patients with any “hot” lymph node positive for disease.

^cA true-positive or a true-negative patient.

^dPatient had at least 1 SLN.

Survival in Early-Stage Invasive Breast Cancer

Jennifer L. Baker, Ava Hosseini, Brian Mailey, Christopher Tokin, Sarah Blair, Anne M. Wallace

Surgery, University of California San Diego, San Diego, California, United States

Objective In recent years, patients have been increasingly electing for mastectomy over breast conservation treatment (BCT), especially when performed with immediate reconstruction. These options are considered oncologically equivalent based on randomized clinical trials, however, a recent population-level study found a survival advantage in women treated with BCT compared to mastectomy and prior work by our group has

demonstrated a survival advantage for patients undergoing breast reconstruction. We sought to compare survival among early-stage breast cancer patients treated with BCT to those receiving mastectomy, with and without reconstruction at our institution.

Methods All consecutive women with stage I or II breast cancer presenting between 1995 and 2011, treated with BCT (lumpectomy plus radiation) or mastectomy without radiation were identified from a prospectively maintained database. Mastectomy patients were further categorized as undergoing immediate reconstruction or mastectomy alone. Survival times between groups were calculated using the Kaplan-Meier method and compared using the log-rank test. Cox proportional hazards modeling was used to evaluate overall survival (OS).

Results Of the 1,326 women meeting study eligibility, 833 (62.8%) underwent BCT, 290 (21.9%) had mastectomy with immediate reconstruction, and 202 (15.2%) underwent mastectomy alone. At mean follow-up 7 years, women undergoing BCT or mastectomy with reconstruction had longer survival times compared to women undergoing mastectomy alone (5-yr survival, 91% and 91% vs. 79%, respectively, $p < 0.001$). After controlling for age, stage, nodal status, hormone receptor status, marital status, ethnicity, and payer source, OS remained greater in the reconstructed mastectomy patients (HR, 0.57; 95% CI [0.34-0.95], $p = 0.04$) and in women undergoing BCT (HR, 0.69; 95% CI [0.34-0.95], $p = 0.01$), compared to women undergoing mastectomy alone.

Conclusion Our single-institution study provides assurance that BCT and reconstruction after mastectomy are oncologically safe alternatives to mastectomy alone in early-stage breast cancer. Moreover the unexpected overall survival benefit in the presence of a breast mound (ie, breast reconstruction or BCT) after breast cancer resection may be explained by a sound body image mentality, with improved psychosocial well-being translating into a survival advantage vs patient selection bias during surgical planning.

Predictors of Lack of Fertility Discussions Between Providers and Premenopausal Breast Cancer Patients

Rahul Banerjee¹, Ekaterini Tsiapali^{1,2}

¹Alpert Medical School of Brown University, Providence, Rhode Island, United States, ²Department of Surgery, Woman and Infants Hospital, Providence, Rhode Island, United States

Objective Premenopausal breast cancer patients often desire future fertility, but their oncology health care providers do not always address the risk of treatment-induced infertility or offer referral to reproductive specialists. We sought to identify patient characteristics associated with lower rates of fertility discussions and lower patient ability to accurately recall such discussions.

Methods The study was IRB-approved. All female patients with invasive breast cancer, age 40 or younger, seen at a single institution's multidisciplinary oncology practice between February 2012 and October 2013 were eligible. After enrolled patients completed the study survey, their medical records were reviewed for documentation of fertility discussions by any provider before chemotherapy initiation. Rates of chart-documented discussions and rate of correct patient recall of such discussions were analyzed with regard to 9 variables: age, parity, patient interest in future fertility, disease stage, tumor receptor characteristics, ethnicity, marital status, insurance status, and educational level.

Results We enrolled 49 patients. Fertility discussions were documented in 55% of charts. The rate of accurate patient recall was 37%. Statistically significant predictors of lower rates of chart-documented fertility discussions included: age over 35 (RR 0.44, 95% CI 0.26-0.76); multiparity (RR 0.37, 95% CI 0.20-0.68); and survey-expressed lack of interest in future fertility (RR, 0.53; 95% CI, 0.34-0.81). Disease stage, tumor characteristics, ethnicity, marital status, insurance status, and education level were not found to be significant. Additionally, multiparous patients were significantly less likely to correctly identify whether such a discussion had occurred (RR, 0.34; 95% CI, 0.14-0.81).

Conclusion Treatment impact on fertility and fertility preservation options should be addressed with all premenopausal breast cancer patients. While limited by small sample size, our data suggest that this discussion occurs in only about half of patients despite the specialized multidisciplinary nature of our practice. Age over 35 and multiparity, as well as patient-expressed lack of interest in future fertility, were risk factors for lower chart-documented discussion rates. Accurate patient recall of such discussions was also limited, particularly in multiparous patients. To our knowledge, this is the first study reporting fertility discussion rates in breast cancer patients specifically using provider documentation as an outcome rather than patient recall. Breast surgeons should play a central role in addressing fertility issues with eligible patients.

Study Variable	% of Total Enrolled Population	% Patients With Documented Fertility Discussion	RR	95% CI
Age over 35 at diagnosis	57%	36%	0.44*	(0.26, 0.76)
Age 35 or lower at diagnosis	43%	81%	1.00	--
Multiparity at diagnosis	53%	31%	0.37*	(0.20, 0.68)
Parity of 0 or 1 at diagnosis	47%	83%	1.00	--
No interest in future fertility	73%	44%	0.53*	(0.34, 0.81)
Interest/ambivalence about future fertility	27%	85%	1.00	--
Stage IIa or higher	73%	61%	1.59	(0.76, 3.31)
Stage Ia or stage Ib	27%	38%	1.00	--
Triple-negative receptor status	18%	56%	1.01	(0.53, 1.93)
ER, PR, or HER2neu positive	72%	55%	1.00	--
Black or Hispanic	34%	53%	0.94	(0.55, 1.62)
White	66%	56%	1.00	--
Married at diagnosis	82%	53%	0.79	(0.46, 1.36)
Separated/single at diagnosis	18%	67%	1.00	--
Uninsured at diagnosis	14%	43	0.75	(0.31, 1.83)
Insured at diagnosis	86%	57%	1.00	--
High school diploma only	24%	42%	0.70	(0.34, 1.44)
Post-high school education	76%	59%	1.00	--

*Statistically significant at alpha = 0.05.

Impact of Weight Change During Neoadjuvant Chemotherapy on Pathologic Response in Triple-Negative Breast Cancer

Jean Bao¹, Rachel Wooldridge², Aisha Rivers², James Huth², Marilyn Leitch², Roshni Rao²

¹General Surgery, University of Texas Southwestern Medical Center, Dallas, Texas, United States, ²General Surgery, Division of Surgical Oncology, University of Texas Southwestern Medical Center, Dallas, Texas, United States

Objective Triple-negative breast cancer (TNBC) is an aggressive subtype of breast cancer found in 15%-20% of all breast cancers diagnosed in the United States. Despite being less common, it leads to a disproportionate number of deaths compared to hormone receptor positive subtypes. Obesity generally has been associated with an increased risk of breast cancer and worse prognosis. Weight gain during chemotherapy has been associated with an increased risk of recurrence and death. Some studies suggest that obese patients are less likely to achieve a pathologic complete response (pCR) to neoadjuvant chemotherapy (NCT) and experience worse overall survival. Ki-67 is a proliferation marker routinely obtained on breast tumors. It correlates with tumor aggressiveness and is an independent prognostic marker for disease-free survival and for overall survival. Lower Ki-67 at the conclusion of NCT predicts improved disease-free survival. The goal of this study is to examine weight change during NCT for TNBC and its impact on pathologic response and Ki-67 reduction.

Methods Retrospective review identified 173 TNBC patients treated between 2004 and 2011. Body mass index (BMI) before and after NCT was obtained. Data were collected on patient demographics, pre- and post-NCT Ki-67, and pCR. Differences between the weight gain and the weight loss groups were analyzed using the *t* test, ANOVA, and chi-square analysis.

Results Sixty-six patients met final study criteria (see table). Forty-three patients lost weight during chemotherapy while 23 gained weight, with a significant difference in BMI change ($p < 0.0001$). Patients in the weight gain group

were significantly younger ($p = 0.0013$). There were 31% more African-American patients in the weight loss group than in the weight gain group and 22% more Hispanic patients in the weight gain group. There was no significant difference between the 2 groups in terms of reduction in Ki-67 ($p = 0.98$). When patients were separated into normal weight ($BMI < 25\text{kg/m}^2$), overweight (BMI between 25 and 30kg/m^2), and obese ($BMI \geq 30\text{kg/m}^2$), there was no significant difference in Ki-67 among the 3 groups either before or after NCT. The weight gain group achieved a 9% higher rate of pCR than the weight loss group, but the difference was not significant ($p = 0.58$).

Conclusion Weight gain or loss during NCT does not appear to correlate with Ki-67 change or achieving pCR in TNBC. This may reflect the nature of this particular subtype of breast cancer that is less responsive to the hormonal effects that adipose tissue exerts on cancer cell proliferation.

Demographics, Ki-67 and Pathologic Complete Response (pCR) Rates in Patients Who Lost Weight vs Gained Weight During Neoadjuvant Chemotherapy for Triple-Negative Breast Cancer

	Weight Loss Group (n = 43)	Weight Gain Group (n = 23)	P value
Change in BMI	-2.09 ± 0.33	1.44 ± 0.32	<0.0001
Age	53.02 ± 1.55	44.35 ± 2.02	0.0013
Race			
African-American	53%	22%	
Hispanic	21%	43%	
White/other	26%	35%	
Initial Ki-67	75.44	72.87	
Final Ki-67	37.76	35.39	
Change in Ki-67	-37.67 ± 40.85	-37.48 ± 44	0.98
pCR	30%	39%	0.58

Exploration of Demographics, Attitudes, Beliefs, and Barriers of Breast Health Among Breast Cancer Patients in a West Texas Cancer Center

Julia Berry¹, Mary Ramirez¹, Ramya Vangipuram¹, Jessica Acosta¹, Amna Aziz¹, Sarah Cazorla¹, Yan Zhang², Candy Arentz¹

¹Surgery, Texas Tech University Health Sciences Center, Lubbock, Texas, United States, ²Family and Community Medicine, Texas Tech University Health Sciences Center, Lubbock, Texas, United States

Objective The purpose of this study is to examine if there are differences in terms of demographics, attitudes, beliefs, and barriers of breast health between early- and late-stage female breast cancer patients in a West Texas cancer center. We hypothesized that there will be socioeconomic-status (SES) differences as well as a difference in stage of cancer at diagnosis and distance to a mammography center.

Methods Data was collected by administering a 32-question survey to 60 breast cancer patients. This survey included questions pertaining to: (1) demographic and SES information, (2) barriers to receiving healthcare, (3) general attitudes regarding health and breast health, and (4) beliefs and attitudes regarding breast cancer prior to diagnosis. In addition, a chart review was conducted to gather information regarding stage at diagnosis and history of screening practices. Statistical analysis was then performed using both the chi-square test and *t* test, where appropriate.

Results Four factors were found to be statistically significant between early- and late-stage female breast cancer patients: income level, distance from home to a mammogram center, knowledge of family history of breast cancer, and fear of receiving a diagnosis of breast cancer. A higher proportion of late-stage patients were with a lower level of income, having a fear of being diagnosed with breast cancer, unaware of having a family history of breast cancer, and lived closer to a mammogram center. The results of the 4 factors are summarized in the following table.

Conclusion The results pertaining to level of income, fear, and knowledge of family history are consistent with the literature. Of interest, patients with late-stage breast cancer lived closer to a mammography center. One possible explanation regarding distance is patients with late-stage breast cancer had moved closer to a mammogram center at the time the survey was conducted in order to meet treatment needs. Contrary to the literature, we found no significant difference in race, education, insurance status, or prior mammogram screening rates. With this

information we plan to implement steps to decrease late-stage breast cancer diagnosis through focusing on lower income and fearful populations of West Texas women for breast cancer screening with treatment awareness and education.

Survey Question #	Early Stage (%)	Late Stage (%)	Total	Test Statistics	P Value
9. Income, recoded variable with 2 groups, significant factor					
Less than \$39,999	46.7	81.2	58.7	$\chi^2 = 5.148$	0.031
\$40,000 and above	53.3	18.8	53.3	$\chi^2 = 7.053$	0.029
13.Distance from home to mammogram center (estimated in miles)	20.31+/- 25.51	10.03+/- 10.57	16.76+/- 21.99	T = 1.678	0.04
31. I knew my family history and could identify at least one relative who was diagnosed with breast cancer.	65.8	31.8	53.3	$\chi^2 = 7.053$	0.029
32. Fear of receiving a diagnosis of breast cancer prevented me from seeing a doctor or getting a mammogram.	10.5	27.3	16.7	$\chi^2 = 6.962$	0.031

Current Guidelines and Past Patients: Missed Opportunities for BRCA Testing

Elisa Bianchi, Seyed Pairawan, Samuel Rodriguez, Sharon Lum

Department of Surgery, Loma Linda University School of Medicine, Loma Linda, California, United States

Objective The diagnosis of triple-negative breast cancer (TNBC) in a patient under the age of 60 is a recent addition to National Comprehensive Cancer Network (NCCN) guidelines for BRCA testing. Patients diagnosed with TNBC prior to this change in testing guidelines were not routinely offered BRCA testing. We sought to evaluate the potential missed opportunities for BRCA testing in a cohort of patients treated for TNBC prior to standard implementation of these new testing recommendations.

Methods We performed a retrospective, single-institution review of all patients diagnosed and treated for TNBC between July 1, 2009, and December 31, 2012. Patient demographic characteristics were recorded. The main outcome measure was receipt of BRCA testing. Indications for BRCA testing and test results were analyzed.

Results A total of 38 patients with TNBC were identified. Their median age was 56 years (range, 35-89). At the time of diagnosis, the majority of patients (60.5%) were younger than age 60. There were 10 (26.3%) patients with stage I disease, 16 (42.1%) patients with stage II disease, 7 (18.4%) patients with stage III disease, and 5 (13.1%) patients with stage IV disease. Overall, 18 (47.4%) patients underwent BRCA testing: 1 patient had a deleterious BRCA1 mutation, 3 patients had deleterious BRCA2 mutations, and 2 patients had BRCA2 variants of uncertain significance. Receipt of BRCA testing was significantly associated with meeting previous versions of NCCN criteria for testing ($p = 0.02$) and patient age less than 60 ($p < 0.001$), but not with stage, race/ethnicity, insurance status, religion, primary spoken language, or vital status. Of the 23 patients diagnosed with TNBC under age 60, 7 (30.4%) did not undergo BRCA testing as recommended by current NCCN guidelines; furthermore, 2 of the patients who did not undergo testing also met previous non-TNBC NCCN guidelines for testing.

Conclusion Nearly one third of previously treated TNBC patients in our institution have not undergone recommended BRCA testing according to current NCCN guidelines. We have identified a group of patients that may benefit from updated genetic counseling. As patients leave active treatment and new indications for BRCA testing unfold, continuous patient tracking and real-time survivorship care plans may help to keep patients and providers up to date with the current standard of care.

A Prospective Comparison of Patient Satisfaction and Outcomes With Radioactive Seed Localization vs Wire Localization

Erica V. Bloomquist¹, Nicolas Ajkay¹, Abigail E. Collett¹, Edward J. Gracely², Thomas G. Frazier¹, Andrea V. Barrio¹

¹Breast Surgical Oncology, The Bryn Mawr Hospital, Bryn Mawr, Pennsylvania, United States, ²Epidemiology and Biostatistics, Drexel School of Public Health, Philadelphia, Pennsylvania, United States

Objective Radioactive seed localization (RSL) has emerged as a viable alternative to wire localization (WL) in patients with nonpalpable breast cancer, with comparable positive margin rates and volumes of excision. Few studies have evaluated patient satisfaction and outcomes with RSL in a prospective fashion. In this study, we report the results of a randomized trial comparing RSL to WL in our community hospital.

Methods Following IRB approval, 119 female patients with nonpalpable breast cancer were prospectively enrolled between January 2011 and September 2013. After informed consent was obtained, patients were randomized to receive either iodine¹²⁵ RSL or WL. Patients rated the pain of the localization procedure and the convenience of the localization process on a 5-point Likert scale. Patient characteristics and outcomes were compared between RSL and WL patients.

Results Of 119 patients enrolled, 10 were excluded due to benign pathology (n = 3), palpable cancer (n = 3), mastectomy (n = 2), and previous ipsilateral cancer (n = 2), resulting in 109 patients. Sixty patients (55%) were randomized to RSL and 49 (45%) to WL. Two patients in the RSL group and 3 patients in the WL group had >1 cancer for a total of 62 and 53 cancers in the RSL and WL groups, respectively. The groups were similar with respect to age (p = 0.34), histology (p = 0.65), and tumor size (p = 0.7). The RSL group had lower pain scores (2 vs 3, p = 0.03) and higher convenience scores (5 vs 3, p < 0.001) compared to the WL group. There was no significant difference between the volume of the main specimen (p = 0.85) or the volume of the first surgery (p = 0.9) between groups. Positive radial margins were seen in 9.3% of RSL, compared to 13.7% of WL patients (p = 0.47).

Conclusion RSL resulted in less pain and higher convenience scores compared to WL, with comparable excision volume and positive margin rates. With an increased focus on patient satisfaction as a measure of quality care, widespread adoption of RSL for localization of nonpalpable cancers should be the rule, not the exception.

Clinical and Pathologic Characteristics of RSL vs WL Patients

Characteristic	RSL		WL		p value
	N	%	N	%	
Patients	60	55.0	49	45.0	
Median age (yr)	67		60		0.34
Cancers	62	53.9	53	46.1	
Histology					0.65
DCIS	20	32.2	15	28.3	
Invasive	42	67.8	38	71.7	
Median tumor size (cm)					
DCIS	0.8 (0.3-2.5)		0.7 (0.2-2.6)		0.76
Invasive	0.8 (0.1-2.7)		1.0 (0.12-3.6)		0.70
Median volume main specimen (cm ³)	53.7		46.7		0.85
Median volume first surgery (cm ³)	61.5		58.9		0.90

RSL, radioactive seed localization; WL, wire localization; DCIS, ductal carcinoma in situ.

Use of Hydrogel Breast Biopsy Tissue Markers Reduces the Need for Wire Localization

Peter W. Blumencranz

Comprehensive Breast Program, BayCare, Clearwater, Florida, United States

Objective The purpose of this study was to determine whether use of breast biopsy tissue markers composed of an ultrasound-visible hydrogel reduced the need for preoperative wire localization in patients undergoing a partial mastectomy.

Methods A retrospective chart review was performed on 691 consecutive female patients, with mean age of 67 (range, 36–98), undergoing partial mastectomies after percutaneous biopsies by stereotactic or ultrasound guidance from 2009 to 2012.

Results Overall, the use of wire localization was more frequent in patients who had standard (other) markers placed during biopsy as opposed to those with hydrogel markers (HydroMARK®) ($p = 1.222 \times 10^{-11}$). In patients with stereotactic biopsy, 75.8% with a standard marker required wire localization compared to only 17.1% of those with HydroMARK® ($p = 1.878 \times 10^{-10}$). In patients with an ultrasound biopsy, 22.6% with a standard marker required wire localization compared to 4.3% of those with HydroMARK® ($p = 1.681 \times 10^{-10}$). In a vast majority of all cases where wire localization was used on patients with a HydroMARK®, multiple wires were used for “bracketing” due to the presence of microcalcifications. On the contrary, when wire localizations were not used on patients with a standard marker, the majority were due to either the primary lesion or marker visibility. Excised specimen volume and the need for re-excision were comparable between patients with HydroMARK® and those with other markers, showing no significant differences ($p = 0.1673$, $p = 0.1813$, respectively). Specimen volumes were consistent with the mean control volume determined from a 12-article literature review. For patients who underwent neoadjuvant chemotherapy (NAC) ($n = 44$ [18 HydroMARK®, 26 other]), intraoperative ultrasound (IOUS) visibility of the marker was maintained during surgery in 77.8% of those with HydroMARK® and 23.1% of those with a standard marker. Wire localization was required in 61.5% of patients with a standard marker compared to 22.2% of those with HydroMARK®.

Conclusion This study demonstrated that use of hydrogel biopsy tissue markers optimizes the surgeon’s ability to perform a partial mastectomy without the use of wire localization. HydroMARK® was found to be as effective as a standard marker in terms of partial mastectomy specimen volume and re-excision rate. This yields potential for cost savings, increased efficacy in operating room and radiology scheduling, and in patient comfort.

TABLE 4: Comparison of Patients with Stereotactic vs. U/S Biopsy

Factor	Breast Tissue Marker (Stereotactic Biopsy)				Breast Tissue Marker (U/S Biopsy)			
	HydroMARK®		Other		HydroMARK®		Other	
N =	146		33		280		230	
Re-excision Rate	13	8.9%	7	21.2%	21	7.5%	24	10.4%
Lesion Size On Resection (mm)*	Avg.	Range	Avg.	Range	Avg.	Range	Avg.	Range
	10.7	0.6 – 50.0	9.5	2.0 – 32.0	16.5	1.0 – 84.0	16.1	1.0 – 55.0
Partial Mastectomy Specimen Volume (cm ³)	Avg.	Range	Avg.	Range	Avg.	Range	Avg.	Range
	185.4	50.6 - 470.3	169.6	42.0 - 340.2	200.5	31.5 - 610.3	184.9	25.2 - 650.0
Wire Loc Performed	25	17.1%	25	75.8%	12	4.3%	52	22.6%
Tissue Marker Visible w/ IOUS	123	84.2%	8	24.2%	249	88.9%	109	47.4%

*Note: For range, some DCIS lesions were omitted.

Improving the Patient Experience; Premedication With Benzodiazepines Can Relieve Pain and Anxiety During Sentinel Lymph Node Biopsy

Caitlin Bonney¹, Mary Naples², Mary Sullivan¹, Anne Larkin¹, Ashling O'Connor¹

¹Department of Surgical Oncology, University of Massachusetts Medical Center, Worcester, Massachusetts, United States, ²Department of Analytics, University of Massachusetts Medical Center, Worcester, Massachusetts, United States

Objective Sentinel lymph node biopsy has become an integral part of breast oncological surgery. As part of the procedure radioactive tracer dye is injected into multiple areas in the breast. This is performed prior to entering the operating room usually without sedation and as such can be a stressful and anxiety-provoking event. In an attempt to ameliorate the overall patient experience, we proposed that premedication with benzodiazepines would improve not only anxiety but also anticipated pain at the time of injection. An additional informative patient-directed teaching session was also performed and examined to see if this education would further reduce pain and anxiety.

Methods Patients undergoing sentinel lymph node biopsy in a tertiary care center received 1 mg of sublingual lorazepam and topical EMLA cream prior to radioactive tracer injection along with an explanation of the procedure. At their first clinic follow-up visit 7-10 days following surgery, each patient was asked to complete an anonymous online survey evaluating their overall injection experience. Patients rated their expected and observed pain and anxiety on the Visual Analog Scale, a standardized scale used to measure pain. Midway through data collection an additional information module was introduced in addition to the information already provided to patients to create 2 defined educational groups.

Results A total of 195 patients underwent treatment. Of these, 172 (88.2%) partially completed the survey, 163 (83.6%) completed pain section, 152 (77.9%) completed anxiety section. The average time to complete the survey was 4.18 minutes. Among survey respondents preexisting expectations of pain during injection differed, but overall 72 patients (44.4%) found lorazepam moderately to very helpful for pain and 81 patients (52.6%) believed lorazepam lessened their experience of anxiety. The overall anxiety and pain ratings experienced with lorazepam and EMLA cream were low. Seventy-four percent of patients experienced mild anxiety, 24% moderate, and only 2% severe anxiety; 52% experienced mild, 30% moderate, and 22% reported severe pain. Very few patients experienced greater pain or anxiety (3 points on Visual Analog Scale) than anticipated (0.03% for anxiety, $p = 0.5$, and 0.23%, $p = 0.29$, for pain). Comparing those receiving additional education about the procedure there was no statistically significant additional benefit of extra education seen between the 2 groups (all p values < 0.74).

Conclusion Premedication with lorazepam and topical analgesia can greatly improve the overall patient experience of radioactive tracer injection for sentinel lymph node biopsies. It is an easy and inexpensive intervention with minimal side effects. As seen by patient-rated scores, the overall anxiety and pain experienced was generally low. We propose the addition of this simple and well-tolerated intervention for all those undergoing sentinel lymph node biopsy.

The Urban/Rural Dichotomy in the Distribution of Breast Cancer Across Pennsylvania

Stefanos Boukovalas, Jack Sariego

Surgery, Temple University School of Medicine, Philadelphia, Pennsylvania, United States

Objective Breast cancer rates clearly differ across the United States. This is due to a variety of factors, but at least 1 determinant is the degree of rurality in any given area of the country. Clearly, breast cancer detection rates and treatment paradigms may differ in rural areas when compared to more urban ones. As the population becomes more mobile and diffuse, this may or may not be a worsening problem. The current analysis was undertaken to examine the issue of differential breast cancer prevalence and outcome in a single state in an attempt to plan for resource allocation in the future.

Methods A retrospective analysis was performed using data available from the Pennsylvania Department of Health regarding breast cancer rates by county, the distribution of cases with regard to degree of rurality, death rates by county as a function of rurality, and the age distribution of all presenting cases. Data from 1999 were compared to those from 2009, and the significance of the relationship evaluated using a simple chi-square statistical tool. Population statistics for each county were available online as well for both 1999 and 2009. The U.S. Census Bureau definition of rurality was used, which specifies that a county be classified as rural if the population density is less than 284 persons per square mile.

Results Between 1999 and 2009 the population of Pennsylvania increased by approximately 4% (421,325 people). Rural population increased by 2.2%, while urban population increased by 3.9%. During that same time period, the

number of cancer cases per 100,000 population remained about the same: 391.41 in 1999; 390.7 in 2009. The distribution of cases shifted during that time toward the more rural areas of the state; however, in 1999, there were 372.3 breast cancer cases per 100,000 population vs 2009, when the rate was 384.4 per 100,000 population. This difference was statistically significant. The number of cancer deaths per 100,000 population actually dropped overall during the decade: 98.5 in 1999 vs 82.3 in 2009. Though this was true in both rural and urban counties, the decrease was much less pronounced in the rural areas. In urban counties, the death rate dropped from 100.5 to 81.5 per 100,000 population, while in rural counties the drop was only from 93.3 to 84.3.

Conclusion The greater increase in cases diagnosed in rural areas of Pennsylvania is only partially explained by the relatively greater increase in urban population. There are undoubtedly other issues at work in rural areas: environmental factors, diffusion of resources, less access to surveillance programs. In addition, though the death rate has dropped in both rural and urban areas, this is much less pronounced in rural counties. Coupled with the increase in prevalence in those areas, this suggests that breast cancer care may be lagging in rural areas. There is a need to examine allocation of resources and surveillance programs so that this trend does not spiral out of control.

Is Postmastectomy Radiation Therapy Indicated in Patients With Close or Positive Margins?

Michelle Bryan¹, Ralph D'Agostino¹, Doris Brown², Edward Levine¹, Marissa Howard-McNatt¹

¹Surgery, Wake Forest Baptist Medical Center, Winston-Salem, North Carolina, United States, ²Radiation Oncology, Wake Forest Baptist Medical Center, Winston-Salem, North Carolina, United States

Objective The indications for postmastectomy radiation therapy (PMRT) for positive or close margins are unclear. We examined the indications for PMRT in mastectomy patients with close or positive margins and then determined patterns for relapse and survival.

Methods The pathology reports of 610 patients treated with a mastectomy between 1999 and 2012 at our institution were reviewed. Of these, 72 patients had a positive or <2 mm margin. Patients with more established indications for PMRT, including T3-4 disease or 4 or more lymph nodes with malignancy, were excluded. Demographic, tumor characteristics, treatment regimens, and Kaplan-Meier relapse-free and overall survival were compared between women who were treated with (n = 17) and without (n = 55) PMRT.

Results The overall mean follow-up was 4.1 years. Patients who received PMRT were younger than women who did not have radiation (48 vs 54 years old; p = 0.03). There was no significant difference between tumor size, grade, and estrogen receptor status between the 2 groups. Patients with lymphovascular invasion (LVI) were more likely to undergo PMRT (p = 0.02). Patients who were treated with PMRT were more likely to receive chemotherapy (p = 0.03). However, they were less likely to receive endocrine therapy than the non-PMRT group (p = 0.01). Seven patients had disease recurrence, of which 4 were local recurrences, with all of the recurrences occurring in the non-PMRT group. There was no correlation with locoregional failure as to age, ER status, LVI, or grade. There were 5 total deaths throughout follow-up, 3 due to recurrence. The mean overall survival was 49.5 months and the recurrence-free survival was 46.4 months. Despite few events, the disease-free survival was better in the PMRT group (p = 0.03), but the overall survival was not statistically different between the 2 groups (p = 0.07).

Conclusion We found that women with a close or positive margin who were younger had LVI and who received chemotherapy were more likely to receive PMRT. The disease-free survival was better in this cohort, but the overall survival was the same between the groups. Our study helps to further define the group of patients who should receive PMRT. PMRT should be offered to younger patients with LVI with a close or positive margin

Implications of Nipple Discharge of Women in Hong Kong

Clement Chen, Raymond Kan, Ava Kwong

Surgery, Queen Mary Hospital, Hong Kong, Hong Kong

Objective To report our 5-year experience in management of patients with nipple discharge. To report our experience concerning mammography, ultrasonography, ductography, and nipple discharge cytology and to determine their role in the management of nipple discharge.

Methods Subjects were identified by retrospective review of clinical data from 2007 to 2011. Subjects were dichotomized into benign and malignant subgroups. Background clinical parameters and results of investigative tools were compared between the 2 subgroups.

Results We identified 60 and 11 patients in the benign and malignant subgroups, respectively. The median age of presentation for benign subgroup was younger than that of the malignant subgroup (48 vs 65, p = 0.003). Significantly more patients in the benign subgroup presented with bilateral nipple discharge. More patients in the

malignant subgroup presented with blood-stained nipple discharge. Presence of blood-stained discharge had a sensitivity of 90.9% for malignant lesions and absence of it had a negative predictive value of 97.1%. Clinically palpable breast mass had a specificity of 91.7% and negative predictive value of 87.3%. In our experience, mammography had 100% specificity and positive predictive value. Ultrasonography had specificity and negative predictive value of 88.1% and 89.7%, respectively. Only 18 of 71 patients had an adequate nipple discharge specimen to make a cytological diagnosis.

Conclusion Clinical parameters, including age of presentation, laterality, and color of nipple discharge, were important in suggesting the underlying pathology of patients presenting with nipple discharge. In patients with non-bloodstained nipple discharge, a negative clinical breast examination, combined with negative mammography and ultrasonography, could reasonably infer a benign underlying pathology. A period of watchful waiting with regular follow-up would be a reasonable alternative to surgical intervention in this particular group of patients.

	Blood-Stained Discharge	Clinical Exam	MMG	USG	Cytology
Sensitivity	91%	27%	18%	46%	50%
Specificity	57%	92%	100%	88%	57%
Positive predictive value	28%	38%	100%	42%	25%
Negative predictive value	97%	87%	86%	90%	80%

Pooled Analysis and Meta-Analysis of Local Recurrence and the Associated Risk Factors in Phyllodes Tumors of the Breast

Kai Chen^{1,2}, Lisa K. Jacobs¹

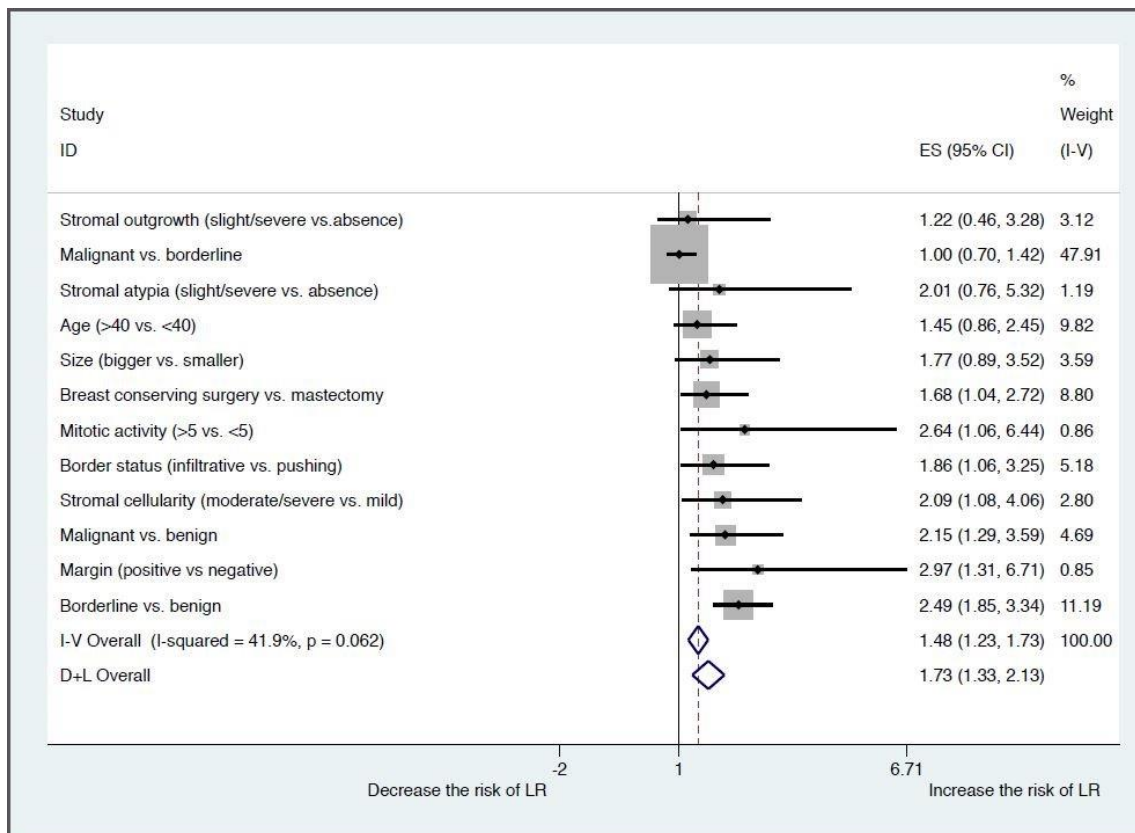
¹Dept. of Surgery, Johns Hopkins Hospital, Baltimore, Maryland, United States, ²Breast Tumor Center, Sun Yat-sen Memorial Hospital, Guangzhou, Guangdong, China

Objective Phyllodes tumors of the breast (PTB), comprised of both stromal and epithelial elements, are traditionally graded as benign, borderline, and malignant subtypes. Because of wide variation of the local recurrence (LR) rate in each subtype reported in the published literature, we performed a pooled analysis and meta-analysis of LR rate in PTB. Associated risk factors were also analyzed.

Methods We searched PubMed, Web of Science, and Embase databases systematically and pooled the results with redundant literature excluded. Articles with 1 of the following criteria were excluded: (1) reviews or meta-analysis; (2) critical data (LR) unavailable to extract, (3) sample size of the reported study less than 50, (4) publication date before 1993. LR rate in each subtype was pooled and subgroup analysis was performed. The strength of the association was determined by combination of odds ratio (OR) using the random-effect model.

Results A total of 20 articles with 3,418 patients were included and reviewed. The pooled-LR rate in benign subtype (9%) was significantly lower than that of borderline (19%) or malignant (18%) subtype. Longer median follow-up time may be associated with higher pooled-LR rate in borderline (> 5yr: 23%; <5 yr: 18%) or malignant (>5yr: 22%; <5yr:15%) subtypes, but not in benign (>5 yr: 10%; <5 yr: 8%) subtypes. The pooled-BCS rates were 96%, 88%, and 30% in benign, borderline, and malignant subtypes, respectively, and were significantly different among the subtypes (benign vs borderline: OR = 3.97; 95% CI, 1.84-8.60; borderline vs malignant: OR = 4.91; 95% CI, 2.48-9.70; benign vs malignant: OR = 19.58; 95% CI, 10.26-37.37). Among the 10 individual risk factors included: positive vs negative margin (OR = 2.97; 95% CI, 1.31-6.71), borderline vs benign subtypes (OR = 2.49; 95% CI, 1.85-3.34), malignant vs benign subtypes (OR = 2.15; 95% CI, 1.29-3.59), moderate/severe vs mild stromal cellularity (OR = 2.09; 95% CI, 1.08-4.06), infiltrating vs pushing border status (OR = 1.86; 95% CI, 1.06-3.25), higher mitotic activity (>5 vs ≤5 HPF: OR = 2.64; 95% CI, 1.06-6.44), and BCS vs mastectomy (OR = 1.68; 95% CI, 1.04-2.72) were significantly associated with LR. Stromal outgrowth, malignant (vs borderline) subtype, stromal atypia, age (>40 vs ≤40 yr), and larger size were not associated with LR.

Conclusion (1) Borderline and malignant subtypes have a similar LR that is higher than that of the benign subtype. Longer follow-up time (5 yr) is suggested for patients with borderline or malignant subtypes. (2) Grade (malignant/borderline vs benign), as a predictive factor of LR, is as important as margin status. BCS (vs mastectomy) is also associated with elevated LR (see following figure). (3) Surgeons tend to perform BCS in PTB with lower grade (benign vs borderline, borderline vs malignant).



Initial Results With Black Ink Tattooing of Biopsied Axillary Lymph Nodes

Nicole S. Choy¹, Jafi Lipson², Anne Kieryn¹, Catherine Porter¹, Debra Ikeda², Sunita Pal², Long Trinh², Michael Ozawa³, Kimberly Allison³, Kristen Jensen³, Irene Wapnir¹

¹Surgery, Stanford University School of Medicine, Stanford, California, United States, ²Radiology, Stanford University School of Medicine, Stanford, California, United States, ³Pathology, Stanford University School of Medicine, Stanford, California, United States

Objective Sampling of abnormal axillary lymph nodes via fine needle aspiration (FNA) or core needle biopsy (CNB) prior to surgery or initiation of chemotherapy is being widely adopted. In patients receiving neoadjuvant chemotherapy (NAC), marking nodes prior to treatment is important so that the downstaging effects of systemic treatments on nodal involvement can be accurately assessed. A metal marker may be deployed to ensure intraoperative identification, but this requires image-guided localization at surgery. As an alternative, we propose tattooing biopsied nodes using a fine carbon suspension (Spot™), which is FDA-approved for tattooing in the gastrointestinal tract. An exploratory pilot study was initiated to determine if tattooed axillary nodes can be visually identified intraoperatively and whether, the inked node coincides with the sentinel node.

Methods Women with breast cancer and clinically or radiologically suspicious axillary lymph nodes were deemed eligible for this IRB-approved study. Group 1 are patients undergoing surgery first and Group 2 are those delaying surgery until NAC is completed. Nodes are tattooed with an injection of 0.1 to 0.5 ml of sterile black ink at the time of FNA or CNB. A total of 18 patients underwent the tattooing procedure; by surgeon (9) and radiologist (9). Sentinel node biopsy was performed with technetium sulfur colloid and/or isosulfan blue in all patients.

Results Eighteen cases underwent tattooing of suspicious axillary nodes, 10 were in Group 1 and 8 in Group 2. Thus far, 10 patients have been operated on, 9 from Group 1 and 1 from Group 2. The time from tattooing to surgery was 1 to 22 days (average, 10.8 days) in Group 1. For the patient in Group 2 receiving NAC, 115 days elapsed from the time of nodal tattooing to nodal dissection. The tattoo ink has a black/greyish tint and is distinguishable from the bright blue appearance of isosulfan blue. All tattooed nodes were visually identified intraoperatively except 1 from

Group 1, which nevertheless had histologic evidence of black ink. The tattooed node coincided with 1 of the sentinel nodes in 8 of 9 cases. There are 8 patients awaiting surgery.

Conclusion Black-ink tattooing of suspicious axillary lymph nodes is technically feasible, inexpensive, and simple. This initial experience successfully identified black ink in 90% of cases. Data on the remaining tattooed cases will be presented.



Applicability of the Z0011 Criteria in Women With High-Risk Node-Positive Breast Cancer Undergoing Breast Conservative Therapy

Alice Chung, Alexandra Gangi, James Mirocha, Armando E. Giuliano
Surgery, Cedars-Sinai Medical Center, Los Angeles, California, United States

Objective Completion axillary lymph node dissection (ALND) did not improve survival or local control in sentinel-node (SLN) positive patients with clinical T1-2N0 breast cancer in the ACOSOG Z0011 trial. The relevance of this trial in patients with high-risk disease has been questioned. We hypothesize that the Z0011 trial is applicable in patients with Her2-positive (Her2+) or triple-negative disease (TNBC), and young age at diagnosis (YA).

Methods A prospectively maintained database of patients with invasive breast cancer treated with breast conservative therapy (BCT) at our institution was used to identify women with high-risk disease, defined as Her2+, TNBC, or age < 50 at diagnosis. Patients were grouped based on the Z0011 eligibility criteria into those meeting eligibility criteria and those who did not. Patient and tumor characteristics were compared, and survival of those who met Z0011 criteria was determined.

Results From January 1, 2000, to December 31, 2011, 186 women with high-risk breast cancer undergoing BCT had a positive SLN by H&E staining: 57/186 (31%) Her2+, 55/186 (30%) TNBC, 74/186 (40%) YA. Overall 61/186 (33%) did not meet Z0011 criteria: 37/61 (61%) had clinically positive nodes at presentation, 3/61 (5%) had clinical T3 tumors, 3/61 (5%) had neoadjuvant therapy, 3/61 (5%) had failed mapping, 7/61 (11%) had evidence of gross extranodal extension, 8/61 (13%) had 3 or more positive SLN. Her2-positivity was associated with the lowest rate of ineligibility compared to TNBC and YA (16% vs 53% and 31%, respectively, $p = 0.0001$). Larger tumor size, high grade, presence of microscopic extranodal extension, and high Ki67 were significant factors associated with exclusion from Z0011. Among those who were eligible for Z0011 ($n = 125$), 105/125 (84%) had ALND and 48/125 (38%) had involvement of non-SLN (NSLN); median number of NSLNs involved was 1 (range, 1-3). With median follow-up of 5.5 years, there was no difference in survival between those who had ALND and those who did not ($p = 0.94$) (see following figure).

Conclusion The ACOSOG Z0011 trial applies to a significant proportion of patients with SLN-positive Her2+, TNBC and young age at diagnosis. ALND can be avoided in approximately 70% of cases.

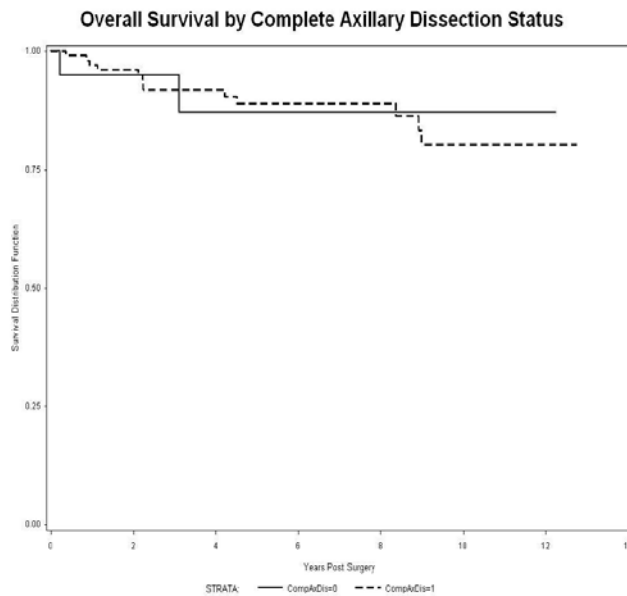


Figure 1 demonstrates no difference in survival between the Complete Axillary Dissection group (CompAxDis=1), which is the dashed line, and the No Complete Axillary Dissection group (CompAxDis=0), which is the solid line

Papilloma/Papillary Lesion on Core Needle Biopsy: Excision or Follow-Up?

Robin M. Ciocca, Jennifer L. Sabol, Ned Z. Carp

Lankenau Medical Center, Wynnewood, Pennsylvania, United States

Objective The reported rate of upgrade to a high-risk lesion after diagnosis of papilloma on core needle biopsy ranges from 1.1 to 19%. The objective is to determine whether or not excision is necessary after a diagnosis of papilloma on core needle biopsy.

Methods We searched the pathology files at our institution for “papilloma” or “papillary lesion” on core biopsy from January 2003 to October 2013. In select cases (cases with excision of a high-risk lesion), the radiology files were reviewed.

Results A total of 588 papillary lesions were identified in the pathology database. The diagnoses were: 494 (84%) benign, 89 (15%) atypical, and 5 (1.0%) malignant. Twenty-seven papillomas (4.5%) were excluded because of a synchronous high-risk lesion in the same quadrant. The majority of cases were abnormal screening mammograms with subsequent ultrasound-guided biopsy. Of the remaining 467 papillomas (24-89 years; mean age, 53.5), 185 (40%) were excised. Of the patients who underwent excision (mean age, 59), 14 showed atypia or malignancy (flat epithelial atypia, 1; lobular neoplasia, 7; atypical duct hyperplasia, 2; duct carcinoma in situ, 2; invasive carcinoma, 2). Review of the radiology of the invasive carcinoma cases shows suspicious lesions on both mammogram and ultrasound for which biopsy was recommended. Regarding the first DCIS case, an MRI ordered because of a family history of breast cancer detected enhancement corresponding to calcifications seen on the mammogram. In the other DCIS patient, screening mammogram detected a nodule that showed interval enlargement 6 months later. The remaining 10 patients with a high-risk lesion showed concordant radiographic findings. In the group of patients who were not excised (282; 60%), radiographic follow-up (7-120 months; mean, 98 months) in 203 patients showed no new masses or calcifications. There was no radiographic or clinical follow-up available in 79 patients with a diagnosis of papilloma.

Conclusion In our cohort of 467 intraductal papillomas diagnosed on core needle biopsy, 14 (2.9%) were “upgraded” to a high-risk lesion. Although further studies are needed, small intraductal papillomas on core needle biopsy, with concordant radiology, may be followed radiographically.

Breast Conservation Rate As a Quality Metric: Impact of Patient and Clinical Factors

Sarah Colwick, Ingrid Lizarraga, Sonia Sugg, Carol Scott-Conner, Ronald Weigel

Surgical Oncology, University of Iowa Hospitals and Clinics, Iowa City, Iowa, United States

Objective Breast conservation rate in early-stage breast cancer is a new metric used to assess the quality of breast cancer care and support accreditation of breast centers. However, there is no consensus on the optimal breast conservation rate. Indeed, breast conservation may not be possible in a subset of patients with stage 0-II disease due to patient choice and surgical ineligibility. The purpose of this study is to identify the patients with stage 0-II breast cancer treated at our institution that were deemed ineligible for breast conservation and identify the factors contributing to ineligibility.

Methods A prospectively collected database of all patients who were treated at our institution between 2008-2012 for stage 0, I, and II breast cancers was used to identify patients who were not offered breast conservation. A retrospective chart review was then performed to identify the reasons that breast conservation was not recommended. Pathologic and clinical stage, tumor size, tumor histology, patient demographics, and treatment were examined.

Results Six hundred thirty-six stage 0, I, and II breast cancer patients underwent surgery at our institution. Four hundred forty-four (69.9%) had breast conservation therapy (BCT). One hundred one (15.8%) were offered breast conservation and declined, while 91 (14.2%) were not considered candidates for breast conservation. Median age was similar in the group offered breast conservation and in the ineligible group. The gender of the treating surgeon did not impact the rate at which BCT was offered. The most common reasons for ineligibility were: multifocality in 36 (39.5%), in-breast recurrence in 24 (26.3%), concerns for cosmesis in 13 (14.2%), and multicentricity in 10 (10.9%) patients. Of those considered ineligible for BCT, 39/91 (42.9%) had clinical T2 or T3 tumors, compared to 95/636 (14.8%) of the overall population studied. Patients with lobular cancer were less likely to be candidates for BCT than those with invasive or in situ ductal carcinoma (OR = 0.37, compared to invasive ductal carcinoma; $p = 0.01$). Other factors predictive for BCT ineligibility were treatment with neoadjuvant chemotherapy (OR = 0.29, $p < 0.001$) and stage IIA (OR = 0.43, compared to stage I; $p = 0.001$) and IIB disease (OR = 0.19, $p < 0.001$).

Conclusion One third of patients with stage 0-II breast cancer treated at our academic breast center did not undergo breast conservation due to patient choice (15.9%) and surgical ineligibility (14.2%). If breast conservation rate is to be used as a true quality metric, consideration should be given to how differing patient populations may affect eligibility for breast conservation.

Impact of Neoadjuvant Chemotherapy on Extent of Axillary Surgery in Patients With Triple-Negative Breast Cancer

Carol S. Connor¹, Bruce Kimler², Joshua M. Mammen¹, Marilee K. McGinness¹, Jamie L. Wagner¹, Samantha M. Alsop¹, Claire Ward³, Carol Fabian³, Qamar Khan³, Priyanka Sharma³

¹Surgery, University of Kansas, Kansas City, Kansas, United States, ²Radiation Oncology, University of Kansas, Kansas City, Kansas, United States, ³Internal Medicine, University of Kansas, Kansas City, Kansas, United States

Objective Neoadjuvant chemotherapy (NAC) is typically utilized for triple-negative breast cancer (TNBC) patients with larger tumors or node-positive disease to achieve breast conservation and/or attain prognostic information. The impact of NAC on axillary disease burden or extent of axillary surgery in clinically node-negative TNBC patients is not known. We utilized data from a prospective TNBC registry to evaluate the impact of NAC vs immediate surgery on axillary disease burden and axillary surgery in patients with clinically node-negative TNBC.

Methods One hundred ninety-three stage I-III TNBC patients presenting for treatment at 5 practice locations were enrolled on an IRB-approved prospective registry. Clinical, demographic, chemotherapy, and surgical outcome information was collected. This study was restricted to analysis of study participants with clinically node-negative disease.

Results One hundred forty-two patients with clinically node-negative TNBC have enrolled on this prospective registry since 2011. Patients underwent either immediate surgery (98/142, 69%) or NAC (44/142, 31%) at the discretion of treating physicians. Median age at diagnosis was 54 years. The following table describes the demographic features and axillary surgical outcomes of patients in the 2 groups.

Demographic Features and Axillary Surgery Outcomes

	Immediate Surgery (n = 98)	Neoadjuvant Chemotherapy (n = 44)	P Value
Median age (yr)	55 (27-80)	52 (24-80)	0.010
Median tumor size (cm)	1.7	3.0	0.001
Stage			0.001
I	55 (56%)	8 (8%)	
II	40 (41%)	33 (75%)	
III	3 (3%)	3 (7%)	
Lymphovascular invasion (LVI)			0.35
Yes	10 (10%)	6 (14%)	
No	73 (75%)	23 (52%)	
Not available	15 (15%)	15 (34%)	
Type of axillary surgery			
SLNB alone with negative SLN	73 (75%)	43 (98%)	0.015
SLNB alone with positive SLN	1 (1%)	0	
SLNB positive with ALND	9 (9%)	0	0.027
ALND alone (No SLNB)	15 (15%)	1 (2%)	
Lymph node status at time of surgery			0.006
Negative	83 (85%)	44 (100%)	
Positive	15 (15%)	0	
Lymph node status at time of surgery by stage			
Stage I LN negative	55 (100%)	8 (100%)	NS*
Stage I LN positive	0	0	
Stage II LN negative	28 (70%)	33 (100%)	0.001
Stage II LN positive	12 (30%)	0	
Stage III LN negative	0	3 (100%)	0.10
Stage III LN positive	3 (100%)	0	

*Not significant.

Although patients receiving NAC had larger and higher stage cancers, they had a decreased chance of having a positive SLNB ($p = 0.015$) and undergoing ALND ($p = 0.027$). Overall, 15% and 0% of immediate surgery and NAC patients, respectively, with clinically node-negative disease at diagnosis were node-positive at the time of surgery ($p = 0.006$). When analyzed by stage, none of the stage I patients had a positive axilla, regardless of treatment with immediate surgery or NAC (NS). However, 30% and 0% of stage II patients in the immediate surgery and NAC group, respectively, had a positive axilla at the time of surgery ($p = 0.001$). One hundred percent and 0% of stage III patients treated with immediate surgery and NAC, respectively, had a positive axilla at the time of surgery, but this did not reach significance in the stage III group due to the limited sample size.

Conclusion A significant proportion of patients with clinically node-negative stage II TNBC have involved axillary LNs if axillary surgery is done prior to chemotherapy. All stage II clinically node-negative TNBC patients in this registry treated with NAC followed by SLNB were node-negative and did not require ALND. Neoadjuvant chemotherapy should be considered in patients with triple-negative breast cancer and a clinically negative axilla in order to reduce the incidence of node positivity and the extent of axillary surgery.

A Patient-Centered Approach Toward Wait Times in the Surgical Management of Breast Cancer in the Province of Ontario

Erin D. Cordeiro³, Matthew Dixon⁴, Natalie Coburn^{2,5}, Claire Holloway¹

¹Department of Surgery, Sunnybrook Health Sciences Centre, Toronto, Ontario, Canada, ²Department of Surgical Oncology, Sunnybrook Health Sciences Centre, Toronto, Ontario, Canada, ³Department of Surgery, University of Toronto, Toronto, Ontario, Canada, ⁴Department of Surgery, Maimonides Medical Center, Brooklyn, New York, United States, ⁵Institution for Clinical Evaluative Sciences, Toronto, Ontario, Canada

Objective Wait time for breast cancer is an important contributor to cancer outcomes and overall patient satisfaction. Current administrative methods of defining surgical wait-time involve measuring the time from decision to treat (eg, signing the consent form) to definitive surgery. However, this time period neglects a significant amount of time that the patient may experience waiting prior to a decision-to-treat. We therefore, sought to measure a more patient-centered wait time by measuring the time from first abnormal imaging to definitive surgery. We hypothesized that multiple preoperative investigations will significantly increase the wait time experienced by the patient.

Methods This is a retrospective analysis of prospectively maintained databases held in Ontario, Canada. We evaluated all women diagnosed with invasive breast cancer in Ontario from 2003-2011. Women who were less than 18 or older than 80, men, patients with any previous cancer diagnosis, those who developed distant metastasis within 4 months of diagnosis, and those who received either chemotherapy or radiation therapy within 9 months prior to definitive surgery were excluded, as were women for whom we could not identify an abnormal imaging test within 6 months prior to surgery. The median wait time between the first abnormal imaging and the date of definitive surgery was then calculated. Univariable and multivariable analyses were then performed to identify characteristics of the patients, treating institution or diagnostic pathways that contribute significantly to the wait time experienced by the patient.

Results After applying our inclusion and exclusion criteria, we defined a final cohort of 42,179 patients. Of these, 31,837 (75%) had breast-conserving surgery and 10,342 (25%) underwent a mastectomy. The mean age for the entire cohort was 58. The median wait time from first abnormal imaging to definitive surgery for the entire cohort was 52 days (IQR: 35-76). On univariable analysis, multiple preoperative factors significantly delayed overall time to definitive surgery. We found that undergoing multiple biopsies preoperatively, having a preoperative medical consultation, and undergoing additional radiological procedures following a tissue diagnosis of cancer all significantly increased surgical wait time. The median wait time for breast cancer surgery increased significantly over the years examined.

Conclusion We defined a patient-centered measure of surgical wait time, which more fully embraces the wait experienced by the patient. We found that many common preoperative interventions significantly impacted overall wait time experienced by the patient. Evidence-based quality initiatives to coordinate appropriate investigations are needed to reduce wait times.

Is In-Breast and Elsewhere Failure Increased After Partial Breast Irradiation?

Paul Dale, Rachel Clapper, Meghan Reicks, Debra Koivunen

Surgery, University of Missouri Hospital, Columbia, Missouri, United States

Objective The American Society of Breast Surgeons MammoSite Registry study, among others, has reported a low incidence of local recurrence after partial breast irradiation. The concern for in-breast and elsewhere failure in these women treated with partial breast irradiation has been expressed as one of the concerns for local brachytherapy treatments. This study evaluates these failure rates in women treated with partial breast irradiation at our institution.

Methods After IRB approval, a retrospective review of our breast cancer database identified breast cancer patients treated with partial breast irradiation following segmental mastectomy.

Results Review of our database from 2005-2013 identified 177 patients treated with breast-conserving surgery and postoperative brachytherapy (MammoSite), 52 (29.3%) with DCIS and 125 (70.6%) with invasive ductal carcinoma. The age range was from 39 to 90 years, with a mean of 61 years. The follow-up ranged from 3 to 102 months, with a mean length of follow-up of 44.6 months. Ten (5.6%) patients were lost to follow-up, and 2 (1.1%) underwent a completion mastectomy due to patient choice, with no evidence of recurrence or new primary on final pathology. The remaining 167 patients underwent routine yearly mammography and clinical exam. During follow-up, 7/167(4.2%) patients were diagnosed with a second breast cancer and 1/167 (0.6%) was diagnosed with metastatic breast cancer presumed to be from her original primary breast cancer. Of the 7 patients diagnosed with a second

breast cancer, 5 were in the ipsilateral breast and 2 were in the contralateral breast. Three of the 5 in-breast cancers were not histologically similar to the original primary and thought to definitively represent a second primary. Of the in-breast failures, 1 was an area of DCIS identified in a breast reduction specimen in a patient with an original diagnosis of DCIS; the relationship to the location of the original primary was not available; however, this was considered a local recurrence. The second patient developed a local failure 2 cm from the original primary, which histologically was considered a local failure. Therefore, we identified 5/167 (3.0%) second primary breast cancers in this group of patients 19-76 months (median, 48 months) post-treatment of their primary breast cancer. In-breast local recurrence after breast-conserving therapy with partial breast irradiation was considered to be 2/167(1.2%) diagnosed at 19 and 20 months post-therapy. All patients with in-breast failure were treated with completion mastectomy and all are alive and well at last follow-up.

Conclusion Breast-conserving therapy with the addition of partial breast irradiation for the treatment of early-stage breast cancer has increased since the development of new brachytherapy catheters. Increased local recurrence rates and elsewhere failure rates have been a major concern in this group of patients. Patients who were treated with breast-conserving therapy and partial breast irradiation at our institution have had a low local recurrence rate (1.2%) and a low second primary rate (3.0%). In select patients, partial breast irradiation remains an oncologically safe alternative to whole-breast irradiation for those patients undergoing breast-conserving therapy.

Radiologic Surveillance After Breast Brachytherapy

Paul Dale¹, Meghan Reicks¹, Rachel Clapper^{2,1}, Julie Chase¹, Debra Koivunen¹

¹Surgical Oncology, University of Missouri, Columbia, Missouri, United States, ²Plastic Surgery, University of Missouri, Columbia, Missouri, United States

Objective We have previously reported the lack of significant clinical impact of 6-month postoperative radiologic surveillance for patients undergoing breast-conserving therapy for invasive or noninvasive breast cancer. For patients undergoing breast-conserving therapy with partial breast irradiation, 6-month radiographic surveillance is still routinely performed. The purpose of this study is to assess the impact of surveillance mammography on clinical management when performed at 6 months following segmental mastectomy and partial breast irradiation.

Methods After IRB approval, a retrospective review of our breast cancer database from 2005-2013 was performed. All breast cancer patients treated with partial breast irradiation following segmental mastectomy were identified. Partial breast irradiation was delivered by the MammoSite brachytherapy technique. The radiographic follow-up and clinical impact of the radiographic findings are reported.

Results Review of our database from April 2005-March 2013 identified 177 patients treated with breast-conserving surgery and postoperative brachytherapy: 53 (29.9%) with a diagnosis of DCIS and 124 (70.1%) with invasive ductal carcinoma. The age range was from 39 years to 90 years with mean of 61 years (SEM = 0.78) The follow-up ranged from 2 months to 102 months with a mean length of follow-up of 44.6 months (SEM = 2.1). At 6 months following completion of brachytherapy, 89.8% of patients (159/177) received screening mammography, and 3.4% of patients (6/177) received follow-up screening via an alternative imaging modality (eg, US or MRI). Twelve (6.8%) patients had no imaging screen performed at 6 months: 10 (5.6%) were lost to follow-up, and 2 (1.1%) underwent a completion mastectomy. Of the patients who received mammography at 6 months following brachytherapy, 96.9% (154/159) had imaging consistent with normal postoperative findings, while 3.1% (5/159) had imaging reported as abnormal. Of those patients with abnormal imaging, 2 received repeat mammography in 6 months (12 months post-operatively), representing no change in medical management. The other 3 patients with abnormal surveillance mammography at 6 months post brachytherapy underwent breast biopsy of the suspicious finding and 3/3 (100%) had benign findings on biopsy. Overall, results of surveillance mammography performed 6 months post brachytherapy following segmental mastectomy did not change clinical management in 98.1% (156/159) of patients, and resulted in no changes to clinical outcome.

Conclusion Surveillance mammography performed at 6 months following segmental mastectomy plus brachytherapy for the treatment of breast cancer does not appear to alter clinical management or provide benefit in clinical outcome. Our findings support that returning these patients to routine yearly screening 1 year after completion of their therapy is safe and cost-effective.

TFAP2C Regulates Breast Tumor Growth and Sensitivity to Vandetanib Through Epidermal Growth Factor Receptor

James De Andrade, Jung Min Park, George Woodfield, Tong Wu, Mikhail Kulak, Philip Spanheimer, Maria Bogachek, Ronald Weigel

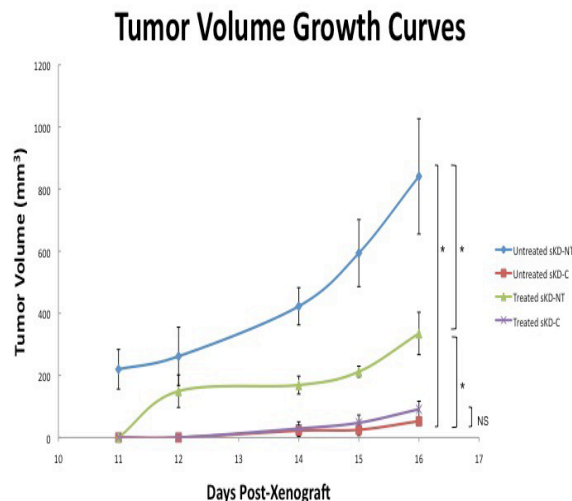
Department of Surgery, University of Iowa Hospitals and Clinics, Iowa City, Iowa, United States

Objective Transcription Factor Activating Protein-2C (TFAP2C) plays a critical role in breast cancer by regulating the expression of estrogen receptor-alpha (ER α) and ER α -associated genes, which includes RET. We have previously shown that some of the effects of TFAP2C are mediated through RET; however, the full effects of TFAP2C have not been accounted for and expression of epidermal growth factor receptor (EGFR), a known oncogene, may also be a target of TFAP2C. We sought to identify additional mechanisms of breast cancer growth and treatment response to the tyrosine kinase inhibitor, vandetanib, mediated through TFAP2C.

Methods MCF-7 cell clones with stable expression of nontargeting (sKD-NT) or shRNA directed toward TFAP2C (sKD-C) were used. Expression profiles were characterized by RT-PCR and Western blot. Transient knockdown of EGFR was performed using siRNA transfection. Proliferation was assessed by MTT assay. ChIP-Seq was used to identify genome binding sites of TFAP2C. Growth of xenografts was assessed in nude mice with or without treatment with vandetanib.

Results Baseline in vitro proliferation of sKD-C was reduced 35% compared to sKD-NT at 24 hours ($p = 0.01$). Treatment with vandetanib preferentially inhibited sKD-NT proliferation compared to sKD-C (80% vs 71% at 48 hours, $p < 0.001$). EGFR expression in sKD-C was $<1\%$ compared to sKD-NT. ChIP-Seq demonstrated 3 TFAP2C binding peaks within the EGFR regulatory domains, confirming that EGFR is a primary target of TFAP2C. Knockdown of EGFR in MCF-7 reduced proliferation 19% compared to NT transfection ($p < 0.001$) and blunted the growth suppressive effects of vandetanib (reduction of proliferation 18% vs 34%, $p = 0.004$). Xenografts of sKD-NT formed larger tumors than sKD-C at 16 days post inoculation (840 vs 52.5 mm³, $p = 0.013$), after which mice required euthanization due to tumor burden. sKD-NT tumors in mice treated with vandetanib formed smaller tumors at 16 days (335 mm³, $p = 0.048$), whereas, vandetanib had no effect on sKD-C xenografts ($p = 0.5$). (See figure below.)

Conclusion TFAP2C regulates the growth and sensitivity of breast cancer cells to vandetanib. The effects of TFAP2C are mediated, in part, through regulation of EGFR, which contributes to growth and sensitivity to vandetanib. Vandetanib may be a viable new chemotherapeutic agent in luminal breast cancer, and EGFR, in addition to RET, may serve as a molecular marker for response to vandetanib.



* indicates $p < 0.05$; NS indicates $p > 0.05$

sKD-NT tumors grow faster than sKD-C tumors. When treated with vandetanib, sKD-NT tumors show reduced growth; however, no difference is seen between treated and untreated sKD-C tumors.

A Critical Look at the Consequences of Preoperative MRI in Breast Cancer Patients

Valerie Deslauriers¹, Mehrzad Namazi², Fatima Hagggar², James Watters¹, Angel Arnaout^{1,2}

¹Surgery, Ottawa Hospital, Ottawa, Ontario, Canada, ²Cancer Therapeutics, Ottawa Hospital Research Institute, Ottawa, Ontario, Canada

Objective Despite the fact that routine use of preoperative breast MRI for breast cancer has not been shown to improve oncologic outcomes, it is still an exceedingly popular test. Due to its decreased specificity, patients are often subjected to additional imaging and biopsies as a consequence of the MRI. There have been few studies that have specifically evaluated the extent of requirement of these additional tests and the implications on the health care system. In conjunction with our radiologists, the objective of this study was to critically evaluate the impact of performing a preoperative MRI on a breast cancer patient at our institution.

Methods A retrospective chart review was performed on all female breast cancer patients diagnosed and awaiting surgery at a tertiary care center from 2010-2012. BRCA mutation carriers were excluded. Imaging and clinicopathological data was extracted from the charts. The primary outcome was the volume and results of MRI-induced diagnostic tests.

Results Of 1,660 breast cancer patients treated at our institution, a total of 1,159 patients underwent a preoperative MRI. 421/1159 (36%) of MRI patients underwent at least 1 additional confirmatory imaging test, most of which were ultrasound (67%). 24% of patients needed at least 2 additional imaging tests. 421/1,159 (36%) of MRI patients underwent at least 1 additional confirmatory biopsy, 104/1,159 (9%) of which were at least 2 biopsies. 446/481(93%) of the post-MRI biopsies were breast; 35/481(7%) were axillary. Of the breast biopsies, 68% were ipsilateral, of which 37% were benign. 35% of the breast biopsies were contralateral, of which 70% were benign. 22/35 (62%) of the axillary biopsies were benign. Post-MRI biopsies resulted in upstaging (DCIS to invasive cancer; node negative to node positive) in 25/1159 (2%) of patients. MRI patients had a trend to a longer OR wait time, but this result was not statistically significant ($p = 0.063$). After surgery, 32% of the MRI patients had an additional 6-month follow-up of equivocal/benign lesions.

Conclusion We have critically evaluated the additional imaging, biopsy, and consequences of a large volume of patients who have undergone breast MRI for preoperative staging for extent of disease. Patients who undergo preoperative MRI undergo additional imaging tests and biopsies, a significant proportion of which result in finding additional benign disease. We believe that this information will be of significant use by not only surgeons and radiologists in the counseling of patients for preoperative breast MRI, but also by administrators who can utilize the data for health care costs.

Telemedicine for Delivery of Specialized Breast Care in Rural Areas: A Pilot Study

Emilia Diego, Priscilla McAuliffe, Kandace McGuire, Atilla Soran, Janell Hinton, Judy Herstine, Ronald Johnson, Gretchen Ahrendt, Marguerite Bonaventura

Surgical Oncology, UPMC-Magee Womens Hospital, Pittsburgh, Pennsylvania, United States

Objective Access to specialist care in the rural setting is an obstacle in the U.S. Telemedicine (TM) allows specialists to provide care from a removed setting and its role has been established in fields such as critical care and stroke management. The goal of this project was to examine the outcome of implementing TM to provide breast care in a rural setting.

Methods The standardized TM program involved consultations conducted by the breast surgery specialist based at the University Hospital via Web-based, real-time video streaming, while a physician extender at the rural site performed the physical exam. Radiology images, pathology slides, and corresponding reports were mailed in advance or were available via electronic medical record. All patients were invited to complete a survey evaluating satisfaction with the TM consultation on a 5-point Likert scale (1 = poor; 5 = outstanding). Results are mean \pm standard deviation. All eligible patients were enrolled in our IRB-approved Breast TM Registry. Comprehensive clinicopathologic information, method of patient recruitment, and survey results were prospectively collected. Travel time and miles from rural to specialty site were estimated using online maps.

Results From 2011-2013, 18 female patients undergoing TM consultations were enrolled in the registry. Patients were recruited as follows: (1) Patients scheduled in the surgical specialist's clinic at the University were offered TM based upon their registered home address--if they lived closer to a TM site, the patients were contacted and offered TM consultation ($n = 4, 22\%$); (2) Referral from local physician after TM was introduced to physicians and hospital administrators in rural communities at medical staff meetings ($n = 10, 56\%$); or (3) Patient self-referral after distribution of brochures explaining the TM process ($n = 4, 22\%$). Mean patient age was 45 ± 16 years. Pathology

was benign in 13 cases (72%) and breast cancer in 5 (28%) patients. AJCC breast cancer stage was 0-IIA. Eight patients (44%) underwent surgery: 5 for cancer, 2 for high-risk lesions, and 1 for symptomatic fibroadenoma. Six of the procedures were performed at the University Hospital and 2 at a satellite surgery center. Average time from consultation to operation was 32 ± 16 days, similar to patients who had face-to-face consultations. Postoperative visit for 4 patients (50%) was done via TM. There were no postoperative complications. There was no difference in cost for patients between consultation performed by TM and by face-to-face visit. Average travel time saved was 4.2 ± 2.1 hours. Survey response rate was 83%. Likert score for patient satisfaction, based upon ease of communication, confidence in the remote physician, and overall rating of care was 4.9 ± 0.3 . All patients reported they would have another TM consult.

Conclusion TM effectively provides specialized breast care to patients in underserved areas without delays in treatment. Patient satisfaction with TM was very high. TM is a feasible alternative to conventional office consultations for patients in rural settings requiring specialist breast care with reduced costs for fuel and travel time, no increased costs of care, and timely surgical intervention.

The Clinical Significance of Flat Epithelial Atypia on Core-Needle Biopsy, an Institutional Review

Allison DiPasquale, Rebecca C. Yang

General Surgery, Lahey Clinic, Burlington, Massachusetts, United States

Objective Flat epithelial atypia (FEA) is a neoplastic proliferation that some may consider to be a precursor in the development of breast cancer. Unlike other entities, such as ADH and LCIS, there is limited data concerning the clinical significance of FEA found on core-needle biopsy (CNB). The purpose of this study was to determine the risk of an associated cancer with a diagnosis of FEA on CNB in our patient population.

Methods IRB-approved retrospective review of a single institutional pathology database identifying all cases of FEA found on CNB performed for BI-RAD 4 mammogram from 2005 to 2009 that were subsequently surgically excised within 6 months of diagnosis. The pathology was reviewed with an upstage to ductal carcinoma in situ (DCIS) or invasive ductal carcinoma (IDC) as significant endpoint.

Results Four thousand one hundred forty-seven CNB were performed over the designated 5 years. One hundred fifteen were found to have FEA in the specimen +/- other benign precursor lesions (ADH, ALH, papilloma, LCIS). Of those, 34 had isolated pure FEA and 11.8% (4/34) had an upstage in diagnosis to DCIS or IDC on final surgical excision.

Conclusion This study validates the identification of FEA as a precursor lesion in the development of breast cancer. At our institution, 11.8% of patients found to have FEA on CNB were upstaged to either DCIS or IDC following definitive surgical excision. This study supports the current recommendations that the presence of pure FEA warrants definitive surgical excision.

Determining the Incremental Risk Associated With Contralateral Prophylactic Mastectomy

Dustin L. Eck, Bhupendra Rawal, Tammeza Gibson, Sanjay Bagaria, Galen Perdakis, Sarah A. McLaughlin

Surgery, Mayo Clinic, Jacksonville, Florida, United States

Objective Rates of contralateral prophylactic mastectomy (CPM) performed simultaneously with unilateral therapeutic mastectomy have been increasing despite accumulating data demonstrating CPM does not offer a survival benefit. Although CPM is expected to add surgical morbidity, the incremental risk of CPM is not defined. We sought to quantify the additional risks associated with CPM and determine how these risks influence the time to commencement of adjuvant therapy.

Methods We retrospectively identified 560 women undergoing mastectomy for breast cancer between 4/2007 and 12/2012 from a prospectively maintained database. We excluded women with synchronous bilateral breast cancer or delayed CPM, leaving a study cohort of 352 women. We abstracted clinicopathological variables and stratified women according to the presence of CPM and the laterality and severity of surgical complications. Time to adjuvant therapy was measured in days and was inclusive of radiation, chemotherapy, or hormonal therapy. Comparisons were made using Fisher exact or Wilcoxon 2-sample rank sum tests with $p < 0.05$ considered significant.

Results Of 352 patients, 205 (58%) had unilateral mastectomy alone (UM) and 147 (42%) had bilateral mastectomy (BM: UM+CPM). Women having BM were younger (55 yo vs 65 yo) and more likely to seek immediate reconstruction [108/147 (73%) vs 91/205 (44%), $p = < 0.001$] than UM patients; however tumor stage was equally matched between cohorts. Overall, 94/352 (27%) women suffered 112 complications [BM: 46/147 (31%) vs UM: 48/205 (23%), $p = 0.11$] of which hematoma, mastectomy skin necrosis, cellulitis, or seroma accounted for 94/112

(84%) complications. Reoperation was required in 37/352 (10%) women. Among women having BM, morbidity occurred only in the prophylactic breast in 19/147 (13%) women and the risk did not differ based on the use of immediate reconstruction [13/108 (12%)] or not [6/39 (15%)]. Of these 19 patients, 10 (53%) required reoperation solely due to morbidity in the prophylactic breast. Finally, the exact start date of adjuvant therapy was known in 192/282 (68%) women with invasive breast cancer. Women with any complication had a significantly longer interval to adjuvant treatment when compared to those having no complications (49 d vs 40 d, $p < 0.001$). However, when stratified according to complication side, complications in the prophylactic breast alone were not associated with a delay to adjuvant therapy (BM complication prophylactic side alone: 41 d vs BM complication cancer side: 50d vs UM 55 d, $p = 0.83$).

Conclusion CPM confers excess morbidity in 1 in 8 women, of whom half require reoperation. Despite this, CPM did not delay the time to adjuvant therapy. Given the rising incidence of patients seeking CPM, women should be informed of the incremental risk.

Does Mammographic Density Impact the Rate of Margin Re-excision After Breast-Conserving Surgery?

Brandy L. Edwards¹, Christopher Guidry¹, Krista Larson⁴, Wendy Novicoff², Jennifer Harvey², Anneke Schroen¹

¹General Surgery, University of Virginia, Charlottesville, Virginia, United States, ²Radiology, University of Virginia, Charlottesville, Virginia, United States, ³Public Health, University of Virginia, Charlottesville, Virginia, United States, ⁴School of Medicine, University of Virginia, Charlottesville, Virginia, United States

Objective Limited, yet conflicting, data exist on the association between mammographic density (MD) and the re-excision rate for positive or close margins after lumpectomy. Additionally, it is unknown if MD is correlated with additional margin resection during initial breast-conserving surgery (BCS) and if these additional margins are necessary for clearance.

Methods Women diagnosed with breast cancer (BC) between January 2003 and December 2012 and enrolled in a larger single-center study on MD ($n = 535$) were included in this study. Data was collected through retrospective chart review; exclusion criteria from the larger study included inadequate follow-up, lack of digital mammography of both breasts preceding systemic therapy, history of breast implants or reduction surgery, and development of bilateral BC within 1 year of initial diagnosis. MD, abstracted from existing imaging reports, was characterized as fatty (<25%), scattered (25-50%), heterogeneous (51-75%), or extreme (>75%). Operative and pathology reports were reviewed to determine need for additional surgery, number of additional margins resected at initial BCS, and margin involvement. Additional resected margins were deemed unnecessary if the inked margin on the lumpectomy specimen was free of invasive tumor, margins were ≥ 2 mm for ductal carcinoma in situ (DCIS), or if separate re-excision was still needed for positive margins.

Results Of 535 patients, 325 (60.7%) had BCS while 182 (34%) underwent mastectomy at initial operation. Women with denser breasts (heterogeneous or extreme), were more likely to have mastectomy as their initial operation compared to women with less dense breasts (scattered or fatty) (43% vs 31.7%, respectively; $p = 0.011$). Of 325 patients who had BCS, 138 (42.5%) required re-excision for positive or close margins. Additional margins were taken during initial BCS in 146 (44.9%) patients, with 113 (77.4%) of these being unnecessary. There was no significant difference in re-excision rate or resection of unnecessary additional margins during initial BCS between MD category (see following table). There was also no significant difference in MD for patients ultimately undergoing mastectomy after attempted BCS. In a multivariate analysis adjusted for age, BMI, presence of DCIS, tumor size, and MD, only the presence of DCIS was associated with increased rates of re-excision ($p = 0.0056$).

Conclusion MD is not associated with increased need for re-excision or for removal of unnecessary additional margins to achieve negative margins at initial BCS. Our findings support not viewing greater MD as a deterrent to BCS.

continues

Rates of Re-excision and Unnecessary Margins by Mammographic Density Category for Patients Undergoing BCS

Variable [n, percent]	Mammographic Densities				P value
	Fatty	Scattered	Heterogeneous	Extreme	
N = 325					---
Number of patients	67 (20.62%)	152 (46.77%)	89 (27.38%)	17 (5.235)	---
Number requiring re-excision	30 (44.78%)	61 (40.13%)	37 (41.57%)	10 (58.82%)	0.4981
Lumpectomy as final procedure	54 (80.60%)	136 (89.47%)	77 (86.52%)	14 (82.35%)	0.2204
Mastectomy as final procedure	13 (19.40%)	16 (10.53%)	12 (13.48%)	3 (17.65%)	0.3050
Number of patients with extra margins taken at initial operation	27 (40.30%)	67 (44.08%)	45 (50.56%)	6 (35.29%)	0.4947
Extra margins unnecessary	23 (85.19%)	51 (76.12%)	32 (71.11%)	6 (100%)	0.9853

Comparison of Side-Specific Complications After Contralateral Prophylactic Mastectomy vs Treatment Mastectomy for Unilateral Breast Cancer

Lillian Erdahl¹, Anushi R. Shah¹, Judy C. Boughey¹, Tina J. Hieken¹, Tanya L. Hoskin², Amy C. Degnim¹

¹Department of Surgery, Mayo Clinic, Rochester, Minnesota, United States, ²Department of Health Sciences Research, Mayo Clinic, Rochester, Minnesota, United States

Objective The use of contralateral prophylactic mastectomy (CPM) is increasing. National database reports have raised concern of overtreatment and excess complications but cannot provide side-specific complication data. We evaluated our single-institution experience to address the hypothesis that complications are less frequent for CPM compared to therapeutic mastectomy (TM).

Methods Using a prospective breast surgery database, patients were identified who underwent both TM for unilateral cancer and CPM within 1 year. Data were collected on axillary staging with sentinel node biopsy (SNB) and/or axillary lymph node dissection (ALND) as well as use of immediate breast reconstruction (IBR). Complications within 30 days were ascertained with review of electronic medical records and were attributed specifically to the CPM or TM side. Side-specific complications included: surgical site infection (SSI), seroma, hematoma, skin necrosis, and reoperation. Complications were defined as events that required systemic treatment or procedural intervention. SSI included cellulitis that resolved with antibiotics. Complication frequencies were compared between the CPM and TM sides using the exact sign test for paired proportions.

Results We identified 303 subjects from 7/2011 to 6/2013 with TM and CPM (median age, 51; range, 27-81). IBR was performed in 191/303 (63%), all bilateral. On the TM side, 181/303 (60%) underwent SNB only, 98/303 (32%) underwent ALND, and 24/303 (8%) had no axillary procedure. SNB was performed in 7% of CPM sides. 294 (97%) patients had at least 30 days of follow-up. The overall frequency of any side-specific complication within 30 days was 9.9% (95% CI: 7.0-13.8%) and did not differ significantly for CPM vs TM sides, 5.4% vs 6.5%, $p = 0.68$ (see table). The frequency of any complication within 30 days was also similar in subjects with and without IBR: 10.6% vs 9.5% overall ($p = 0.76$), 6.7% vs 6.3% for TM sides ($p = 0.89$), and 6.7% vs 4.7% for CPM sides ($p = 0.48$). Complication frequencies were similar for CPM and TM sides for individual complications of SSI, seroma, hematoma, and necrosis. The frequency of any complication with bilateral mastectomy (TM + CPM) was significantly higher (9.9%), compared to the frequency of any complication for TM alone (6.5%), $p = 0.002$, a relative increase in risk of 52%. However, the absolute increase in frequency was only 3.4% for any complication within 30 days for TM + CPM compared to TM alone.

Conclusion Side-specific complication rates after CPM are similar to those after TM. For the patient, the addition of CPM to TM results in a small absolute increase in short-term complications requiring treatment compared to TM alone. These data may help inform patient decision-making regarding CPM.

Complications Within 30 Days*	Per Patient N = 294 (Either or Both Sides)	CPM Side N = 294	TM Side N = 294	P value† CPM vs TM
Any side-specific complication	29 (9.9%)	16 (5.4%)	19 (6.5%)	0.68
SSI	9 (3.1%)	4 (1.4%)	7 (2.4%)	0.45
Seroma	13 (4.4%)	8 (2.7%)	7 (2.4%)	1.0
Hematoma	5 (1.7%)	3 (1.0%)	2 (0.7%)	1.0
Skin necrosis	3 (1.0%)	1 (0.3%)	3 (1.0%)	0.50
Reoperation	8 (2.7%)	5 (1.7%)	4 (1.4%)	1.0

*Including only those with at least 30 days of postsurgery follow-up (n = 294).

†P value from the exact sign test for paired proportions.

Paravertebral Block in Patients Undergoing Mastectomy – Improves Pain Control and Decreases Postoperative Nausea and Vomiting

Aodhnait S. Fahy¹, Judy C. Boughey¹, Nora S. Eldin¹, Benzon Dy¹, William S. Harmsen³, Hans Sviggum², James W. Jakub¹

¹Department of Surgery, Mayo Clinic, Rochester, Minnesota, United States, ²Department of Anesthesia, Mayo Clinic, Rochester, Minnesota, United States, ³Department of Biomedical Statistics and Informatics, Mayo Clinic, Rochester, Minnesota, United States

Objective Postoperative pain is an important issue for patients undergoing mastectomy, especially when combined with immediate prosthetic reconstruction. Breast cancer surgery is also frequently associated with postoperative nausea and vomiting. The goal of this study was to compare pain control, postoperative nausea/vomiting, and hospital length-of-stay in patients undergoing mastectomy with PVB vs mastectomy without PVB. We also sought to determine if any benefit seen was present both for patients who underwent immediate reconstruction and those who did not.

Methods With IRB approval, we performed a retrospective cohort analysis of all patients who underwent a mastectomy with or without immediate breast reconstruction with or without a PVB (from 2008 to 2010). This 3-year timespan bridged the period when PVB use was increasing in our practice. Patient demographics, surgery type, intraoperative anesthesia and analgesia provision, postoperative opioid and antiemetic use, length of stay in postoperative recovery, and length of hospital stay were reviewed.

Results Six hundred thirteen patients were identified. After exclusions based on additional concomitant procedures, alternate neuraxial blocks and declined research participation, 526 patients were available for analysis--294 patients with mastectomy without a PVB, 232 patients who underwent mastectomy with a preoperative PVB. Immediate reconstruction was performed in 203 (39%) patients. Hospital length-of-stay was shorter in the PVB group than the non-PVB group. The proportion of patients discharged within 36 hours of surgery was significantly higher in the PVB patients than those without PVB (LOS <36 hours 42% vs 55%, p = 0.0031) on univariate analysis. However, hospital length-of-stay decreased across the time period of this study and when controlled for year of surgery, the impact of PVB on hospital length-of-stay was not significant (p = 0.17). Antiemetic use was significantly reduced in patients who received PVB (% patients requiring anti-emetics 39% vs 57%, p < 0.0001). Day-of-surgery opioid use was also significantly lower in the PVB group than the non-PVB group (40.1 morphine equivalents (ME) vs 47.6 ME, p < 0.0001). The subset of patients who underwent immediate reconstruction (whether unilateral or bilateral) experienced a significant reduction in day-of-surgery opioid use, 60 ME in non-PVB group vs 46 ME in PVB group (p < 0.001).

Conclusion Paravertebral block for patients undergoing mastectomy results in decreased need for postoperative narcotics and anti-emetic medication. The benefit of PVB is significant both in patients undergoing mastectomy and patients undergoing mastectomy with immediate reconstruction. Regional anesthesia use can help improve patients' perioperative experience for breast surgery.

continues

Variation in Narcotic Use, Antiemetic Use, and Length-of-Stay Features in Various Patient Subsets

	No PVB	PVB	P value ¹ Univariate model	P value ² Multivariate model
All patients (n = 526)				
Narcotic use	47.6 ME	40.1 ME		0.0001
Antiemetic use	56.8%	38.8%		0.03
LOS	42.2%	55.2%	0.0031	0.17
Patients without immediate reconstruction (n = 323)				
Narcotic use	41.0 ME	35.3 ME	0.0001	0.0002
Antiemetic use	50.0%	32.1%	0.0014	0.007
LOS	55.7%	75.6%	0.0003	0.001
Patients with immediate reconstruction (n = 203)				
Narcotic use	60.5 ME	46.4 ME		
Antiemetic use	69.6%	47.5%	0.001	0.001
LOS	16.7%	28.7%	0.04	0.65

P values are expressed in a ¹univariate model and in a ²multivariate model, including year of surgery. ME = morphine equivalents.

Minimally Invasive Lumpectomy for Small Cancers

Rachel L. Farkas¹, Avice O'Connell², Kristin Skinner¹

¹Surgery, University of Rochester, Rochester, New York, United States, ²Radiology, University of Rochester, Rochester, New York, United States

Objective Site select™ (SS) is a stereotactic excisional breast biopsy (BB) device that removes an intact core 10-22 mm in diameter, while preserving orientation and architecture. In selected patients, it offers several advantages over surgical excisional biopsy, including precise stereotactic localization (1-mm accuracy), improved cosmesis and patient satisfaction, and avoidance of the operating room. Since 2007, we have offered it as an alternative to surgical excisional biopsy for small lesions after needle biopsy revealed a high-risk lesion. More recently we offered it as an option for women with small intraductal cancers or for patients with small invasive cancers who were felt to be poor surgical candidates. We review our initial experience with this minimally invasive approach to determine its safety and efficacy in the treatment of small cancers.

Methods A prospectively maintained QA database of patients who underwent SSBB between January 2007 and October of 2013 was reviewed for patients whose final pathology revealed cancer. During the SSBB, as in standard lumpectomy, a specimen mammogram was done, orientation was maintained, and margins inked. Extra margins were taken at the time of the procedure if the specimen mammogram or gross inspection suggested inadequate margins. Data retrieved included indication, tumor type and size, margins, need for reexcision, adjuvant therapies, recurrence, and follow-up.

Results SSBB was performed in 92 patients. In 82 patients (92%), diagnostic SSBB was done after needle biopsy showed a high-risk lesion. A small DCIS was found in 1 patient (1.1%). SSBB was performed with therapeutic intent in 10 patients with small cancers [DCIS (N = 5), invasive ductal carcinoma (N = 4), invasive lobular carcinoma (N = 1)] that potentially could be removed with adequate margins. SSBB was offered for invasive cancers only in patients whose co-morbidities precluded a standard surgical approach. Mean tumor size was 8.5 mm and all tumors were receptor positive and Her2 negative. Of 11 patients undergoing SSBB for cancer, reexcision was required in 2 (18%), both for DCIS. Average margin width was 5.8 mm (range, 0 - >10). One patient had a focally positive margin and was not re-excised after tumor board discussion; the remainder had margins >2 mm. At 23 months' median follow-up (range, 9-62), there has been 1 (9%) local in situ recurrence at 18 months.

Conclusion SSBB is a safe and effective alternative to standard lumpectomy in selected patients with small breast cancers. Re-excision and recurrence rates seem acceptable.

Age	Indication	Site Select Size	Final Path	Tumor Size (cm)	ER	PR	HER2	XRT	HT	Final Surgery	Re Excision	Margin Width (mm)	Local Recurrence	FU Months	Status
73	DCIS	22mm	DCIS	0.5	P	N		D	D	SSBB	N	10	N	37	NED
90	DCIS	22mm	DCIS	2.6	P	P	N	N	N	MAST	Y	10	N	21	NED
75	ILC	22mm	ILC	0.6	P	P	N	Y	D	SSBB	N	10	N	22	NED
43	DCIS	22mm	DCIS	0.2	P	P		D	D	BCS	Y	10	Y	22	NED
54	IDC	22mm	IDC	1.2	P	P	N	N	Y	SSBB	N	0	N	9	NED
82	IDC	22mm	IDC	1.0	P	P	N	Y	Y	SSBB	N	3	N	14	NED
53	ADH	15mm	DCIS	0.1	P	P		D	D	SSBB	N	2	N	62	NED
67	IDC	22mm	IDC	1.75	P	P	N	Y	Y	SSBB	N	2	N	51	NED
64	DCIS	22mm	DCIS	0.3	P	P		D	D	SSBB	N	2.5	N	41	NED
62	DCIS	22mm	DCIS	0.3	P	P		D	Y	SSBB	N	4	N	44	NED
66	DCIS	22mm	DCIS	0.8	P	P		D	D	SSBB	N	10	N	23	NED
Mean=66				Mean=0.85								Mean=5.8		Mean=23	

DCIS = ductal carcinoma insitu, ILC = infiltrating lobular cancer, ADH = atypical ductal hyperplasia, P = positive, N = negative, D = declined, SSBB = Site select™ breast biopsy, MAST = mastectomy, BCS = breast-conserving surgery, NED = no evidence of disease.

Pathologic Complete Response (pCR) in Breast Cancer Patients After Neoadjuvant Chemotherapy at a Comprehensive Cancer Center: The Natural History of an Elusive Prognosticator

Oluwadamilola M. Fayanju¹, Iheoma Nwaogu¹, Donna B. Jeffe², Julie A. Margenthaler¹

¹Surgery, Washington University School of Medicine, St. Louis, Missouri, United States, ²Medicine, Washington University School of Medicine, St. Louis, Missouri, United States

Objective Pathologic complete response (pCR) to neoadjuvant chemotherapy is associated with improved survival and lower rates of recurrence in breast cancer. Given its prognostic significance, we sought to chronicle the clinical course of patients at our National Cancer Institute-designated Comprehensive Cancer Center whose tumors underwent pCR.

Methods In a retrospective review of patients treated for a first primary breast cancer at our comprehensive cancer center between March 1999 and September 2010, we identified patients with pathologically confirmed invasive breast cancer who received neoadjuvant chemotherapy that resulted in pCR, defined as no evidence of residual invasive malignancy in the breast or axilla (DCIS was allowed to be present). Descriptive statistics of treatments received, recurrence, morbidity, and mortality as of October 2013 are reported.

Results Of 5,533 patients reviewed, 86 patients (1.6%) met inclusion criteria. Mean age at diagnosis was 48 years old (standard deviation [SD], 9.4 years), and mean length of follow-up was 68 months (SD, 27 months). A majority of patients underwent axillary lymph node dissection (ALND, n = 60, 69.8%), were Caucasian (n = 60, 69.8%), received adjuvant radiation therapy (XRT, n = 72, 83.7%), had a poorly differentiated (ie, grade 3) tumor (n = 74, 86.0%), had only ductal histology (n = 74, 86.0%), and received a taxane as part of their neoadjuvant treatment (n = 83, 96.5%). Five patients (5.8%) experienced recurrence, 1 with both locoregional and distant disease and 4 with distant disease. All of the patients who recurred had grade 3 tumors with ductal histology and underwent ALND for known pre-neoadjuvant-treatment lymph-node metastases; none received adjuvant chemotherapy. Four patients (4.7%) died, 3 of breast cancer that recurred <18 months after initial diagnosis and 1 of metastatic small bowel adenocarcinoma.

Conclusion Breast cancer patients whose tumors underwent pCR after neoadjuvant chemotherapy have low rates of breast-cancer-specific mortality and recurrence compared to the general population of breast cancer patients of similar stage, though time to recurrence when it did occur was short, at less than 18 months. All patients who recurred and died of breast cancer had axillary metastases at initial diagnosis, indicating that axillary lymph node disease burden may have a negative interaction with pCR as a predictor of prognosis.

Stage-Related Racial Disparity in an Academic, Community-Based, NAPBC-Accredited Breast Program

Stephanie G. Fine¹, Andrew Fenton¹, Kathryn Billue¹, Ankit Anand²

¹Surgery, Akron General Medical Center, Akron, Ohio, United States, ²Medicine, Akron General Medical Center, Akron, Ohio, United States

Objective African Americans have many reported disparity issues in breast cancer treatment, ranging from delays in care, more advanced stage presentation, increased mortality, and less likely to complete recommended therapy. We hypothesize that a breast cancer program within a teaching institution, and supported by a dedicated multidisciplinary team, has evidence of less racial disparity in areas that tend to be stage-independent, such as use of neoadjuvant therapy, enrollment in clinical trials, reconstruction rates, and parity of chemotherapy and radiation treatment.

Methods An IRRB-approved retrospective chart review was performed during the time period 2008-2012. Subjects were 57 African American women and 446 Caucasian women with a T1 or T2 invasive breast cancer, age 18-79, and stage < 3. Race, age, T-size, stage, type of surgery, reconstruction, type of nodal evaluation, type of medical treatment, receipt of radiation therapy, time interval to first treatment, and trial enrollment were recorded. A 2-sample *t* test was used for obtaining mean ages; the Mann-Whitney test was used for time to treatment, and the Pearson chi-square test was used for analysis of equality between the 2 groups for remaining categories. Significance was set at $p = .05$.

Results The mean age of each group was 59 years of age. African Americans chose breast conservation surgery more often than Caucasians, 86% vs 70%, $p = .01$. African Americans were more likely to present with a T2 tumor and stage 2 disease than Caucasian women, 38% vs 24%, and 42% vs 28%, $p = .03$ and $p = .04$, respectively. Black women were more likely to have axillary node dissection, 16% vs 5%, $p = .02$, with an associated decrease in sentinel node biopsy rate, $p = .05$. A trend toward greater use of neoadjuvant therapy in black women was observed. There was no significant difference in time to first treatment between groups. There were no significant differences between racial groups receiving hormonal manipulation, chemotherapy, combination therapy, application of radiotherapy, or trial enrollment. Too few black women with reconstruction were available for statistical comparison, but 65% of Caucasian women had reconstruction vs 38% of African Americans.

Conclusion There is evidence of racial disparity in this breast program that primarily involves stage-related parameters. African American women present with more advanced disease in this community, but use of a specialized multidisciplinary team may minimize additional opportunities for disparity.

Surgical Management of Breast Cancer and Impact on Sexual Function

Sara P. Fogarty, Michaela Onstad, Ashley Stuckey, E. Kunkel, Melissa Clark, Christina Raker, Katina Robison, V. Lopes, Libertad Flores, Laura Manning, Jesse Boggis, Jennifer Gass

Program in Women's Oncology, Women & Infants Hospital, Brown University, Providence, Rhode Island, United States

Objective Contralateral prophylactic mastectomy (CPM) is increasing across the country. Given the favorable cosmetic results of breast reconstruction, we sought to evaluate the impact of breast cancer surgery on the sexual function of the treated breast. A survey incorporating the Female Sexual Function Index (FSFI), a validated tool measuring sexual function in patients with cancer, was employed. We aim to evaluate the association between surgical modalities and a woman's sexual function

Methods This is a retrospective cohort study of 3,407 eligible women undergoing breast cancer surgery for in situ or invasive disease at an academic cancer program between 2000 and 2010. Excluded were patients <21 or with a diagnosed sexual disorder. Eligible patients completed a survey of 28 FSFI and 6 investigator-generated questions. Demographic and medical data were extracted from the medical record to explore for potential confounders.

Results Sixty-one patients underwent breast conservation therapy (BCT) (72.1%), mastectomy with reconstruction (MR) (11.5%), or mastectomy (M) alone (16.4%). Patients who underwent BCT or MR were more satisfied with the appearance of their chest (81.8% and 85.7%, respectively) than those undergoing M (50%, $p = 0.05$). The importance of a patient's chest in intimacy after surgery was highest in patients undergoing MR (100%), as compared to BCT (65%) or M (60%, $p = 0.09$), though this role preoperatively was not a driving force in surgical decision-making. Patients with MR reported equal sexual satisfaction of the treated breast when compared to BCT patients (60% vs 61.8% $p = 1.0$). Evaluation of FSFI revealed the mean overall score to be low for all study participants at 17.9 (<26 indicates sexual dysfunction). However, women with MR had better sexual function (24.2), compared to BCT (18.3) or M (13.0). In each of the 5 domains evaluated by FSFI (desire, arousal, lubrication,

orgasm, satisfaction), trends showed women with MR had overall higher mean FSFI scores.

Conclusion This is the first study analyzing the impact of breast cancer surgery on sexual function of the treated breast. With increasing rates of CPM across the country, understanding consequences of treatment is essential. We noted a favorable trend in satisfaction with appearance of the postoperative chest in women undergoing MR or BCT, when compared to those treated with M. FSFI scores similarly showed a trend favoring improved desire, arousal, lubrication, orgasm, and satisfaction in women who underwent MR, as compared to BCT or M. Interestingly, more patients with MR reported a preserved role of their chest in intimacy than patients treated with BCT, though with respect to the treated breast, BCT and MR patients reported equal sexual satisfaction. Thus, CPM with reconstruction may not have a negative impact on the sexual function of the breast. Examination of a larger cohort is needed to better understand the relationship of surgical choices on sexual function.

Optimal Time Interval to Surgery After Neoadjuvant Chemotherapy in Breast Cancer

Robert C. Gabordi, James Huth, Aeisha Rivers, Ashley A. Hendrix, Rachel Wooldridge, Marilyn Leitch, Roshni Rao
Breast Oncology, UT Southwestern, Dallas, Texas, United States

Objective Neoadjuvant chemotherapy (NCT) is utilized in breast cancer treatment to increase the rate of breast conservation and to evaluate clinical response. A better response to NCT predicts decreased rates of recurrence and improved overall survival. Significant reductions in final Ki-67 following NCT, compared to initial Ki-67, correlates with decreased recurrence rates. Prolonged intervals without exposure to chemotherapy and without surgical intervention may allow for tumor regrowth and neoangiogenesis to occur, potentially increasing the risk of local and systemic recurrence. Surgical intervention is typically performed within 4-6 weeks after the completion of NCT. This allows patients to sufficiently recover from the side effects of NCT, and theoretically prevents potential tumor regrowth. Studies in patients receiving neoadjuvant therapies for colorectal cancer, however, actually support the use of a prolonged (16 week) time interval to surgery. Alternatively, studies utilizing dose-dense NCT would support surgical intervention within 1 week after NCT, an approach that is not generally clinically applicable. There are currently no studies establishing the optimal time interval to surgical intervention after NCT in breast cancer.

Methods Retrospective review identified 83 patients who underwent NCT prior to surgical therapy for locally advanced breast cancer from 2012-2013. Reviewing our experience in a private university hospital and a county hospital, we expected private hospital patients would be more likely to undergo surgery within 4-6 weeks after NCT. Longer delays were expected in this year at the county hospital due to acutely limited resources. The primary endpoint was decreased Ki-67 or pathologic complete response (pCR). Data regarding demographics, clinical presentation, stage at diagnosis, type of systemic chemotherapy administered, tumor histology, hormone receptor status, final pathologic stage, immediate reconstruction, complications, white blood cell count, and nutritional status were evaluated.

Results Eighty-three patients completed NCT and surgical intervention, 46 in the private hospital and 37 in the county hospital. The mean number of days from completion of chemotherapy to surgery was 38 days (33.6 days for private hospital and 43.6 days for the county hospital, $p = 0.02$). Patients undergoing surgery after 40 days were considered in the “delay” group ($n = 26$) by virtue of falling at the extreme end of the optimum 4- to 6-week interval (mean = 60.7 days). Fifty-seven patients were termed “compliant,” as they underwent surgery within this 40-day period (mean = 27.7 days). There was no difference between the delayed and compliant groups in regard to patient age ($p = 0.82$), tumor size ($p = 0.56$), race ($p = 0.25$), ER status ($p = 0.051$), PR status ($p = 0.3017$), Her2 status ($p = 0.1993$), initial Ki-67 (0.56), or type of chemotherapy received ($p = 0.159$). The mean initial Ki-67 for all patients was 58% vs 25% at the completion of chemotherapy ($p = 0.001$). 29.8% of patients had a pCR (compliant 33.3% vs delayed 23.1%, $p = 0.32$). The Ki-67 reduction in the compliant group was 40.52% vs 22.8% in the delayed group ($p = 0.038$).

Conclusion Patients who undergo surgery within 40 days from the completion of NCT experienced a greater reduction in Ki-67. Patients undergoing surgical intervention more than 40 days after NCT had lesser reductions in Ki-67, potentially indicating tumor regrowth and predicting a worse oncologic outcome.

Is Low Tumor Grade an Exclusion Criterion for the 21-Gene Recurrence Score (RS) Assay?

Michele Gage^{1,2}, Martin Rosman², Charles Mylander², Erica Giblin², Lorraine Tafra²

¹General Surgery, Walter Reed National Military Medical Center, Bethesda, Maryland, United States, ²The Breast Center of the DeCesaris Cancer Institute, Anne Arundel Medical Center, Annapolis, Maryland, United States

Objective Controversy exists over the ability of Oncotype Dx (ODX) to add prognostic benefit over routine pathological analysis. Although published results show grade as an independent and significant predictor of distant recurrence (Paik et al. *N Engl J Med*; 2004), tumor grade is not routinely considered an exclusion criterion for ODX testing. Our initial research revealed that ODX testing has limited clinical utility in patients with high-grade-or-low-ER (HG/lowER) tumors, because of their strong concordance with a high RS. Our purpose was to determine if ODX testing on low-grade tumors has similar concordance with low RS.

Methods Three pathologists using the same staining and computer-aided slide-reading methodology from 4/08 to 7/13 evaluated 224 samples that underwent ODX testing. The retrospectively analyzed data included RS, tumor type, tubular formation, nuclear pleomorphism, mitotic count, and ER, PR, HER2, and Ki67 status.

Results Of the 224 samples, 85 (37.9%) had a Nottingham Grade of 3, 4, or 5 (low grade). When evaluated separately, the low-grade group and the rest of the cohort showed no statistical difference in mean age or tumor size. The vast majority of patients with low-grade tumors (n = 81, 95.3%) had an RS of 25 or below (the threshold for the chemosensitive group in the TAILORx trial). When excluding the 10 patients with negative PR, all patients had an RS of 25 or less. Furthermore, 61 (81.3%) had an RS of 17 or less (low risk as defined by ODX). To determine the potential impact of excluding the group of low-grade-positive-PR (LG + PR) patients from ODX testing, we examined our breast center's population of invasive, sentinel lymph node-negative, hormone-positive cancer patients. It contains 35.6% LG + PR patients, while 33.5% in this study are in that group. Based on our findings, 50.4% of the samples tested were LG + PR or HG/lowER (33.5% and 16.9%, respectively).

Distribution of Oncotype DX Recurrence Score in Study

All Grades	≤10	11-17	18-25	26-30	31+	Total
NG 8-9	0	2	4	6	24	36
NG 6-7	19	39	30	6	9	103
NG 5	14	22	8	0	1	45
NG 4	7	10	4	2	0	23
NG 3	6	4	6	1	0	17
	46	77	52	15	34	224
Low Grade + Positive PR						
NG 5 + Positive PR	14	21	7	0	0	42
NG 4 + Positive PR	7	9	2	0	0	18
NG 3 + Positive PR	6	4	5	0	0	15
	27	34	14	0	0	75

NG: Nottingham Grade Score. An NG of 3, 4 or 5 defines low tumor grade. An NG of 8 or 9 defines high tumor grade.

Conclusion ODX testing has limited clinical utility in patients with LG+PR tumors because of their very strong concordance with a low RS. In our breast center, 56.1% of the population have LG+PR or HG/lowER tumors. The decision to give or withhold chemotherapy based solely on ODX testing is not supported in these patient populations. Further studies may confirm the limited clinical value of ODX testing in these patients.

Prevalence and Predictors of Upstaging of Ductal Carcinoma In Situ Found With Core Needle Biopsy

Alexandra Gangi¹, Negeen Shahandeh², Daisy Chou¹, James Mirocha³, Shikha Bose⁴, Alice Chung¹, Armando E. Giuliano^{1,2}

¹Department of Surgery, Cedars-Sinai Medical Center, Los Angeles, California, United States, ²School of Medicine, University of California, Los Angeles, Los Angeles, California, United States, ³Department of Biostatistics, Cedars-Sinai Medical Center, Los Angeles, California, United States, ⁴Department of Pathology and Laboratory Medicine, Cedars-Sinai Medical Center, Los Angeles, California, United States

Objective Image-guided core needle biopsy (CNB) is the preferred method for histopathological diagnosis of breast lesions, thereby avoiding operation. However, CNB may fail to identify the invasive component of an in situ lesion resulting in underdiagnosis. The current study examines the prevalence and predictors of invasiveness in patients with ductal carcinoma in situ (DCIS) diagnosed by CNB.

Methods A prospective database was reviewed and patients with CNB identifying DCIS were evaluated for upstaging. Upstaging was defined as the identification of invasive or micro-invasive cancer after excision. Only patients with complete data, including age at diagnosis, palpability, number of cores examined, gauge of needle, imaging technique, tumor grade, presence of comedonecrosis, presence of estrogen receptor (ER), progesterone receptor (PR), and human epidermal growth factor receptor 2 (HER2) status, were included in the final analysis.

Results One hundred thirty-two patients were identified with a mean age of 59 years. Of these, 27.3% (36/132) CNB specimens showing only DCIS were upstaged to invasive cancer. Mean age of those upstaged was 57.7 years, compared to 59.4 years of those not upstaged ($p = 0.5$). The upstaged DCIS were more frequently palpable, compared to nonpalpable (22.2% vs 1%; $p < 0.0001$); a mass was more often seen on imaging (79.4% vs 59.4%; $p = 0.049$); median size was larger (3cm [1.3-5] vs 1.5 [0.3-2.5]; $p < 0.0001$); needle size was smaller (11 g vs 8 g; $p = 0.0004$), and final pathology showed evidence of comedonecrosis (80.6% vs 58.3%; $p < 0.024$). Number of core biopsies taken and evidence of comedonecrosis on CNB were not different between upstaged and not upstaged groups. Additionally, 60.6% (80/132) of patients had sentinel lymph node biopsies (SNB); 83.3% (30/36) in upstaged group and 52.1% (50/96) in not upstaged group. Seven of 30 (23.3%) patients who were upstaged and had sentinel node biopsy were found to have nodal metastasis.

Conclusion Preoperative variables significantly associated with upstaging include palpability, an identifiable mass on imaging, larger size, and use of smaller needle on CNB. Additionally, given fairly high rates of upstaging, SNB may be performed on those patients who have a palpable mass, lesions ≥ 2 cm, or mass seen on imaging.

Accuracy of Mammography, Breast MRI, and Ultrasound in Depicting the Pathologic Size of Invasive Breast Cancer

Omar Ghanem, Shadi Al-Bahri, Patrick Farha, Maen J. Farha

Surgery, MedStar Union Memorial Hospital, Baltimore, Maryland, United States

Objective Clinical stage assignment for breast cancer patients is a Commission on Cancer requirement and a major determinant of the extent of staging and the course of treatment. Decisions on the feasibility of breast conservation, preoperative or postoperative chemo/hormonal therapy, and response to preoperative therapy depend heavily on radiologic size estimates. Clinical examination is frequently unreliable, thus we depend on imaging to help assign the clinical stage. Our study evaluated the accuracy of imaging modalities in estimating pathologic tumor size in a community breast practice setting.

Methods Following IRB approval, we performed a retrospective review of patients' charts diagnosed with breast cancer in a prospectively maintained database in a single breast surgery practice from 2005-2012. We collected breast cancer tumor size measured by pathology, mammography, ultrasound, or MRI. We excluded patients who underwent preoperative chemotherapy, patients with noninvasive cancer, and patients with multifocal or multicentric disease. All 161 patients who met the criteria had a pathologic size recorded. All patients had a mammogram but only 102 had an ultrasound and 95 had an MRI. Radiologists did not routinely report a size estimate on mammography. A paired t test was used to search for a statistically significant difference, comparing radiologic size to the pathologic size.

Results Mammogram size estimates in 64 were off by an average of 0.78 cm, while the discrepancy in 110 patients with ultrasound measurements was 0.81 cm and 1.04 cm in the 95 patients with MRI measurement. All these were differences were statistically significant with a p value $< .0001$. Overestimating tumor size by 0.5 cm or more was present in 13%, 21%, and 34% of ultrasound, mammogram, and MRI, respectively. Underestimating the tumor by 0.5 cm or more was present in 36%, 30%, and 22% of ultrasound, mammogram, and MRI, respectively.

Conclusion Our current radiologic staging modalities are highly inaccurate in estimating breast cancer tumor size. Over half the patients in each group had a variance from the pathologic size by 5 mm or more. The mean variances surprisingly show the mammogram to be slightly more accurate than ultrasound, which is more accurate than the MRI. Strict protocols should be developed to obtain accurate measurement of tumor loads for both clinical and pathologic measurement. In the absence of such protocols, clinicians should integrate different modalities trying to assign the most accurate clinical stage.

Axillary Ultrasound (AxUS) Is Highly Relevant in the Clinical Management of Breast Cancer Patients

Erica M. Giblin¹, Martin Rosman¹, Charles Mylander¹, Kristen Sawyer¹, Michele Gage², Lorraine Tafra¹

¹Breast Surgery, Anne Arundel Medical Center, Annapolis, Maryland, United States, ²General Surgery, Walter Reed National Military Medical Center, Bethesda, Maryland, United States

Objective The role of AxUS in the preoperative assessment of breast cancer patients is debated. Since the adoption of Z0011, it has been suggested that an abnormal AxUS or positive lymph node core biopsy condemns a patient to an axillary lymph node dissection (ALND). As such, some have abandoned this modality completely. Conversely, others place strong credence in AxUS and use it in lieu of sentinel node biopsy (Veronesi's SOUND trial). The goal of this study was to assess the impact of AxUS on total positive axillary nodal burden.

Methods A retrospective investigation of records from June 1996 through August 2013 was performed, including clinically node-negative (cN0) patients with positive sentinel nodes (SN+) followed by ALND designated the cN0&SN+ group (N = 218). This group was divided into those with a negative AxUS (called the NegAxUS&SN+ group, N = 163), and those with a suspicious AxUS (the USSusp group, N = 55). Additionally, a group with both a suspicious AxUS and suspicious physical exam was studied (US&PEsusp group, N = 33). These groups were compared to the published Z0011 group undergoing ALND and our own published SN validation pre-AxUS era series (all cN0, SN+).

Results The frequency of the total number of positive axillary nodes (AN) is decreased through removal of the USSusp group. Forty-two percent of the USSusp group had >3 total AN involved compared with 18% of the NegAxUS&SN+ group and compared to 26% of the pre-AxUS era cN0&SN+ group. This is in contrast to 61% of US&PEsusp patients who had >3 total AN involved. The mean number of positive AN in the USSusp group was 5.9 and decreased to 2.5 in the NegAxUS&SN+ group, while US&PEsusp patients had a mean of 6.8 involved AN. Only 40% of USSusp patients had 2 or fewer positive AN. Seventy-two percent of NegAxUS&SN+ group had 2 or fewer positive AN, which is similar to the 79% of the Z0011 trial group that was in the ALND arm.

Conclusion AxUS provides crucial information partitioning patients as to their potential benefit from ALND. Those with USSusp are likely to have a higher nodal burden than the Z0011 cohort. SN+ patients with a NegAxUS have a nodal burden similar to the Z0011 cohort recommended to forgo an ALND. Thus, AxUS provides useful information for the clinical management of breast cancer patients.

Ultrasound of the Axilla Partitions Patients Into Groups With Different Nodal Burden

Group	Number	Number of Positive Axillary Lymph Nodes							Mean # of Positive AN
		0	1	2	3	>3	4-9	>9	
(Pre-AxUS Era) cN0&SN+	187	0 0%	85 45%	36 19%	18 10%	48 26% (20%, 33%)*	35 19%	13 7%	3.0 (2.6, 3.5)†
(AxUS Era) cN0&SN+	218	3 1.4%	89 41%	48 22%	25 11.5%	53 24.3% (19%, 31%)*	38 17.4%	15 6.9%	3.4 (2.8, 4.1)†
NegAxUS&SN+	163	0 0%	77 47%	41 25%	15 9%	30 18% (13%, 25%)*	25 15%	5 3%	2.5 (2.1, 2.9)†
Z0011 ALND arm	343	4 1%	199 58%	68 20%	25 7%	47 14% (10%, 18%)*	n/a	n/a	n/a
USsusp	55	3 5%	12 22%	7 13%	10 18%	23 42% (29%, 56%)*	13 24%	10 18%	5.9 (3.7, 8.2)†
US&PEsusp	33	1 3%	5 15%	4 12%	3 9%	20 61% (42%, 77%)*	10 30%	10 30%	6.8 (4.6, 9.4)†

AxUS = axillary ultrasound, cN0&SN+ = physical exam negative and sentinel node positive, NegAxUS&SN+ = axillary ultrasound negative and sentinel node positive, AN = axillary lymph nodes, USsusp = axillary ultrasound suspicious for nodal involvement, US&PEsusp = axillary ultrasound suspicious and physical exam suspicious for nodal involvement.

*95% confidence intervals on the proportions. †95% confidence interval about the mean.

Patients Who Develop Breast Cancer While Enrolled in a Risk Assessment and Prevention (RAP) Program Have Lower Stage Breast Cancer at Diagnosis

Erica M. Giblin¹, Martin Rosman¹, Charles Mylander¹, Victoria Shellem¹, Michele Gage², Clarisa Hammer¹, Lorraine Tafra¹

¹Breast Surgery, Anne Arundel Medical Center, Annapolis, Maryland, United States, ²General Surgery, Walter Reed National Military Medical Center, Bethesda, Maryland, United States

Objective Identifiable factors correlating with an increased risk of developing breast cancer have been well established. Multiple models exist to stratify these risk factors. Special screening strategies and risk-reduction counseling have demonstrated a higher impact on high-risk women, compared to the general population. Our institution’s highly structured RAP program encompasses a sophisticated evaluation profile, individually tailored risk-reduction strategies, and robust long-term follow-up. The goal of this study was to identify high-risk women who developed breast cancer while actively enrolled in our RAP program in comparison to similar high-risk women not enrolled in such a program (non-RAP).

Methods Retrospective chart review of patients followed in the RAP program was performed from 2005-present. Thirty-five patients who developed breast cancer while enrolled in our institution’s RAP program were matched to a similar group of 30 patients with increased risk characteristics who developed breast cancer but were not in a high-risk program. Clinicopathologic data were collected on both groups. All patients were BRCA-negative and none received neoadjuvant therapy.

Results Non-RAP patients had larger mean tumor size (2.31 cm), as compared to RAP patients (1.27 cm) (p = 0.02). The mean lifetime Gail score for the non-RAP patients was 17.7, compared to 23.2 in the RAP group (p = 0.01). Despite this lower Gail score, only 30% of non-RAP patients presented with stage 1 breast cancer, as compared to 57.1% of RAP patients. Furthermore, only 20% of the RAP group presented with stage 2 and 3 breast cancer, in contrast to 46.7% of the non-RAP group. 23.3% of the non-RAP group were stage 0 compared to 22.9% of the RAP group. 13.6% of non-RAP patients were ER-negative in contrast to 3.7% of RAP patients. 22.7% of the non-RAP

group was Her2/neu-positive as compared to 13.6% of the RAP group. Only 7.4% of RAP patients presented with positive sentinel nodes on biopsy in contrast to 30.4% of non-RAP patients (p = 0.06).

Characteristics of RAP vs Non-RAP Patients

	RAP	Non-RAP	p-value
Lifetime Gail score - mean	23.2	17.7	0.01*
IDC	56%	58%	1.00†
Mean invasive tumor size (cm)	1.27	2.31	0.02*
Median invasive tumor size (cm)	1.2	2.0	
Stage 0	22.9% (8/35)	23.3% (7/30)	0.04‡
Stage I	57.1% (20/35)	30.0% (9/30)	
Stage 2 &3	20.0% (7/35)	46.7% (14/30)	
Peri/postmenop. @ cancer dx	58.3% (21/36)	58.1% (18/31)	1.00†
ER-negative status (for stage 1 or >)	3.7% (1/27)	13.6% (3/22)	0.31†
Her2-positive status (for stage 1 or >)	13.6% (3/22)	22.7% (5/22)	0.70†
% patients with positive SLN	7.4% (2/27)	30.4% (7/23)	0.06†
% of patients with invasive cancer with 3 or > total positive nodes	11.1% (3/27)	13.0% (3/23)	1.00†

All p-values are 2-sided.

*t test, †Fisher exact test, ‡Chi-square test (Pearson) [0.04 applies to all stages].

RAP = risk assessment and prevention, Peri/Postmenop. = perimenopausal/postmenopausal, IDC = infiltrating ductal carcinoma, ER = estrogen receptor, Her 2 = Her 2/neu, SLN = sentinel lymph nodes.

Conclusion Women who develop breast cancer while enrolled in RAP are more likely to present with lower-stage breast cancer, including smaller tumor size and a lower total axillary burden. RAP demonstrates valuable effectiveness in the early diagnosis of breast cancer in high-risk patients.

The Impact of Availability of Immediate Breast Reconstruction on Bilateral Mastectomy Rates for Breast Cancer Across the United States

Elizabeth B. Habermann^{1,2}, Kristine M. Thomsen¹, Tina J. Hieken², Judy C. Boughey²

¹Department of Health Sciences Research, Mayo Clinic, Rochester, Minnesota, United States, ²Department of Surgery, Mayo Clinic, Rochester, Minnesota, United States

Objective Immediate breast reconstruction (IBR) after mastectomy for breast cancer has nearly doubled in the United States over the past 15 years. For women who require or choose mastectomy for breast cancer, IBR may improve body image and quality of life. Availability of IBR varies amongst institutions, yet the impact of IBR availability on the rates of bilateral versus unilateral mastectomy for breast cancer is unknown.

Methods From the 2002-2010 Nationwide Inpatient Sample (NIS), we analyzed discharge data from a stratified sample of 20% of United States hospitals. We identified all women with in situ and invasive breast cancer undergoing unilateral mastectomy (UM) or bilateral mastectomy (BM) with and without IBR by ICD-9 diagnosis and procedure codes. Hospitals were classified as performing IBR if at least 1 hospitalization included both mastectomy and reconstruction. Hospitals were then further classified by IBR volume. Unilateral vs bilateral breast cancer cannot be discerned through ICD-9 diagnoses; however bilateral breast cancer is uncommon (1%-3% of cases) and rates are unlikely to differ significantly across hospitals. Statistical comparisons utilized chi-square tests, tests for trend, and multivariable logistic regression.

Results We identified 130,761 women undergoing UM (84.0%) or BM (16.0%) for breast cancer from 2002-2010. Rates of BM increased over time, from 8.3% in 2002 to 25.7% in 2010. BM rates were higher in younger women, those with in situ disease, and those treated at an urban or teaching hospital (all p < 0.001). Of the 6,584 hospitals, 3,399 (51.6%) did not perform any IBRs. Of the remaining 3,185 hospitals, the number of IBRs ranged from 1 to 637 per year. Teaching, urban, and Northeastern hospitals were more likely to have higher IBR volumes (see table). At the patient level, BM rates were significantly higher at hospitals with greater availability of IBR. At hospitals

without IBR, 4.9% of women underwent BM, compared to BM rate of 24.6% in women treated at hospitals performing ≥ 24 IBRs/year ($p < 0.001$). Upon adjusted analysis, patients most likely to be seen at hospitals performing ≥ 24 IBRs/year were younger (odds ratio [OR] 1.46 for 18-40 vs 55-64, $p < 0.001$), had in situ disease (OR 1.33 vs invasive, $p < 0.001$), elected bilateral mastectomy (OR 1.85 vs UM, $p < 0.001$), or were treated in more recent years (OR 1.98 for 2010 vs 2002, $p < 0.001$).

Characteristics of Hospitals by Number of Annual Immediate Breast Reconstructions Performed

		N or % of All Patients/Hospitals	Immediate Breast Reconstruction Hospital Volume (Per Year Numbers)				P Value
			None (0)	Low (1-11)	Medium (12-23)	High (24+)	
Number of patients (N)		130,761	20,684	42,495	21,388	46,194	-
Mastectomy	Unilateral	84.0%	95.1%	88.5%	83.1%	75.4%	
	Bilateral	16.0%	4.9%	11.5%	16.9%	24.6%	
Number of hospitals (N)		6,584	3,399	2,233	479	473	-
Hospital teaching status	Nonteaching	77.3%	93.8%	70.5%	41.9%	26.2%	
	Teaching	22.7%	6.2%	29.5%	58.1%	73.8%	
Hospital rurality	Rural	33.7%	56.8%	12.4%	1.9%	1.1%	
	Urban	66.3%	43.2%	87.6%	98.1%	98.9%	
Hospital region	Northeast	15.8%	11.5%	18.6%	22.1%	27.5%	
	Midwest	28.0%	32.6%	23.9%	23.4%	19.0%	
	South	36.7%	37.6%	36.8%	33.0%	34.0%	
	West	19.4%	18.3%	20.7%	21.5%	19.5%	

Conclusion In this analysis of national data, the performance of bilateral mastectomy for breast cancer was higher in hospitals where immediate breast reconstruction was available. Further study is needed to ensure all breast cancer patients have access to IBR when desired and to better understand the reasons for hospital variation in bilateral mastectomy rates.

Doctor, Your Patient Had Breast Surgery. Where May I Obtain a Blood Pressure?

Linwood R. Haith¹, Kathleen M. Toomey², MaryLou Patton¹, Robert E. Guilday¹

¹Surgery, Crozer-Chester Medical Center, Upland, Pennsylvania, United States, ²Nursing, Crozer-Chester Medical Center, Upland, Pennsylvania, United States

Objective Nursing professionals admitting patients with a history of breast surgery are often uncertain where they may obtain blood pressure (bp), place an iv or draw blood. They may have limited understanding of the nuances between breast and associated axillary procedures. Breast surgeons may be unaware of the literature, causing inconsistency in whether blood draws, bp and iv's should be performed in the ipsilateral arm.

Methods A questionnaire was distributed to nurses in the hospital endoscopy and short stay units. Questions included the following:

1. If a patient had breast surgery where can you place a bp cuff, draw blood, or start an iv?
 - a. ipsilateral (same) arm ____
 - b. contralateral (opposite) arm ____
 - c. makes no difference ____
2. Does it make a difference if the patient had axillary surgery as part of the breast operation? Y ____ N ____
3. Does it make a difference if the patient had a level I/II axillary dissection? Y ____ N ____
4. Does it make a difference if the patient had a sentinel node biopsy? Y ____ N ____

continues

Breast surgeons were asked:

- a. Do you know of evidence based literature substantiating bp's, iv's, blood draws should not be performed on the ipsilateral side after axillary or sentinel node surgery? Y___N___
- b. Is there evidence based literature substantiating bp's, iv's, blood draws should not be performed on the ipsilateral side after axillary or sentinel node surgery? Y___N___
- c. Do you tell your patients: Do not allow bp's, iv's, or blood draws on the side having had:
 - (1) Level I/II axillary dissection: Y___ N___ Do not discuss it___
 - (2) SLN: Y___ N___ Do not discuss it___

Results One hundred percent of the nursing staff felt that the contralateral side should be used if the patient had previous breast surgery. All nursing staff felt that axillary surgery made a difference with regard to how they would approach procedures on the ipsilateral arm. Sixty percent felt that both level I/II axillary dissection and SLN influenced their decisions regarding procedures on the ipsilateral arm. One half of the breast surgeons thought that they could cite literature validating their beliefs that bp's, iv's, blood draws should not be performed on the ipsilateral side. Half of the surgeons directed their patients not to have procedures on the ipsilateral arm after axillary dissection, whereas 75% of the surgeons allowed patients to use the ipsilateral arm for procedures after SLN.

Conclusion Nursing staff members have misconceptions regarding breast surgery and often may not differentiate between purely breast procedures and breast procedures involving the axilla. Breast surgeons are poorly informed about evidence-based evidence regarding postaxillary procedure restrictions in the ipsilateral arm. Half allow patients to receive iv's, blood draws, and blood pressure measurements in the ipsilateral arm after axillary dissections and most allow procedures in the ipsilateral arm after SLN. An extensive review of the literature reveals sketchy data suggesting increased lymphedema with iv's after axillary dissection. There are no evidence-based data regarding appropriateness of obtaining blood pressures or drawing blood in the ipsilateral arm after sentinel node biopsy.

Increasing Utilization of Breast MRI: A Population Study

Nicole Hodgson^{1,2}, Som Mukherjee², Gregory Pond², Peter J. Lovrics², Mark Levine², Jonathan Sussman²

¹Surgery, McMaster University, Hamilton, Ontario, Canada, ²Oncology, McMaster University, Juravinski Hospital and Cancer Centre, Hamilton, Ontario, Canada

Objective The routine use of preoperative breast magnetic resonance imaging (MRI) remains controversial. A recent meta-analysis identified increased mastectomy rates in women imaged with MRI prior to surgery. The objective of this study was to determine the incidence of preoperative MRI in a large Canadian population database and to assess its impact on mastectomy rates for women with invasive breast cancer for the years 2006-2011.

Methods All cases of invasive breast cancer undergoing surgery were identified using the Institute for Clinical Evaluative Sciences (ICES) database for the years 2006-2011. Analysis between MRI and no-MRI groups included descriptive statistics, annual percent change, chi-square test and multivariate analysis, adjusting for age, histology, year of diagnosis, rural vs urban, income quartile, and Charlson scores.

Results There were 34,909 eligible patients with newly diagnosed invasive breast cancer who underwent surgery. 2692 (8%) patients had an MRI prior to surgery and 32,217 (92%) had no MRI. The rate of MRI increased from 0.1% in 2006 to 17% in 2011. The rate was highest in younger women, 35% in the under-45 age group. For the years 2006-2008 the rate of MRI use was 1 in 917 patients and increased annually by 1,583% (2008-2009), 828% (2009-2010), and 4% (2010-2011) to a rate of 1 in 6 patients in 2011. From 2006-2011 the annual rate increased by over 16,000%. In the MRI group, 1537 (57.1%) patients underwent a lumpectomy and in the no-MRI group, 21,112 (65%) had a lumpectomy. (p value < 0.001, OR 0.53, 95% CI = 0.40-0.53). The mastectomy rate in the MRI group was 49.5% vs 41.5% in the no MRI group (p value < 0.001). This remained statistically significant after multivariate analysis (OR, 1.70; 95% CI = 1.56-1.85), including adjusting for year of diagnosis, age, histology, and other available clinical factors.

Conclusion Our summary of a large population cohort identifies a significant increase in the incidence of preoperative breast MRI prior to surgery. MRI results in a statistically significant increase in mastectomy rates, compared to women without MRI. Further outcome analysis, including provider/patient preference, are paramount in determining if MRI is predictive of mastectomy.

Who Is Receiving the Oncotype Dx Breast Cancer Assay in Current Practice?

Ava Hosseini, Jennifer L. Baker, Christopher Tokin, Brian Mailey, Anne M. Wallace
UCSD, La Jolla, California, United States

Objective The Oncotype Dx breast cancer assay is routinely used in clinical practice to identify patients at high risk for distant recurrence in order to tailor adjuvant therapy. However, the decision to order the test is not completely standardized and is still greatly influenced by oncologist and patient preferences. We sought to determine the patient and tumor characteristics associated with likelihood of receiving Oncotype Dx testing, as well as factors associated with high Oncotype Dx recurrence score (RS).

Methods All consecutive female patients with estrogen-receptor-positive, lymph node-negative breast cancer between 2003 and 2011 were identified from a single institutional database. Demographic data, tumor factors, and adjuvant treatment information was collected. Patients were analyzed corresponding to receipt or not of the Oncotype Dx assay, and those who received it were further analyzed corresponding to RS.

Results Of the 944 patients meeting inclusion criteria, 12.8% (N = 121) received the Oncotype Dx breast cancer assay. These patients were more likely to be younger ($p < 0.001$), have private insurance ($p = 0.001$), and have higher modified Bloom-Richardson (MBR) histologic grade tumors ($p < 0.001$) with presence of lymphovascular invasion ($p = 0.006$). A low-risk RS, defined as less than 18, was reported in 41.3% (N = 50) of patients, with 45.5% (N = 55) having an intermediate-risk RS between 18-30 and 13.2% (N = 16) having a high-risk RS greater than 30. MBR was the only patient or tumor factor that was associated with a high-risk RS ($p = 0.013$). Those with high-risk RS were more likely to receive adjuvant chemotherapy than those with low-risk RS (81.3% vs 14%, $p < 0.001$). Overall, patients who underwent Oncotype Dx analysis were more likely to receive adjuvant chemotherapy (38% vs 13.6%, $p < 0.001$) and/or adjuvant hormonal therapy (95% vs 60.4%, $p < 0.001$) than those who did not undergo testing.

Conclusion Younger patients with higher grade tumors are more likely to be offered the Oncotype Dx assay, and these patients have a higher probability of receiving adjuvant chemotherapy overall. Within the subset of patients tested, those with higher RS were more likely to receive chemotherapy as reported in other studies. Our study also shows that the test may be underutilized in patients with public insurance.

Deformity After Breast-Conserving Surgery (BCS) and Its Impact on Quality of Life of Breast Cancer Survivors in Taiwan

Chia-Ming Hsieh¹, Wei-Chieh Lin²

¹Breast Center, Department of Surgery, Taiwan Adventist Hospital, Taipei, Taiwan, ²Taiwan Breast Cancer Alliance, Taipei, Taiwan

Objective Conventional BCS leaves cavity after tumor excision. After radiation, depression of breast develops frequently. So far there are no available data showing occurrence rate of breast deformity after BCS in Taiwan. To investigate deformity occurrence rate after BCS and its impact on quality of life, a survey was conducted on patients who received BCS.

Methods To collect data, a questionnaire was designed. A total of 1,260 questionnaires were sent out to BCS patients through 23 breast cancer support groups from Aug 2013 to Oct 2013.

Results There were 259 questionnaires collected and the response rate was 21%. Among those collected, 244 questionnaires were effective for analysis. Among the 244 patients, 144 patients (59%) claimed breast deformity and the ages at diagnosis ranged from 48 to 68 years old (average, 47.6 years old). Average interval after surgery was 4.7 years. Nine patients had diabetes and 3 had history of smoking. There are 124 patients (93.2%) who had early breast cancer (stage 0, 1, 2) among those suffering deformity, and average tumor size was 2.3 cm. Among those 144 patients with deformity, 122 patients (84.7%) had radiotherapy after BCS. There are several types of deformity, including depression in 79.2% (103/133 respondents); folding, 7.7% (10/133); and others, such as keloid scar, pigmentation, deviation of nipple, etc, 13.1% (17/133). The reported impacts in the cases of 144 patients with deformity are as follows: affecting mood in 50 patients (34.7%), changing in self-confidence in 67 (46.5%), feeling uncomfortable for intimate relationships in 62 (45.1%), and unwillingness to swim and to spa in 72 (50%). To prevent deformity, 86 respondents with breast deformity (59.7%) would choose oncoplastic breast surgery if surgery modality could be informed and selected.

Conclusion The number of long-term breast cancer survivors increases because of mammography screening, improvement of treatment, and awareness of the disease. In the past, surgical treatment mainly focused on oncological safety, and surgeons cared less on cosmetic outcomes. This report revealed high rate of breast deformity

after conventional BCS and negative impact on quality of life for those BCS survivors. To prevent breast deformity and to improve the quality of life, several oncoplastic surgery techniques were developed. Most patients with early breast cancer would prefer oncoplastic breast surgery if the service is available.

Selective Use of Axillary Staging in Clinically Node-Negative Elderly Women With Invasive Breast Cancer

Melissa Hughes¹, Jessica Young¹, Seyedeh Shiva Dibaj², Shicha Kumar¹

¹Surgical Oncology, Roswell Park Cancer Institute, Buffalo, New York, United States, ²Biostatistics, Roswell Park Cancer Institute, Buffalo, New York, United States

Objective Axillary staging in elderly patients with invasive breast cancer is considered standard, yet some surgeons omit axillary procedures in this population. Our objective was to identify factors associated with omitting axillary lymph node surgery in elderly women and to determine outcomes in this group of patients.

Methods Women aged 70 years or older with clinically node-negative T1-T4 invasive breast cancer who underwent surgical therapy without any axillary staging at our institution between January 2000 and December 2010 were identified from a prospective database. Clinical and pathologic data, as well as information regarding surgeons' reasons for omission of axillary staging, were obtained from chart review. Kaplan-Meier estimates were used to determine overall survival. Information on local recurrence, distant metastasis, recurrence free survival, and median time to recurrence were determined.

Results A total of 124 patients were identified. Nearly 84% of the breast cancers were less than 2 cm. Invasive ductal carcinoma accounted for 68.5% of patients and of all histological types, 92% were estrogen receptor positive, with 73% progesterone receptor positive, and 87.9% HER2 negative. Of the 124 women, 69.4% had 1 to 3 comorbidities, while 26.6% had more than 3. Almost all of the women (97.6%) were treated with lumpectomy, 73.4% did not undergo adjuvant radiation, while 85.4% were treated with some form of endocrine therapy. No patient underwent chemotherapy. Of the reasons stated for omitting axillary surgery, 34.9% were due to age, 28.7% to comorbidities, 18.2% to favorable tumor characteristics, and 5.3% stated the results of axillary staging would not change management. In 14 patients, no reason was stated, and 13 patients refused axillary surgery. There were 9 documented recurrences: 2 with distant disease, 6 with local recurrence to the breast, and 1 with recurrence to the axilla. Median time to recurrence was 24 months. Of 123 patients with follow-up information, 58 (47.2%) died, only 3 of which were from breast cancer. Sixty-five (52.8%) patients were still alive at date of last contact. Overall survival had a median of 88.3 months (95% CI: 74.8, 130.9) and recurrence-free survival had a median of 81.2 months (95% CI: 65.5, 107.4).

Conclusion Advanced age, comorbidities, and favorable tumor characteristics are the main reasons cited by surgeons for omission of axillary lymph node surgery in this group of elderly women with mostly small, estrogen receptor-positive tumors treated with a combination of lumpectomy and endocrine therapy alone. Incidence of local and regional recurrence was low, as was breast cancer-related mortality. Further studies to determine oncologic safety of omission of axillary staging in this population is warranted.

Examination of 246 Cases of Invasive Secretory Carcinoma of the Breast From the National Cancer Data Base: 0.01% of Breast Cancers

John Jacob¹, Jan Franko², Charles D. Goldman², V. Suzanne Klimberg³, Christopher M. Pezzi¹

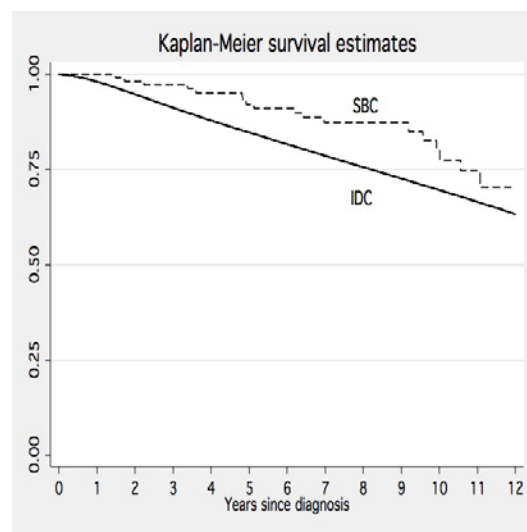
¹Surgery, Abington Health, Abington, Pennsylvania, United States, ²Surgical Affiliates, Mercy Medical Center, Des Moines, Iowa, United States, ³Surgery, University of Arkansas for Medical Sciences, Little Rock, Arkansas, United States

Objective Invasive secretory breast carcinoma (SBC) is an uncommon histological variant of breast cancer. We examined the characteristics, patterns of treatment, and outcomes of SBC compared to infiltrating ductal carcinoma (IDC) using the National Cancer Data Base (NCDB).

Methods The NCDB Participant Use Data File (PUF) for breast cancer covering 1998-2011 was queried for clinical characteristics, demographic, treatment, and outcome data for all cases of SBC and IDC. Analysis was limited to female patients with invasive cancers. Hormone receptor status was examined for patients from 2004-2011. Age and tumor size was compared with *t* test. Race, nodal status, stage IV incidence, grade, and hormone receptor status were compared with χ^2 . Survival analysis was performed for patients diagnosed 1998-2005 to allow 5 years of follow-up. Calculation of overall survival was stratified by lymph node status using the Kaplan-Meier method, and excluded those initially presenting with distant metastatic disease.

Results Patients with SBC (n = 246) were younger compared to IDC (n = 1,564,068; age 56.4 ± 16.0 vs 60.4 ± 13.9 years, $p < 0.001$), had similar tumor size (19.9 ± 17.8 vs 21.6 ± 25.5 mm, $p = 0.297$), and were more frequently reported of black race (expressed as number of SBC per 100,000 IDC, B/W/other: 24.1 vs 14.8 vs 13.7; $p = 0.004$). There was no difference in the incidence of node-positivity (32 vs 34%, $p = 0.520$) or stage IV presentation (2.4 vs 3.6%, $p = 0.372$). SBC was more likely to be well-differentiated (32 vs 18%, $p < 0.001$) and less likely to be hormone receptor positive (ER: 64 vs 76%, $p = 0.001$; PR: 43 vs 65%, $p < 0.001$). Breast-conserving surgery rates were similar for SBC and IDC (60 vs 58%, $p = 0.405$). Systemic chemotherapy was used less often for SBC compared to IDC (38 vs 45%, $p = 0.035$), while the use of hormonal therapy (among those with positive ER/PR status) was not different (67 vs 71%, $p = 0.489$). Among node-negative patients, SBC was associated with superior survival (median not reached vs 14.9 years, $p = 0.042$). The overall survival of all patients with SBC compared to all patients with IDC was better for SBC ($p = 0.030$), a result primarily influenced by the difference seen in the N0 subgroup. No survival difference was seen comparing those with node-positive disease (not reached vs 13.5 years, $p = 0.325$).

Conclusion SBC is an uncommon tumor that occurs in younger women, is more often well differentiated, and less frequently hormone receptor positive. Crude survival is more favorable compared to IDC, especially in node-negative patients.



Kaplan-Meier survival curves for patients with invasive secretory carcinoma and infiltrating ductal carcinoma of the breast (excluding stage IV at presentation).

History of Radiation Therapy Does Not Diminish Nipple Survival Following Nipple-Sparing Mastectomy

J. Arthur Jensen², Parisa Mirzadehgan¹, Armando E. Giuliano¹

¹Surgery, Cedars-Sinai Medical Center, Los Angeles, California, United States, ²Division of Plastic Surgery, UCLA/Geffen School of Medicine, Los Angeles, California, United States

Objective Nipple-sparing mastectomy (NSM) results in a more cosmetically acceptable surgical outcome than non-NSM but questions have been raised about the safety of NSM in the setting of previous radiation therapy (RT). If a patient who has been treated for breast cancer using lumpectomy and RT develops an ipsilateral recurrence, a contralateral recurrence, or considers herself high risk (BRCA positivity or family history), mastectomy might be required in the setting of previous RT. Can NSM be safely offered to these patients?

Methods Nipple survival (NS) was analyzed in 140 patients who underwent 216 NSMs. Thirty of the 216 breasts analyzed had been previously treated with RT. Nipples removed because of positive subareolar biopsies were excluded from analysis as were all breasts that had been previously treated with a surgical delay procedure to improve NS following NSM. NS in patients with a history of previous RT was compared with NS in patients with no history of RT. Type of breast reconstruction was likewise compared between the 2 groups.

Results No difference in NS was observed between NSM with history of RT (1 loss in 30 NSM, 3.3%) vs NSM with no RT (9 losses in 186 NSM, 4.8%). Indications for NSM in the RT group (n = 30) were ipsilateral recurrence in 19 (63%), contralateral occurrence in 6 (20%), and high risk in 5 (17%). Indications for NSM in the non-RT

group (n = 186) were invasive or noninvasive cancer in 111 (60%) and prophylactic in 76 (40%). Reconstruction in the NSM RT group included TRAM or latissimus dorsi flap in 21 (70%) and expander/implant alone in 9 (30%). In the non-RT NSM group, TRAM and latissimus flap totaled 86 (46%) and expander/implant alone 101 (54%).

Conclusion A history of radiation therapy does not diminish nipple survival following nipple-sparing mastectomy but autologous tissue reconstruction is more often used in the setting of patients with a history of breast radiation.

Hazard of Recurrence After Breast Surgery According to Hormone Receptor Status and Age

Seung Pil Jung¹, Jeong Eon Lee², Seok Jin Nam², Jeoung Won Bae¹

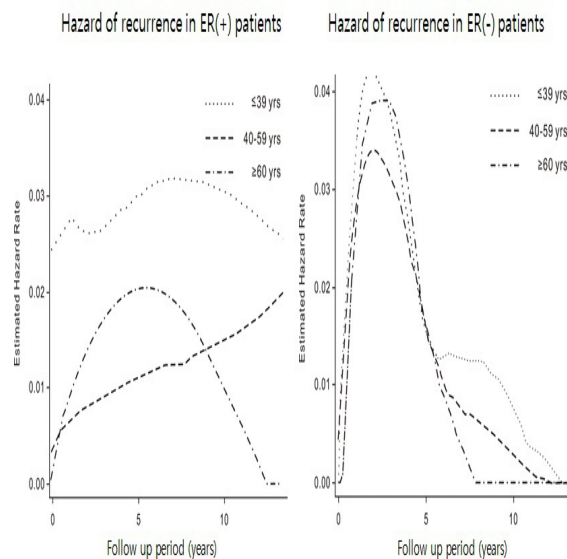
¹Division of Breast and Endocrine Surgery, Department of Surgery, Korea Univeristy Hospital, Korea University College of Medicine, Seoul, Republic of Korea, ²Division of Breast and Endocrine Surgery, Department of Surgery, Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, Republic of Korea

Objective Breast cancer can recur many years after treatment. Age and hormone receptor status have been reported to be related with recurrences in breast cancer. Most studies have focused on disease-free survival and survival curves. We estimated hazard rates for recurrence to evaluate the risk of recurrence at a given time and how to recurrence changes over time according to hormone receptor status and patient age.

Methods We retrospectively reviewed the medical records of 6,308 patients with stage T1-3 breast cancer who received breast cancer operation from August 1995 to December 2010. We excluded women treated with trastuzumab to avoid the bias from different treatment. Recurrence was defined as not only locoregional but also any distant recurrences. Hazard rates were estimated by using Proc Lifetest in SAS through the Kaplan-Meier method. Patients were grouped according to estrogen receptor (ER) status [ER (+, n = 4589), ER (-, n = 1719)] and age [less than 39 years (n = 1192), 40 – 59 years (n = 4250), more than 60 years (n = 866)].

Results Median follow-up period was 60 months. Estimated 5-year and 10-year recurrence rate calculated by using the Kaplan-Meier method were 11.2% and 19.5% in overall cohort. Estimated 5-year and 10-year recurrence rate were 10.6% and 19.6% in ER(+) patients, and 16.6% and 18.4% in ER(-) patients. For the age group, estimated 5-year and 10-year recurrence rate were 18.5% and 28.9% in <40-year group, 10.2% and 16.3% in 40- to 59-year group, and 15.3% and 22.3% in >60-year group. Hazard of recurrence (HR) was highest in 2-3 years after surgery in overall cohort. ER(-) patients showed steep pattern of HR, while ER(+) patients showed steady pattern of HR. Five years after surgery, HR was higher in ER(+) patients than ER(-) patients. Younger patients showed higher HR than older patients regardless of ER status and stage (see figure).

Conclusion Our study suggests that ER(-) patients showed high-recurrence rate in early postoperative stage, however, in late postoperative stage, ER(-) patient showed lower recurrence rate than ER(+) patient. In young patients, the effect of ER status on recurrence might be reduced than older patients. Young patients should be carefully observed because of high and longstanding hazard of recurrence especially in ER(+) patients.



The Short-Term Effect of Weight Loss Surgery on Breast Density

Swapnil Kachare¹, Olga Pylaeva², Dylan Suttle², Timothy Fitzgerald¹, Paul Vos³, Bruce Schroeder⁴, Kathryn Verbanac¹, Jan Wong¹, Nasreen Vohra¹

¹Surgical Oncology, East Carolina University, Brody School of Medicine, Greenville, North Carolina, United States,

²Surgery, East Carolina University, Brody School of Medicine, Greenville, North Carolina, United States,

³Biostatistics, East Carolina University, Greenville, North Carolina, United States, ⁴Radiology, East Carolina University, Greenville, North Carolina, United States

Objective The highest levels of breast density as measured mammographically are associated with a 2- to 6-fold increased risk of breast cancer. Density is also affected by age, BMI, menopausal status, and parity. Large population-based studies report a lower incidence of breast cancer in women undergoing weight loss surgery (WLS), but the biological mechanism(s) is not understood. Factors that contribute to mammographic density may also affect breast cancer risk. We used an objective assessment of volumetric breast density, to determine the effect of weight loss surgery on breast density.

Methods A retrospective chart review of all women who underwent weight loss surgery at our institution was performed. We identified patients with both preoperative and postoperative digital screening mammograms. Postoperative mammograms were performed on average 6 months following weight loss surgery. We used Volpara™, an FDA-approved breast imaging software to calculate volumetric breast density. Volpara analyzes digital mammographic data in a volumetric fashion and produces a quantitative assessment of breast composition using volume of fibroglandular tissue, volume of breast tissue, and their ratio to determine volumetric breast density.

Results A total of 87 women met study criteria. The median age was 52 years (range, 37 y–68 y). Forty-six percent were African American. The majority never smoked (64%) or abused alcohol (97%) and had no family history of breast cancer (76%). At the time of surgery, 28% (n = 24) were premenopausal, 25% (n = 22) were perimenopausal, and 47% (n = 41) were postmenopausal. The majority of patients (80%) underwent a laparoscopic gastric bypass. Average BMI pre-surgery was 45.9 kg/m² (range, 35.1–68.2 kg/m²). Patients had an average decrease in BMI of 12.4 kg/m² and average weight loss of 32.8 kilograms after surgery. Regardless of menopausal status, after undergoing bariatric surgery, patients on average showed decreases in fibroglandular volume (-11.26 cm³), total breast volume (-600.4 cm³), and height (-22.95) with a resultant increase in calculated breast density (2.91%).

Conclusion A decrease in BMI in women who underwent WLS was associated with a significant decrease in fibroglandular volume and total breast volume, but an increase in breast density. This can be attributed to a disproportionate reduction in fat content of the breast as compared to the fibroglandular tissue. These data suggest that breast density is a modifiable factor with weight loss surgery.

	Breast Density, % (mean)			Fibroglandular Volume, cm ³ (mean)			Breast Volume, cm ³ (mean)		
	Pre WLS	Post WLS	p Value	Pre WLS	Post WLS	p Value	Pre WLS	Post WLS	p Value
Premenopausal	4.84	8.36	0.05	80.29	68.55	0.26	1788.8	1014.4	0.0004
Perimenopausal	5.54	9.56		67.72	61.41	0.44	1288.01	750.47	0.001
Postmenopausal	5.15	7.12	0.002	67.33	53.9	0.03	1394.7	862.29	
<i>Total</i>	5.17	8.07		70.91	59.65	0.01	1473.11	872.74	

How Does Screening Mammography Work?

Prathima Kanumuri, Brigid K. Killilea, Anees B. Chagpar, Nina R. Horowitz, Brandon Hayse, Donald Lannin
Breast Surgery, Yale University, New Haven, Connecticut, United States

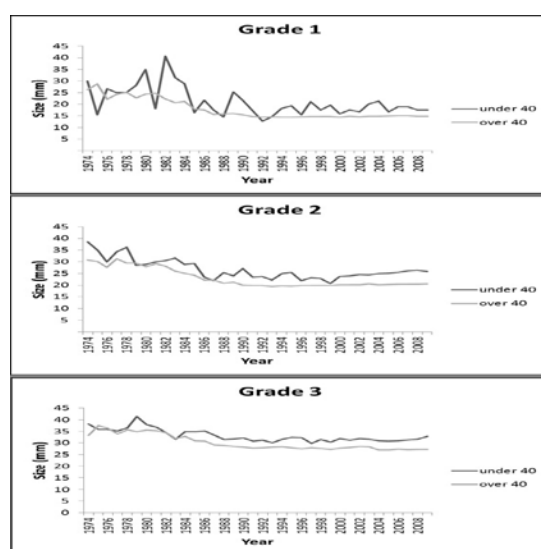
Objective Studies of screening mammography consistently show a small but significant reduction in breast cancer mortality (15% to 25%). The mechanism by which mammography achieves this benefit is unclear. If the principle of early detection is valid, why is the benefit so small?

Methods SEER data for invasive and in situ breast cancer from 1973–2009 were reviewed. Incidence, tumor size, and tumor grade of invasive cancers and incidence and tumor grade of in situ cancers were compared between women older than 40 (routine screening is common) and women under 40 (routine screening is uncommon).

Results As seen in the following figure, tumor size decreased during the 1970s and 1980s in both groups, probably

due to an increased awareness of breast cancer, and thereafter has remained constant. Both age and tumor grade were significantly associated with tumor size ($p < 0.001$), but when stratified by grade, the difference in size between the groups was small. Since 1990 mean tumor size (mm) for women >40 and <40 was 15 ± 0.3 and 18 ± 2.3 for grade 1; 20 ± 0.3 and 24 ± 1.6 for grade 2; and 28 ± 0.5 and 31 ± 0.8 for grade 3 tumors. In women under 40, there has been little change in incidence of invasive tumor (all grades) and DCIS is extremely rare (2 cases/100,000 women). In contrast, in women over 40 the incidence of grade 1 and 2 invasive cancer and all grades of DCIS have increased markedly ($p < 0.001$), whereas the incidence of grade 3 invasive cancer has steadily declined ($p < 0.001$). The overall decrease in grade 3 invasive cancers from 65 cases/100,000 women in 1974 to 44 cases/100,000 in 2009 parallels the increase in incidence of high-grade DCIS to 18 cases/100,000 over the same period, suggesting a causal relationship. High-grade invasive cancers account for 60% of cancer deaths in the SEER database. Therefore, the 32% decrease in incidence of grade 3 invasive cancer is of sufficient magnitude to explain the observed 15%-25% mortality reduction from screening mammography.

Conclusion The small difference in size of invasive cancer between a screened and unscreened population is unlikely to explain the benefit of screening mammography. On the other hand, reduction in the incidence of high-grade invasive cancer, most likely from detection and removal of high-grade DCIS, would adequately explain the observed benefit of mammography.



Intraoperative Ultrasound-Guided Surgery for Breast Cancer – 10 Year Results

Cary S. Kaufman¹, Valerie S. Behrndt², Laurie Hill¹, Rebecca Caro³, Sid Nix³, Karen Ness³, Carol Mahon³, Nancy Schnell³, John Lape³

¹Bellingham Regional Breast Center, University of Washington, Bellingham, Washington, United States, ²Women's Diagnostic Center, Mount Baker Imaging, Bellingham, Washington, United States, ³Surgical Department, Bellingham Ambulatory Surgery Center, Bellingham, Washington, United States

Objective The use of ultrasound by surgeons in the operating room to localize breast cancer is a necessary technique for today's breast surgeons. A review of the results of intraoperative ultrasound localization (IOL) provides a guide to compare performance of this procedure. We review our breast cancer surgical patients from 2003 to 2012 to characterize patients, results, and comment on the technique.

Methods We reviewed 1,100 consecutive breast cancer patients seen from 2003 to 2012. Of these 727, (66%) had IOL procedures and 373 had either wire localization (117) or palpation-guided (267) surgical excision. Of those 727 patients with IOL, we collected at least 96% of the datapoints for this review. Initial presentations were an abnormal imaging study in 70% of patients or an initial clinical finding in 30%. Our radiologists typically obtain a core needle biopsy and place an ultrasound visible clip for IOL. Patients who had breast lesions or targeted markers visible by ultrasound were included in the IOL group. Patients were on average 63 years old (range, 25-94), with needle biopsy achieving diagnosis in 95.6% (695/727). Average size of breast cancer was 1.74 cm with grade evenly divided between grades 1, 2, and 3 (33%, 34%, and 32%). Histology distribution was typical and included IDC (50%), IDC with DCIS (18%), DCIS (17%), ILC (9%), and assorted other histologies (6%). Tumor markers revealed 84%

estrogen positive and 87% Her2 negative tumors. Our IOL protocol will be described but is typical of other reports which include ultrasound visualization, guidewire placement, and image confirmation of the excised lesion.

Results Negative margins were achieved in 84% of patients with 61% of margins at least 3 mm at the initial procedure. The final surgical procedure was breast-conserving surgery in 93% and mastectomy in 7%, of which 30% were bilateral. The overall positive margin rate was 15.8% (110/697), with the majority of these patients having significant degrees of DCIS. Of the positive-margin patients, there were 49% (54/110) with either pure DCIS or mixed invasive ductal with DCIS. This group is proportionately larger than their representation in the database. The remainder of the positive margin tumors includes 35% invasive ductal (38/110) and 16% invasive lobular carcinoma (18/110). Repeat breast operations occurred in 13.3% of patients (93/697). Breast re-excisions occurred in 78% patients (73/93) and mastectomy in 22% patients (20/93). Axillary node surgery occurred in 75.4% of patients, with 67% found to have negative nodes, 25% had 1-3 positive nodes, 6% had 4-9 positive nodes, while only 8 patients had 10 or more positive nodes. Over 94% of patients were early stage as noted by Stage 0, 1a, 2a, 2b were 17%, 49%, 19%, and 9%, respectively. A cost and time analysis suggests significant savings with IOL.

Conclusion Intraoperative ultrasound localization is a foundation surgical technique for breast surgeons. A 10-year review demonstrates successful targeted excisions with low re-excisions. Ongoing research and clinical collaboration will lower our positive margin and re-excision rates in the future.

Retaining Adjustable Implants for Single-Stage Breast Reconstruction

Stephanie Kekulawela¹, Joseph Desantis²

¹General Surgery, Geisinger Medical Center, Danville, Pennsylvania, United States, ²Plastic Surgery, Geisinger Medical Center, Danville, Pennsylvania, United States

Objective Two-stage breast reconstruction with tissue expansion is the leading method for reconstruction in the United States. However, single-stage breast reconstruction utilizing adjustable saline implants for expansion is also an option that is not commonly used. We present a 5-year series of breast reconstructions performed by 1 surgeon at our institution. All women were offered the traditional 2-stage reconstruction: exchange of the adjustable implant for gel implants. Potential predictors of ultimate exchange were studied, including adjuvant chemotherapy, post-mastectomy radiation therapy, smoking, obesity, hypertension, and age at the time of reconstruction. Complication types and rates associated with implant-based breast reconstruction for exchanged and nonexchanged patients were also determined and included infection, capsular contraction, and poor wound healing post reconstruction.

Significant cost savings were anticipated. Our goal was to examine whether the above complications and patient predictors influence patients to retain their adjustable implants to undergo single-stage than 2-stage reconstruction.

Methods This a retrospective study that reviewed the electronic medical records of patients who underwent breast tissue expander placement and replacement by a single plastic surgeon from January 1, 2006-December 31, 2011. Patient characteristics that were reviewed included age, gender, body mass index, diabetes, hypertension, tobacco, chemotherapy, and radiation therapy. The technical and product fees associated with surgery were calculated for replacement of adjustable implants as well as port removal at clinic.

Results One hundred forty-one adjustable implants were placed in 89 patients. Out of these, 4 patients were excluded because their implants were removed within 6 months due to infection (in 3 patients) or worsening erythema while receiving radiation therapy (in 1 patient). Sixty-three patients exchanged their adjustable implants for silicone implants, while 22 patients kept their adjustable implants permanently by undergoing port removal. Potential predictors of ultimate exchange that included adjuvant chemotherapy, postmastectomy radiation therapy, smoking, obesity, hypertension, and age at the time of reconstruction did not differ between both groups. The port removal group demonstrated the following: Age, 50 (+/-9); BMI < 25 (43%); Diabetes, 22% (n = 5); Hypertension, 39% (n = 9); Tobacco, 48% (n = 11); chemotherapy, 57% (n = 16); Radiation, 56% (n = 13). The tissue expander replacement group demonstrated the following characteristics: Age, 48 (+/-9); BMI < 21 (32%); Diabetes, 7.6% (n = 5); Hypertension, 39% (n = 22); Tobacco, 43% (n = 28); chemotherapy, 56% (n = 37); Radiation, 49% (n = 32). Port removal at bedside, compared to surgical replacement with permanent implants, appears to save individuals about \$47,000-48,000 for technical fees, products, and hospital stay.

Conclusion Single-stage breast reconstruction is a viable and aesthetically satisfying option that costs less and allows cancer patients to undergo 1 surgery vs 2 surgeries. A 2-stage reconstruction is still a potential choice, but the opposite (single-stage reconstruction) would not be true if they underwent traditional tissue expander placement.

The Utility of Breast-Specific Gamma Imaging for Invasive Lobular Carcinoma

Katherine A. Kelley¹, Jeffrey Crawford¹, Nathalie Johnson²

¹Surgery, Oregon Health and Sciences University, Portland, Oregon, United States, ²Surgical Oncology, Legacy Medical Group, Portland, Oregon, United States

Objective Invasive lobular carcinoma is the second most common form of breast cancer. However, it is the type of breast cancer most often missed on screening mammography. In addition, lobular lesions can be difficult to identify even with adjunctive use of magnetic resonance imaging or ultrasound. Functional breast tissue evaluation with breast-specific gamma imaging (BSGI) has been demonstrated to be quite sensitive and specific for the identification of breast cancer. We aim to evaluate the utility of BSGI to specifically identify lobular carcinoma as compared to its use in ductal carcinoma.

Methods A retrospective review of prospectively maintained imaging registry data identified 713 women who underwent BSGI for a new diagnosis of breast cancer at our institution from 2006-2012. Breast carcinomas included DCIS, ILC, invasive ductal carcinoma (IDC), and invasive mammary carcinoma (IMC). All women were surveyed with a Dilon 6800 gamma camera per Dilon Diagnostics protocol.

Results There were 46 lobular carcinomas and 667 ductal carcinomas. The mean age of diagnosis was 57.9 years and the average tumor size was 1.7 cm. In the ductal group, the known lesion was seen in 586/667 (82.2%). In the lobular group, the sentinel lesion was seen in 32/46 (69.6%). Elsewhere lesions were detected by BSGI in 57 ductal carcinomas (8.5%) vs 9 of the lobular carcinomas (19.6%). The study population is summarized in the following table. The sensitivity/specificity for lobular carcinomas compared to ductal carcinomas was 89%/79% and 85%/81%, respectively.

Conclusion To our knowledge, this is the largest review evaluating the utility of BSGI specifically for the diagnosis of ILC. BSGI identified elsewhere lesions twice as often in lobular carcinomas than it did in ductal carcinomas. The sensitivity and specificity was not appreciably different for lobular histology vs ductal. Our study demonstrates BSGI can be reliably used to evaluate disease extent and assist in the diagnosis of additional malignant lesions not identified by standard diagnostics in patients with ILC.

Patient Characteristics

Surgical Pathology	N (%)	Mean Age	BSGI Positive for Known Ca (%)	Additional Cancers Found by BSGI (%)
Total	713 (100)	57.9	586 (82.2)	66 (9.3)
Lobular	46 (6.4)	58.4	32 (69.6)	9 (19.6)
Ductal	667 (93.6)	57.9	554 (83.0)	57 (8.5)

High-Risk Program Snapshot of the First Year: Results of Mammography-Based High-Risk Identification, Ultimate Accrual Into a High-Risk Program and Resulting Interventions Within a Comprehensive Breast Center Setting

Jessica Keto¹, Cam Teems², Jamie Caughran¹, Mariah Call¹, Kelly O'Donnell¹, Shruthi Thiagarajasubramanian¹, Raj Amin¹

¹Comprehensive Breast Center, Mercy Health Saint Mary's, Grand Rapids, Michigan, United States, ²Breast Medicine, Practice Advantage, LLC, Atlanta, Georgia, United States

Objective The High Risk Program (RiskPlus) sought to review the first year's patient data. RiskPlus™ was created to (1) identify women at increased risk within the general screening pool, (2) accrue them into RiskPlus for risk education and corresponding evidence-based intervention, and finally (3) provide ongoing high-risk surveillance and risk management.

Methods The Program had 2 components: the accrual methodology called MammoPlus® and the evaluation component called RiskPlus™. MammoPlus® was the screening mammography encounter that included the NCI Breast Cancer Risk Assessment Tool. If a patient met the threshold of Lifetime Risk =>20%, she was offered an initial RiskPlus™ risk assessment. The initial RiskPlus encounter involved patient data gathering and entry into the Hughes riskApps™ Survey, including a pedigree, patient risk model data points, and familial data, such as BRCA status. Depending on risk model results and NCCN Guidelines® algorithm adherence, patients were offered appropriate genetic counseling, screening, and risk reduction.

Results The following table demonstrates our results in Year 1 of RiskPlus™. Approximately 20% of the Eligibility

Pool patients were ultimately accrued into the RiskPlus™ Program. Of the 168 patients accrued into RiskPlus™ 20% came from MammoPlus (“Eligibility Pool”) and 79% came from direct referrals for risk-based consultation. Eighty-four patients (50%) were candidates for NCCN Guidelines-based intervention, such as genetic testing, chemoprevention, or breast MRI. Thirty-eight percent of the Program patients met the criteria for screening breast MRI. With a 2-year follow-up to date, 3 patients were diagnosed with a mammographically occult breast cancer by screening breast MRI.

Conclusion Our results were within our expectations for accrual volume (20% out of anticipated 9%-12%) and exceeded any anticipated downstream impact on patient access to Center-based interventions, and morbidity (3 occult breast cancers). The 20% accrual rate demonstrated that our screening population benefited from risk stratification at a single-care-point like screening mammography. The rate itself, albeit better than many single-digit accrual high-risk programs across the United States, could be improved. At the time of this writing, the Program is researching methods to increase accrual from the eligible pool. Finally, we anticipate the 165 patients (minus 3 affected patients) to continue their risk management within RiskPlus in the form of screening imaging intervals, CBE schedule, chemoprevention compliance, and lifestyle-based risk-reduction activities.

Year 1 Results

Year	Total Screening Mammography	Eligibility Pool: Mammography-Risk Assessment with Results Lifetime =>20%	Eligibility Pool: Average NCI Breast Cancer Risk Assessment Tool Lifetime =>20%	NCI Breast Cancer Risk Assessment Result of Lifetime =>20% and/or 5 Year 1.67%	Patients Accrued Into RiskPlus Program	Referral From Mammography-Based Risk Assessment Identification From Eligibility Pool
2011	19,812	357	23.9%	4,569	168	73

Direct Referral to RiskPlus™	Genetic Testing Recommendation Based on NCCN Guidelines®	Positive for Mutation	Chemoprevention Recommendation Based on NCCN Guidelines®	Screening MRI Based on NCCN Guidelines® (BRCA PRO Lifetime =>20%)	Screening MRI Patients BRCA PRO Lifetime Score Average	Occult Malignant Path Found at Screening MRI (Negative Mammogram at MammoPlus Encounter)
94	8	1	13	63	10.1%	3

Evaluating Assessment Tools to Predict Axillary Status Postneoadjuvant Chemotherapy in Locally Advanced Breast Cancer

Hisham Khalifa, Ahmed Touny, Ihab Saad, Iman Hussein, Sheriff Maamoun
Surgical Oncology, National Cancer Institute, Cairo University, Cairo, Egypt

Objective This study proposes to replace the completion axillary dissection with the confirmation of a complete pathological response to neoadjuvant chemotherapy among the axillary nodes.

Methods From May 2010 to April 2012 we prospectively studied 50 women consecutively selected from among patients presented to Surgical Oncology Department, National Cancer Institute (NCI), who fulfilled the following inclusion criteria: locally advanced operable breast cancer histologically confirmed by thick-needle biopsy puncture who had undergone preoperative primary systemic chemotherapy, breast cancer surgery, and SLNB with immediate axillary lymphadenectomy. The clinical, sonographic, and pathological response of the tumor and the axillary lymph nodes were documented, classified, and correlated with each other. The response of the tumor and the axilla were correlated with various patient characteristics and analyzed.

continues

Results Post NACT, on sonographic assessment of the axilla, response was complete in 17 (33.3%) axillae and 34 (66.7%) axillae still showed residual metastatic disease. Complete pathological nodal response (pCR) occurred in 16 (31.4%) axillae and no pathological complete nodal response in 35 (68.9%) axillae. The sentinel lymph node was successfully identified in 39 (76.5%) axillae out of 51 axillae; yielding a detection rate of about 76.5% (SLN was not identified in 12 cases). Out of 39 axillae in which SLN were identified, there were 32 (82.1%) axillae showed metastatic deposits, while SLN were free of metastatic disease in 7 (17.9%) axillae by hematoxylin and eosin pathological examination. And by using the immunohistochemical examination of negative SLN all of them were also negative with absence of micrometastases, SLN was the only positive node in 9 axillae. Correlation of clinical assessment of ALN vs pathological results (considered as the gold standard) showed that the sensitivity of clinical assessment was 60.0%, specificity was 62.5%, PPV was 77.8%, NPV was 41.7%, and accuracy was 60.8%, with p value (0.135). Correlation of US response of ALN vs pathological results (considered as the gold standard) showed that the sensitivity US assessment of ALN was 82.9%, specificity was 68.8%, PPV was 85.3%, NPV was 64.7%, accuracy was 78.5%, with highly significant p value <0.001. Correlation of SLNB assessment of ALN vs pathological results (considered as the gold standard) showed that sensitivity of SLNB was 94.1%, specificity was 100.0%, PPV was 100.0%, NPV was 71.4%, accuracy was 94.9% with highly significant p value <0.001.

Conclusion We suggest that formal ALND can be avoided post NACT in patients with LABC with cytologically proven metastatic ALN if there were complete clinical sonographic response and negative SLNB post NACT.

Modified Radical Mastectomy Using 1 vs 2 Drains: A Randomized Controlled Trial

Salma Khan, Tufail Bawa, Dr Tanveer, Sadia Raffique

Memon Medical Institute, Karachi, Pakistan

Objective To test the hypothesis that placement of 1 drain does not increase postoperative complications (seroma, wound infection, flap necrosis, and prolonged axillary drainage) in modified radical mastectomy (MRM), as compared to 2 drains.

Methods A randomized controlled trial was conducted between October 2012 and September 2013. After taking written informed consent, adult females undergoing MRM were randomly allocated to either single (n = 99) or 2-drain (n = 99) groups.

Results Both the groups were comparable for baseline variables with age of 50.5 ± 12.2 and 48.5 ± 14.5 years in single- and 2-drain groups, respectively. Single-drain group yielded comparable outcomes as to double-drain group with drain volume (731 ± 175 vs 809 ± 113 , p value: 0.09), drain days (11 ± 2 vs 13 ± 4 , p value: <0.015), and surgical site infection (0% vs 2%, p value: 0.122). Whereas postoperative pain was significantly lower in single-drain group [median (range): 2 (1-2) vs 4 (4-5), p value: <0.001]. On the other hand, single-drain group had higher percentage of seroma formation (35.7% vs 25.6%, p value: 0.071). On multivariable cox regression analysis, single drain was associated with lower risk of significant postoperative pain [adjusted relative risk: 0.028 (95% CI: 0.004-0.2)].

Conclusion Single-drain placement in patients undergoing MRM has comparable postoperative morbidity with higher risk of seroma formation. Use of single-drain decreases postoperative pain and discomfort. Therefore, we recommend preferential use of single drain in MRM.

Individual Risk of Medical Complications: Application of the Breast Reconstruction Risk Assessment Score

Nima Khavanin¹, John Y. Kim¹, Alexei S. Mlodinow¹, Kevin Bethke², Francis Lovecchio¹, Jacqueline S. Jeruss², Nora Hansen², Karl Y. Bilimoria³, Albert Losken⁴, Neil A. Fine¹

¹Plastic and Reconstructive Surgery, Northwestern University, Feinberg School of Medicine, Chicago, Illinois, United States, ²Lynn Sage Comprehensive Breast Center, Northwestern University, Feinberg School of Medicine, Chicago, Illinois, United States, ³Department of Surgery and Surgical Outcomes and Quality Improvement Center, Northwestern University, Feinberg School of Medicine, Chicago, Illinois, United States, ⁴Division of Plastic and Reconstructive Surgery, Emory University Hospital, Atlanta, Georgia, United States

Objective With over 90,000 prosthetic and autologous breast reconstructions each year, many studies have evaluated population-level measures of postoperative risk. However, these traditional population-based measures may not always capture the nuances of an individual patient's risk. This study aims to develop a breast reconstruction risk assessment (BRA score) calculator for the risk of postoperative medical complications.

Methods All mastectomies with immediate reconstruction between 2005 and 2011 were identified in the ACS NSQIP use-files via Current Procedural Terminology codes. A predictive model for medical complications was

developed; forward-stepwise multiple logistic regression identified preoperative variables for inclusion in the model. Hosmer-Lemeshow p value, c-statistic, and Brier score were computed to assess model performance. Bootstrap analysis validated the model. Secondary outcomes of interest included hospital readmission, reoperation, and hospital length-of-stay.

Results Forward stepwise logistic regression selected 4 predictors of medical complication in addition to reconstruction modality: BMI, ASA class, bleeding disorder, and neoadjuvant chemotherapy use. The model c-statistics were 0.711 and the optimism corrected c-statistic was 0.704. The model was well calibrated (HL, $p = 0.295$) and the Brier score was 0.0246. Average risk of medical complication was 1.65% in the prosthetic cohort, 2.43% latissimus, 7.45% pedicled TRAM, and 13.40% free flap; however, for each of the 4 major categories of breast reconstruction, the distribution of predicted individual risks demonstrates a positive skew. The absolute error between a patient's individual risk and her population-derived average risk ranged from 0 to 65%, and was greater than 10% in 16 patients; within the free flap and TRAM cohorts, the average patient's mean risk was under-predicted by nearly 2%.

Conclusion The BRA score risk calculator for medical complications mitigates the potentially inaccurate extrapolation of population-based measures of average risk to individual patients. The model demonstrates acceptable performance, and when applied to our study cohort reveals a positively skewed distribution of individual risk. We developed an easy-to-use online interface—accessible by patients and surgeons alike—to more objectively assess individual risk for medical complications and inform surgical decision-making in a more patient-centric fashion.

Factors Related to Positive Margin Status and Re-excision Rates in 600 Partial Mastectomies for Invasive and Noninvasive Breast Cancer

Isaac Kriley¹, Carol Slomski¹, Jason Woollard²

¹Allegheny General Hospital, Pittsburgh, Pennsylvania, United States, ²Statistics, Chatham University, Pittsburgh, Pennsylvania, United States

Objective The goal of a partial mastectomy is to conserve the breast by removing the tumor with a margin of normal tissue. The risk is of transecting the tumor which leads re-excision to ablate residual tumor. After a large study published a re-excision rate of 22.9% and a positive margin rate of 14.0% at the initial operation, we wanted to evaluate our rates of re-excision and positive margins and whether there were patient, tumor, or operative factors associated with positive margins that could allow us to reduce our re-excision and positive margin rates.

Methods This study is a retrospective review of all partial mastectomies for noninvasive and invasive cancer performed in calendar years 2009 and 2010 in our hospital system (5 institutions). Patient demographic information, tumor characteristics, and operative factors were analyzed for association with positive margins. Margins were considered either positive, if tumor was seen at the inked border, or negative. Correlations were calculated to determine whether patient demographics, tumor characteristics, or operative factors were associated with positive margins and re-excisions. Logistic regression was used to determine whether or not factors strongly correlated to margin status could predict margin status.

Results Of the 617 patients who underwent 642 operations, 35 patients were excluded leaving 600 procedures for analysis. Our positive margin rate at the initial operation is 14.3% and our re-excision rate is 18.0%. On univariate analysis, only node status correlated with positive margin rate and rate of re-excision. Positive nodal status resulted in increased odds of having a positive margin (OR = 1.89; 1.53-2.33, 95% CI); 8% of specimens associated with negative nodes had positive margins, while 19% of specimens associated with positive nodes had positive margins. Margin status at primary operation did not relate to whether or not tumor was found on re-excision. In the 65 specimens from re-excision after positive margins on primary operation, 33 (51%) had residual tumor, and in the 39 specimens from re-excision with initial negative margins, 18 (46%) had residual tumor.

Conclusion Our rates of positive margins are equivalent to those reported in a recent large multi-institutional study (14.3% vs 14.0%) and our rates of re-excision are lower (18.0% vs 22.9%). Only positive nodal status correlated with positive margin status and re-excision. A surgeon knows the nodal status in some cases prior to the primary operation and could approach that excision with a heightened awareness of the risk of positive margins and adjust the operative plan accordingly. We can reduce our rate of re-excision to 11.5% by strictly adhering to a policy of re-excising for positive margins only, as 38 patients underwent re-excision despite negative margins at the primary excision. We found patients had residual tumor on re-excision regardless of the margin status at their primary operations which leads to questions about the further classification of margins as close and about the necessity of re-excision, especially if other therapies, such as radiotherapy, will be employed.

Does Pure Invasive Ductal Carcinoma Differ With Estrogen Receptor Status?

*Shicha Kumar*¹, *Melanie Ruzszyk*², *Chi-Chen Hong*², *Patricia Masso-Welch*³, *Christine Ambrosone*²

¹Surgical Oncology, Roswell Park Cancer Institute, Buffalo, New York, United States, ²Cancer Prevention and Control, Roswell Park Cancer Institute, Buffalo, New York, United States, ³Biotechnical and Clinical Laboratory Science, State University of New York at Buffalo, Buffalo, New York, United States

Objective Invasive ductal carcinoma (IDC) without accompanying ductal carcinoma in situ (DCIS), or pure IDC, is associated with more aggressive clinical characteristics and worse survival in breast cancer patients when compared to invasive ductal carcinoma with DCIS (mixed IDC/DCIS). Patients with pure IDC present more often with higher grade and larger tumor size, and more pure IDC tumors have a negative estrogen receptor (ER) status, even after adjustment for other variables. Our objective was to investigate clinical factors and recurrence associated with pure IDC in relation to ER status.

Methods We compared tumor characteristics and survival outcomes between women with mixed IDC/DCIS and pure IDC, stratified by ER status. Information for 857 women treated with breast conservation therapy for invasive breast cancer between July 1997 and December 2005 was collected from a prospective institutional database. Factors such as age at diagnosis, menopausal status, tumor size, stage, grade, lymph node status, lymphovascular invasion (LVI), and human epithelial receptor 2 (HER2) status were examined for their association with pure IDC by ER status. In addition, Kaplan-Meier curves and Cox proportional hazards models were constructed for local recurrence and distant metastasis, stratified by ER status.

Results Pure IDC with ER-positive status were more likely to have a lower grade (p value = 0.05), whereas pure IDC with ER-negative status were more likely to be larger (p value = 0.01), with an absence of LVI (p value = 0.03), compared with mixed IDC/DCIS of the same status. Women with pure IDC were less likely to experience local recurrence than mixed IDC/DCIS, among both ER-positive and ER-negative tumors (log rank p value for ER+ tumors = 0.0316, log-rank p value for ER- tumors = 0.0337). In adjusted models, a hazard ratio (HR) was not possible for local recurrence because of the lack of local recurrences among women with pure IDC for which information on all clinical factors were available. Kaplan survival curves and HRs for differences in rates of distant metastasis were not significant.

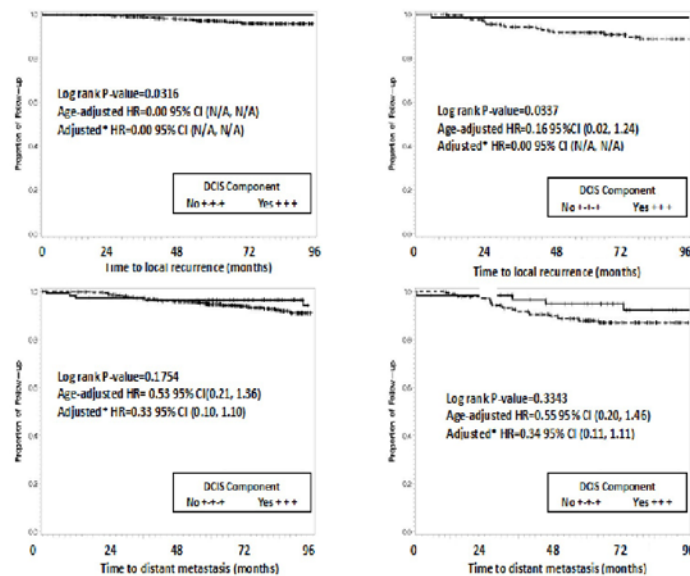


Figure 1. Kaplan-Meier curve of local recurrence (A and B) and distant metastasis (C and D) in patients with mixed IDC/DCIS and pure IDC who received breast conservation therapy, stratified by (A and C) ER positive, n=636 and (B and D) ER negative status, n=221
*adjusted for age at diagnosis, tumor size, grade, LN status and Her2 status

Conclusion Pure IDC is associated with larger tumor size among ER-negative tumors, and lower grade among ER-positive tumors. Pure IDC may not be associated with worse clinical characteristics among ER-positive tumors. The risk of local recurrence is greater among women with mixed IDC/DCIS, regardless of ER status.

Interstitial Multicatheter Brachytherapy for Select DCIS: a Multi-Institutional Study

Robert R. Kuske¹, Mitchell Kamrava⁴, Peter Chen², John Hayes³, Bethany Anderson⁵, Coral Quiet¹, Pin-Chieh Wang⁴, Darlene Veruttipong⁴, Margaret Snyder¹, Jeffrey Demanes⁴

¹Arizona Breast Cancer Specialists, Arizona Center for Cancer Care, Scottsdale, Arizona, United States, ²William Beaumont Hospital, Royal Oak, Michigan, United States, ³Gamma West, Salt Lake City, Utah, United States, ⁴UCLA Medical Center, Los Angeles, California, United States, ⁵UW Cancer Center, Madison, Wisconsin, United States

Objective To report outcomes for ductal carcinoma in situ (DCIS) treated with breast-conserving therapy using accelerated partial breast irradiation (APBI) with interstitial multicatheter brachytherapy by a cooperative group of institutions. APBI results with single-entry brachytherapy devices have been reported, and this is the first report with patients treated by interstitial brachytherapy.

Methods Five institutions with extensive experience in treating select breast cancers with interstitial brachytherapy contributed their experience to this retrospective clinical study. From March 1997 to August 2013, 147 patients with stage 0 breast cancer were treated with breast-conserving surgery and adjuvant APBI using interstitial multicatheter brachytherapy. Mean age was 55.6 +/- 8.9 years. All patients underwent surgical excision and received 34 Gy in 10 fractions over 5 days with high-dose-rate Iridium-192. Mean DCIS size was 0.9 +/- 0.75 cm (size unknown for 4 patients). Surgical margins were positive in 2 patients (1.4%), <2 mm in 18 (12%) and >= 2 mm in 65 (44%) of patients, negative but size of margin not specified in 61 (42%), and not known in 1 (0.7%). ER/PR was 71/63% positive and 23% were sentinel node-negative. DCIS grade was 1 in 21%, 2 in 43%, 3 in 34% and not reported in 2% of patients. Thirty-eight percent of patients received endocrine therapy.

Results With a median follow-up of 33 months (range, 0.03-192 months), the overall and cause-specific survival rates were 99% and 100%, respectively. The 4-year actuarial risk of an ipsilateral breast tumor recurrence was 4%, with 2 IDC and 3 DCIS. The recurrences included 3 ipsilateral breast (elsewhere), 1 marginal miss, and 1 true recurrence. There was 1 regional nodal recurrence, and no distant recurrences. The median time to recurrence was 94 months (range, 66-97 months). For the 5 patients with local recurrence, the mean age was 53.8 years. ER-negative/positive was 2/3 and PR-negative/positive was 3/2. The DCIS size was 0.8-1.5 cm (mean, 1 cm). DCIS was grade 3 in 4 patients and grade 2 in 1 patient. The surgical margin was <2 mm in 1 patient and >2 mm in another. The absolute margin size was not reported in the other 3 patients. Two patients received hormone therapy and 2 did not (hormone use unreported in 1). All 5 local recurrence patients were salvaged with surgery and are locally/regionally controlled.

Conclusion This cooperative multi-institutional study is the largest published report of the outcomes of patients with DCIS treated by interstitial brachytherapy. This radiotherapy method to complete breast-conserving therapy for pure DCIS was associated with excellent local control and survival rates. APBI is an acceptable option for select women with DCIS with recurrence and survival rates that are similar to published outcomes of 6- to 7-week whole-breast irradiation outcomes or mastectomy.

Germline Mutation Screening: Conventional or Next-Generation Sequencing?

Ava Kwong^{1,2}, Tommy Au³, Fian Law³, Dona Ho³, Beca Ip³, Anthony Wong³, Vivian Shin¹, Chris Chan^{2,3}, Edmond Ma^{2,3}

¹Surgery, The University of Hong Kong, Pokfulam, Hong Kong, ²Cancer Genetics, Hong Kong Hereditary Breast Cancer Family Registry, Happy Valley, Hong Kong, ³Pathology, Hong Kong Sanatorium & Hospital, Happy Valley, Hong Kong

Objective Inherited mutation in BRCA genes is associated with increased risk of breast and ovarian cancers. Around 45% to 65% of women with BRCA mutation are prone to develop breast and ovarian cancer by age of 70. Studies have shown that only specific BRCA variants are known to be deleterious and mutation spectrum varies between different ethnicities, hence, increasing understanding of the full spectrum of deleterious mutations in the different ethnic cohorts would improve the risk assessment and facilitate genetic counseling and testing. With the advances in next-generation sequencing, we want to evaluate the potential use of this technology to facilitate the characterization of the mutation spectrum in the Chinese population.

Methods Patients with breast cancer were recruited from high-risk clinics of breast surgery and underwent genetic testing for BRCA1 and BRCA2 mutations. Peripheral blood samples were collected from 464 patients and 105 healthy subjects. BRCA full gene sequencing was carried out by 454 GS Junior System and further validated by conventional full gene sequencing. Sequencing data were analyzed by our inhouse-developed, fully automatic

bioinformatics pipeline, including GS Amplicon Variant Analyzer, SAMtools, and Ensembl Variant Effect Predictor.

Results Results of this study showed that 30 deleterious mutations were seen in breast cancer patients, including 13 in BRCA1 and 15 in BRCA2, 1 PTEN, and 1 TP53. We were able to identify 1 novel recurrent BRCA1, 6 novel recurrent BRCA2 mutations, and 1 novel founder BRCA2 mutation. The BRCA mutation prevalence in this cohort is 6.5% (30/464). Together with our previous Sanger sequencing studies of more than 600 patients, 46.7% of these mutations are classified as recurrent mutation in the Chinese population.

Conclusion With next-generation sequencing (NGS), the rate of mutation analysis can be dramatically enhanced in a short period of time and lead to the conclusion of frequent recurrent mutation in southern Chinese population (ie, 46.7% recurrent mutation in patients with genetic predisposition of BRCA genes mutation). This technology largely increased the number of mutations identified in a single test with relatively small quantity of DNA, which marks a new milestone for genetic testing with faster turnover rate and reduced cost. Also, it provides a framework for better preventive measures or management of breast cancer.

Impact of the American College of Surgeons Oncology Group (ACOSOG) Z0011 Trial on the Management of the Axilla

Viet H. Le, Wendy R. Cornett, Anita Patt, Kathleen Brant, Dawn Blackhurst, Brian P. McKinley
Surgery, Greenville Health System, Greenville, South Carolina, United States

Objective Before the publication of ACOSOG Z0011, axillary dissection (AD) was recommended for all patients with tumor involvement discovered by positive sentinel lymph node biopsy (+SLNB). After this trial's publication in February 2011, omission of AD became the recommended way to manage properly selected patients with a +SLNB. We investigated the impact of ACOSOG Z0011 on the completion AD rate. We also examined adherence to the recommendation to omit AD in patients who met ACOSOG Z0011 inclusion criteria.

Methods We performed a retrospective review from our institutional tumor registry of all breast cancers diagnosed from March 1, 2009, through February 28, 2013. We divided the cohort into 2 groups, BEFORE and AFTER. The BEFORE group included cancers diagnosed in the 2 years immediately before the publication of Z0011. The AFTER group included cancers diagnosed in the 2 years after the publication of Z0011. We calculated the percentage of patients with a +SLNB who went on to AD, and the percentage of patients who met Z0011 inclusion criteria. Comparisons between the BEFORE and AFTER groups were tested for statistical significance. In addition, common clinical, pathologic, and treatment-related variables were also analyzed.

Results The BEFORE group contained 849 patients, 563 of whom underwent SLNB. Of these, 144 were classified as +SLNB and 113 underwent AD. The AFTER group contained 932 patients, 613 of whom underwent SLNB. Of these, 139 were classified as +SLNB and 73 underwent AD. The completion AD rate in the BEFORE group was 78.5% (113/144), but only 52.5% (73/139) in the AFTER group ($p < 0.001$). The groups did not differ with respect to age, stage at diagnosis, tumor size, or type of breast operation ($p > 0.05$ for all), but the AFTER group did have more estrogen and progesterone receptor-positive tumors and fewer Her2-negative tumors, compared to the BEFORE group ($p < 0.001$, $P = 0.011$, $p < 0.001$, respectively). Among those meeting Z0011 criteria, 75.6% (34/45) in the BEFORE group underwent AD, while only 17% (9/53) such patients in the AFTER group underwent AD. Among those who did not meet Z0011 criteria, a similar percentage of patients underwent AD in each group (BEFORE, 79.8%; AFTER, 74.4%; $p = 0.384$).

Conclusion The completion AD rate among patients with a +SLNB treated at our institution decreased after the publication of the ACOSOG Z0011 trial. This decrease in the rate of completion AD appears to be limited to patients who met the inclusion criteria for the trial and unrelated to any factors that would normally prompt axillary dissection. Based on these data, the results Z0011 have substantially changed practice patterns at our institution.

Invasive Micropapillary Carcinoma: Tumor Characteristics and Cause-Specific Survival in Comparison to Ductal Carcinoma

Courtney Lee¹, John Rescigno², Alison Estabrook¹, Beth Freedman¹, Aye Ma¹

¹Surgery, St. Luke's/Roosevelt Hospital, New York, New York, United States, ²Radiation Oncology, Beth Israel Medical Center, New York, New York, United States

Objective Invasive micropapillary carcinoma (IMPC) is a rare variant of breast carcinoma associated with an increased risk of lymph node involvement. IMPC is thus often considered to yield a worse prognosis than invasive ductal carcinoma, NOS (IDC). However, given the relative lack of outcome data, the prognostic significance of

IMPC histology remains in question. Does IMPC histological subtype hold prognostic significance independent of stage?

Methods From 16 registries of the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) database, 935 IMPC cases and 381,197 IDC cases from 2001 through 2010 were identified. Pearson chi-square analysis was used to evaluate differences in presentation of patients with IMPC as compared to IDC. Log-rank test was used to compare Kaplan-Meier cause-specific survival (CSS) by histology. Multivariate Cox regression was used to analyze the independent significance of histology on CSS.

Results Patients with IMPC were slightly older than those diagnosed with IDC (age > 50: 80% vs 76%, $p = 0.001$), more likely to be of a racial minority (32% vs 27%, $p < 0.001$), and more likely to be diagnosed in the latter 5-year period (70% vs 53%, $p < 0.001$). Patients with IMPC were less likely to present with metastatic disease (2.6% vs 4.0%, $p = 0.03$), but were more likely to present with node-positive disease (54% vs 36%, $p < 0.001$) with 4 or more nodes involved (22% vs 11%, $p < 0.001$), higher T-stage (T3/T4: 12% vs 8%, $p < 0.001$), and higher grade (intermediate/high grade: 90% vs 81%, $p < 0.001$). IMPC histology was more frequently ER- and/or PR-positive (87% vs. 78%, $p < 0.001$). IMPC patients were more likely to undergo mastectomy (48% vs 40%, $p < 0.001$), and more likely to undergo postmastectomy radiotherapy (27% vs 21%, $p = 0.004$), owing to greater nodal involvement. Analysis of all patients revealed better survival with IMPC (5-yr CSS, 91% vs 88%, 7-yr CSS, 87% vs 85%, $p = 0.04$). IMPC patients with distant-stage disease had better survival (5-yr CSS, 50% vs 31%, $p = 0.009$). This difference persisted when analyzed according to hormone receptor status ($p = 0.01$). Of patients without distant disease and pathologically node negative, 7-yr CSS was 97% for IMPC and 94% for IDC ($p = 0.3$). Of 381 node-negative IMPC cases, there were only 7 deaths. Of node-positive cases, despite a mean lymph node involvement of 4.7 nodes for IMPC vs 3.5 for IDC, the 5-yr CSS for IMPC was better (92% vs 84% $p = 0.02$). In multivariate analysis of node-positive patients, IMPC was associated with an odds ratio for breast cancer death of 0.66 (95% CI 0.46-0.95, $p = 0.02$).

Conclusion In this study, the largest to date, IMPC was surprisingly found to be the more favorable histology. Stage for stage, IMPC was associated with survival comparable to, or better than IDC. Additional study and extended follow-up is needed to determine whether the improved prognosis persists over time, and whether IMPC is intrinsically prognostic or predictive of greater sensitivity to systemic therapies.

The Effect of Type of Breast Reconstruction on Long-Term Psychosocial Functioning in Women With Bilateral Prophylactic Mastectomy

Lucy Dong Xuan Li^{1,2}, Tulin D. Cil³, John L. Semple^{2,3}, Kelly A. Metcalfe^{2,4}

¹Faculty of Medicine, University of Toronto, Toronto, Ontario, Canada, ²Women's College Research Institute, Toronto, Ontario, Canada, ³Women's College Hospital, Toronto, Ontario, Canada, ⁴Lawrence S. Bloomberg Faculty of Nursing, University of Toronto, Toronto, Ontario, Canada

Objective To evaluate if type of mastectomy (skin-sparing, nipple-sparing, areola-sparing) impacts on the long-term psychosocial functioning in women with bilateral prophylactic mastectomy.

Methods Women who had undergone a bilateral prophylactic mastectomy at a major Canadian academic hospital between January 1, 2002, and June 30, 2012, were identified through procedure billing codes after ethics review board approval. Participants were sent validated psychosocial questionnaires which included the Impact of Event Scale, Hospital Anxiety and Depression Scale, Body Image and Sexuality, SF-12, Life Orientation Test-Revised, Decision Regret Scale, Satisfaction with Decision Scale, BREAST-Q, and Reconstruction Module (Post-Operative) that could be completed on paper or online.

Results Twenty-five of 46 patients (54%) completed the study; 56% ($n = 14$) had skin-sparing, 32% ($n = 8$) had nipple-sparing, and 12% ($n = 3$) underwent an areola-sparing mastectomy. The average age was 41 (range, 25-55 years) with the oldest participants in the skin-sparing mastectomy group (mean age = 47.5 years) and the youngest in the areolar-sparing mastectomy group (mean age = 37.5 years). Women who had undergone a skin-sparing mastectomy had low perceived distress (mean [m] = 0.5; range, 0-56) related to breast cancer risk, whereas individuals who had undergone a nipple-sparing mastectomy reported more distress ($m = 18.5$; range, 6-29). Among psychosocial variables, women who had a skin-sparing mastectomy reported low anxiety ($m = 4.3$; range, 0-14), had higher regret scores ($m = 36.25$; range, 0-100), and expressed the lowest satisfaction with their decision ($m = 1.85$, range, 1-5) of all the groups. Postoperatively, skin-sparing mastectomy patients also reported the lowest satisfaction with their breasts ($m = 59.4$ range, 40-77), their surgical outcome ($m = 68.7$; range, 39-100), and their psychosocial ($m = 73.1$; range, 40-100) and sexual well-being ($m = 50.1$; range, 23-100). Women who underwent skin-sparing

mastectomy experienced high levels of optimism (m =18.9, range 16-24), whereas those who had a nipple-sparing mastectomy scored low on this outcome (m =13.1; range, 8-22).

Conclusion This study aims to elucidate the various degrees of psychosocial functioning in women depending on the type of prophylactic mastectomy procedure. Preliminary findings suggest that type of mastectomy impacts on the long-term satisfaction and psychosocial functioning in women undergoing this preventive procedure. Women who had skin-sparing mastectomy seem to have the least favorable psychosocial outcomes, whereas those who underwent an areola-sparing mastectomy reported the highest level of satisfaction and psychosocial functioning. The findings of this study will enable the provision of more accurate preoperative counseling to women considering risk-reduction surgery.

Use of Oncotype DX in Bilateral Breast Cancer

Pamela Li, Sarah Cate, Stephen Malamud, Manjeet Chadha, Alyssa Gillego, Susan Boolbol
Beth Israel Medical Center, New York, New York, United States

Objective Oncotype DX is a validated 21-gene assay that is used to optimize the selection of patients who will benefit from adjuvant chemotherapy. Synchronous bilateral breast cancer represents a total of 0.2-3.2% of all new breast cancers diagnosed¹, and there is limited data about the use of Oncotype Dx in this subset of patients. In this study, we report our institution's patients with synchronous bilateral breast cancer, who had Oncotype Dx scores performed on both tumors.

Methods In this IRB-approved study, we performed a retrospective review of our institutional database of cancer patients. The study included only those patients presenting with bilateral invasive breast cancer. From April 2010 to January 2013, we identified 7 patients who were treated for bilateral synchronous breast cancer, and in whom Oncotype Dx testing had been performed on specimens from each breast. Variables, including demographic and clinical factors, age at diagnosis and ethnicity, tumor size, histology, nodal involvement, and hormonal status were studied. In addition, a retrospective chart review on type of adjuvant treatment received and recurrence status was completed.

Results The patients in our cohort ranged in age from 46 to 74 years old. All cancers were ER+ and Her2-. All 7 patients had 1 breast cancer that was low risk based on Oncotype (Oncotype Dx score range, 0-18). Five patients had a contralateral intermediate-risk Oncotype score (18-30), and 1 patient had a contralateral high-risk score (31 and above). One patient had bilateral low-risk scores. All patients received adjuvant hormonal therapy. Four of the 7 patients were offered adjuvant chemotherapy. One patient who refused chemotherapy had 1 intermediate score and 1 low score. There are no recurrences at this time.

Conclusion Although this is a small series, it demonstrates the importance of evaluating the Oncotype Dx score of both primary tumors. In only 1 patient did we observe that the Oncotype Dx score of both primaries had similar risk. While further studies are needed with a large sample size, our study demonstrates that bilateral synchronous cancers with similar hormonal profiles have different recurrence potentials.

Reference

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Patient Demographics

Patient	Age	Oncotype DX	Tumor Side	Tumor Size (mm)	Histological Type	Positive Nodes	Total Nodes Removed	ER	PR	Her2	Chemo-therapy	Hormone Therapy
Patient 1	64	15	Right	12	IDC	0	5	+	+	-	TC	Anastrozole
Patient 1	64	40	Left	30	ILC	0	0	+	-	-	TC	Anastrozole
Patient 2	74	11	Right	10	ILC	0	1	+	+	-	None	Letrozole
Patient 2	74	18	Left	20	ILC	3	25	+	+	-	None	Letrozole
Patient 3	71	21	Right	8	IDC	0	6	+	+	-	None	Anastrozole
Patient 3	71	8	Left	18	ILC	0	1	+	+	-	None	Anastrozole
Patient 4	63	15	Right	12	IDC	0	1	+	+	-	None	Anastrozole
Patient 4	63	16	Left	12	ILC	0	1	+	+	-	None	Anastrozole
Patient 5	46	6	Right	11	IDC	0	2	+	+	-	ACT	Tamoxifen
Patient 5	46	19	Left	11	IDC	2	21	+	+	-	ACT	Tamoxifen
Patient 6	61	4	Right	5	IDC	0	2	+	+	-	CMF	Anastrozole
Patient 6	61	22	Left	30	IDC	0	2	+	+	-	CMF	Anastrozole
Patient 7	71	8	Right	10	ILC	1	7	+	+	-	Refused	Anastrozole
Patient 7	71	20	Left	7	ILC	0	3	+	+	-	Refused	Anastrozole

Pathological Features of Breast Cancer Molecular Subtypes, 2010-2011: A Report From the National Cancer Data Base

Erik Liederbach¹, Katharine Yao¹, Catherine Pesce¹, David J. Winchester¹, Dezheng Huo²

¹Surgery, NorthShore University Health System, Evanston, Illinois, United States, ²Health Studies, University of Chicago, Chicago, Illinois, United States

Objective Using the National Cancer Data Base, we analyzed 240,526 patients with AJCC Stage I-IV breast cancer and categorized them into 4 molecular subtypes: Luminal A (ER or PR+, Her2-), Luminal B (ER or PR+, Her2+), Triple Negative (ER-, PR-, Her2-), and HER2+/ER- (ER-, PR-, Her2+). Chi-square tests were used to examine tumor features associated with each molecular subtype.

Methods The distribution of molecular subtypes was as follows: Luminal A (74%), Luminal B (9.8%), Triple Negative (12.1%), and HER2+/ER- (4.1%). There was an observed monotonic trend that younger patients were more likely to have a TN, HER2+/ER-, or Luminal B subtype, compared to the Luminal A subtype. Luminal A tumors tended to be smaller while Triple Negative and HER2+/ER- tended to be larger; 10.5% of Triple Negative and 11.1% of HER2+/ER- were >5 cm vs 7.8% of Luminal B and 5.5% of Luminal A tumors were >5 cm. Luminal

B (35%) and HER2+/ER- (35.4%) were more likely to metastasize to regional lymph nodes and had the highest incidence of lymphatic vascular invasion (30.6% and 32.8%, respectively). A vast majority of Triple Negative (81.7%) and HER2+/ER- (75%) were poorly differentiated grade 3. Luminal A subtypes tended to have more stage I or II, and HER2+/ER- tended to have more stage III or IV compared to the other subtypes. Nine different histological types were correlated with molecular subtypes. Triple-negative subtypes were over-representative in the medullary (59.9%) and metaplastic (76.6%) histologies. Only 14.3% of ductal cancers were triple-negative. HER2+/ER- subtypes were mostly observed in the inflammatory (17.1%), medullary (7.4%), and ductal (5.1%) histologies. Luminal A subtypes dominated the lobular (93.2%), mucinous (93.6%), and tubular (98.2%) histologies whereas Luminal B subtypes were most common in inflammatory (17%) and ductal (11%) histologies.

Results The distribution of molecular subtypes was as follows: Luminal A (74%), Luminal B (9.8%), Triple Negative (12.1%), and HER2+/ER- (4.1%). There was an observed monotonic trend that younger patients were more likely to have a TN, HER2+/ER-, or Luminal B subtype compared to the Luminal A subtype. Luminal A tumors tended to be smaller while Triple Negative and HER2+/ER- tended to be larger; 10.5% of Triple Negative and 11.1% of HER2+/ER- were >5 cm versus 7.8% of Luminal B and 5.5% of Luminal A tumors were >5 cm. Luminal B (35%) and HER2+/ER- (35.4%) were more likely to metastasize to regional lymph nodes and had the highest incidence of lymphatic vascular invasion (30.6% and 32.8%, respectively). A vast majority of Triple Negative (81.7%) and HER2+/ER- (75%) were poorly differentiated grade 3. Luminal A subtypes tended to have more stage I or II, and HER2+/ER- tended to have more stage III or IV compared to the other subtypes. Nine different histological types were correlated with molecular subtypes. Triple Negative subtypes were over-representative in the medullary (59.9%) and metaplastic (76.6%) histologies. Only 14.3% of ductal cancers were triple-negative. HER2+/ER- subtypes were mostly observed in the inflammatory (17.1%), medullary (7.4%), and ductal (5.1%) histologies. Luminal A subtypes dominated the lobular (93.2%), mucinous (93.6%), and tubular (98.2%) histologies whereas Luminal B subtypes were most common in inflammatory (17%) and ductal (11%) histologies.

Conclusion The 4 breast molecular subtypes have very distinct clinical and pathological characteristics. The HER2+/ER- subtype was correlated to the worst prognostic factors, such as grade 3, lymphatic vascular invasion, node-positive status, larger size, and higher stage. The molecular subtypes vary greatly by histology type. Clinicians should be aware of these subtype differences when counseling newly diagnosed breast cancer patients.

Preoperative Genetic Testing Affects Surgical Decision-Making Breast in Cancer Patients

Elizabeth Lokich, Ashley Stuckey, Christina Raker, Jennifer Scalia, Jessica Laprise, Jennifer Gass

Women's Oncology, Women and Infants' Hospital, Warren Alpert Medical School at Brown University, Providence, Rhode Island, United States

Objective In women with newly diagnosed breast cancer, the optimal time for referral to cancer genetic specialists is unknown. The aim of our study was to determine if mutation status changes surgical decision-making in women who undergo genetic testing for BRCA mutations after the initial diagnosis of breast cancer. Additionally, we aimed to determine if concurrent prophylactic bilateral salpingo-oophorectomy (BSO) was feasible at the time of breast cancer surgery for BRCA mutation carriers.

Methods This is a retrospective cohort study of breast cancer patients in an academic oncology program who were diagnosed between 2006 and 2012, and who had BRCA testing performed. Patients were identified from the hospital tumor registry. We compared women who tested positive for a BRCA mutation prior to surgery with those who tested negative. Data collected from the tumor registry included: age, race, insurance status, stage, histology, receptor status, and adjuvant treatment. Gravity, parity, surgeon, family history, BRCA test result, and surgery performed were obtained from the electronic medical record. Type of surgery was considered to be the most definitive surgery within a year of initial diagnosis. Variables were compared by BRCA status using chi-square or Fisher exact test.

Results Three hundred two women were included in the study. Thirty-two (10.6%) were identified as carrying a BRCA mutation. The median age at diagnosis was 49.6 (range, 25-85). Most women had early-stage disease (55.6% T1 lesions, 72.8% node-negative). 55.6% of women had breast-conserving surgery and the remaining had unilateral or bilateral mastectomy. BRCA mutation carriers were more likely than noncarriers to choose bilateral mastectomy with reconstruction (56.3% vs 15.9%, $p < 0.0001$). 71.9% of BRCA mutation carriers opted for a different surgery than what was initially planned by their surgeon as compared to 29% of mutation negative patients ($p < 0.0001$). The results were equivalent when BRCA-1 and BRCA-2 mutation carriers were analyzed independently. When family history was examined independently of BRCA status, there was no association with family history and either

type of surgery performed or choosing a different surgery than what was initially planned. Four BRCA mutation carriers (12.5%) chose to have prophylactic BSO at the time of their breast cancer surgery after learning their carrier status.

Conclusion BRCA testing strongly influences surgical decision-making in newly diagnosed breast cancer patients. Additionally, it is feasible to perform BSO concurrently with breast cancer surgery and/or reconstruction. Therefore, women who meet NCCN referral guidelines should have their genetic evaluation done prior to surgical intervention.

The Effect of Insurance Status on Stage at the Time of Diagnosis and Surgical Treatment Options in the Treatment of Breast Cancer

Robert Lukavsky, Jack Sario

Surgery, Temple University School of Medicine, Philadelphia, Pennsylvania, United States

Objective Insurance status has the potential to play a significant role in an individual's health care by affecting the stage of diagnosis and the treatment offered. This is particularly true of breast cancer, where incidence and treatment have been shown to have a strong geographic and racial relationship. The current analysis looked at insurance status as it related to stage at the time of diagnosis in a cohort of women reported to a single large database.

Methods A retrospective review was performed of data entered into the American College of Surgeons National Cancer Database Benchmark Reports. All patients with a diagnosis of breast cancer who presented between 2000 and 2010 were evaluated with regard to stage at the time of diagnosis and further stratified by insurance status. Specifically, patients were classified as either Insured or Under-Insured. Both groups were then evaluated with regard to initial treatment offered: mastectomy vs breast conservation surgery.

Results There was a statistically significant relationship between stage at the time of diagnosis and insurance status; this relationship existed for initial treatment offered as well. Patients with insurance were diagnosed at an earlier stage than those who were underinsured: 85.6% of insured patients presented with early-stage disease, as opposed to 71.2% of underinsured patients. In addition, among those patients who presented with early-stage disease, insured patients had a higher rate of breast conservation surgery than did underinsured patients: 62.4% vs 55.5%, respectively. This difference was statistically significant. This trend continued in late-stage breast cancer as well; a higher percentage of insured patients received breast conservation therapy than did underinsured patients (24.2% vs 21.1%, respectively).

Conclusion There is a clear discrepancy between insured and underinsured patients with regard to stage of breast cancer at the time of diagnosis and initial treatment offered. This is likely due to multiple factors, such as differential access to regular office visits and differential breast cancer screening. These same factors may be at play when decisions are made regarding treatment as well.

Chronic Granulomatous Mastitis: An Uncommon Breast Disorder?

Xuan Luu¹, Adam Mor², Kathie-Ann P. Joseph¹

¹Breast Service, Bellevue Medical Center, , NYU Langone Medical Center, New York, New York, United States,

²Rheumatology Service, Bellevue Medical Center, NYU Langone Medical Center, New York, New York, United States

Objective Granulomatous mastitis (GM) is a rare inflammatory disease of the breast, affecting mainly women of childbearing age. Originally described by Kessler and Wolloch in 1972, the condition can mimic carcinoma of the breast. The diagnosis of GM can only be confirmed by histopathology, which is characterized by the presence of multinucleated giant cell granulomas with microabscesses. The etiology of GM is still unknown and its treatment remains controversial. Uses of antibiotics, corticosteroids, and surgery have been reported as treatment options. The disease may be locally aggressive and has a tendency to relapse in up to 50% of cases. The aim of this study was to review the clinical presentations, diagnostic features, and treatment outcomes in 20 women diagnosed with GM in our center between March 2012 and February 2013.

Methods Twenty cases of GM diagnosed histopathologically were identified from the surgery and arthritis clinics records during the study period. The patients' medical records were retrieved and data analyzed retrospectively. Diagnosis of GM was confirmed histologically by either core biopsy of the breast lesions, or from excisional biopsy of the breast mass.

Results The mean age at presentation was 34.3 years. Of these 20 patients, 85% were Hispanic, 10% were Afro-Americans, and 5% were white. Eighty-five percent of the patients are immigrants to the U.S. Fifty-three percent of these were from Mexico, with an average stay in the U.S. of 13.6 years. All patients live in New York City. Seventy-

five percent of these patients were diagnosed in our hospital, while 25% were diagnosed in a tertiary hospital and were referred to our center. Twenty-five percent experienced previous flares before presenting at our clinic. Twenty-five percent presented during pregnancy, with 95% diagnosed within 6 years of previous pregnancy (average, 17 months). A history of breast-feeding was common to 90% of the patients. Our treatment approach to GM included a combination of physical intervention (needle aspiration) and drug therapy. Fifteen percent of the patients underwent needle aspiration. Aspirated fluid (pus) was sent for both bacterial and mycobacterial cultures. All samples were sterile. Sixty percent of our patients were treated with oral prednisone (1.0 mg/kg) for 3 weeks followed by gradual tapering over the course of 2 additional weeks. Eighty percent of the patients treated with prednisone had complete resolution of their inflammatory findings, with the remaining having incomplete but significant improvement. Patients with flare-ups were given low-dose methotrexate treatment (10-15 mg/week). Nonsteroidal anti-inflammatory drugs were prescribed for pain control.

Conclusion Most articles published in the literature are case reports/small series. Our series of 20 patients is the largest reported to date in the U.S. GM occurred within 6 years of delivery and breast-feeding was the most significant predicting factor. The optimal treatment of GM remains controversial. Generally, GM is sterile and therefore antibiotic therapy does not have a role. Many authors recommended surgical excision, although in our series, this modality was not applied. The use of corticosteroids remains controversial. Although the etiology of GM is unknown, it has been postulated that the condition could result from an autoimmune response. It is possible that damage to the ductal epithelium produced by local trauma, chemical irritation, or infection may allow the extravasation of luminal fat and protein-rich secretion into the lobular connective tissue, thereby provoking a granulomatous response, with lymphocyte and macrophage migration.

Wound Complications Following Breast-Conserving Surgery (BCS) - A Quality Improvement Study

Brian A. Lyle^{1,2}, Jeffrey Landercasper^{1,3}, Jeanne M. Johnson^{1,3}, Mohammed Al-Hamadani⁴, Choua A. Vang⁴, Kristin Zutavern⁴, Joy Hennessy³, Lonna Theede³, Jared Linebarger^{1,3}

¹Department of Surgery, Gundersen Health System, La Crosse, Wisconsin, United States, ²Department of Medical Education, Gundersen Medical Foundation, La Crosse, Wisconsin, United States, ³Norma J. Vinger Center for Breast Care, Gundersen Health System, La Crosse, Wisconsin, United States, ⁴Department of Research, Gundersen Medical Foundation, La Crosse, Wisconsin, United States

Objective Utilization of a Comprehensive Unit-based Safety Program (CUSP) has been associated with increased patient safety, including decreased infectious complications, in the critical care and colorectal surgery literature. The purpose of this study was to examine the incidence of postoperative wound complications following BCS prior to implementing a CUSP for patients treated with BCS.

Methods A prospectively maintained breast cancer registry at a community-based multidisciplinary breast center was queried to identify all patients diagnosed with breast cancer from 2010 to 2012. A retrospective review was performed to identify patients treated with BCS. Patients who had lumpectomy for benign pathology, had surgery elsewhere, were treated with mastectomy, or presented with metastatic disease were excluded. Univariate analysis was performed to identify the rates of wound complications, defined according to NSQIP criteria as superficial surgical site infection (SSI), deep abscess, seroma, hematoma, wound dehiscence, and lymphedema. Wilcoxon sum rank test and chi-square (Fisher) were performed to identify independent risk factors for wound complications.

Qualitative chart review, literature review, and provider opinion were used to identify potential CUSP interventions. **Results** Two hundred eighty-six patients were included, with a median age of 64.5 years. Nineteen percent (N = 54) presented with DCIS and 81% (N = 232) with invasive cancer. Twenty-four percent (N = 69) underwent lumpectomy alone while 76% (N = 217) underwent lumpectomy with surgical axillary staging. Wound complication rates are presented in the following table. Tissue excision volume greater than 250 cm³ (p = 0.049) was a risk factor for wound complications, but oncologic closure was not. Additionally, pathologic stage II/III (p = 0.045) was associated with more wound complications, but axillary surgery with BCS was not. Finally, reoperation (p = 0.012) was significantly associated with increased postoperative wound complications. After review of results, a standardized protocol for preoperative care was developed and agreed upon by all surgical care providers, to include: preoperative instructions (including skin care), preoperative antimicrobial therapy, preoperative skin preparation and draping, and postoperative instructions.

Conclusion An institutional wound complication rate following BCS was established at a multidisciplinary breast center. A CUSP was developed to standardize the preoperative care among patients and care providers. These wound complication data provide a baseline, allowing future assessment of the effectiveness of a CUSP to reduce BCS complications.

Wound Complication Rates

Complication	N	Rate (%)
Any	58	20.28
Superficial SSI	17	5.94
Deep abscess	5	1.75
Seroma	17	5.94
Hematoma	13	4.55
Wound dehiscence	7	2.45
Lymphedema	18	6.29
Two or more	15	5.24

The Use of Digital Mammography, Ultrasonography, and Contrast-Enhanced MRI to Identify Candidates for Intraoperative Radiation Therapy (IORT): A Prospective Trial

Tam T. Mai^{1,2}, Peter Chen¹, Brian Kim¹, Gary Levine¹, Lisa Guerra¹, Lincoln Snyder¹, Colleen Coleman¹, Faaiza Vaince^{1,2}, Jin Huang¹, Ralph MacKintosh¹, Cristina DeLeon¹, Melvin J. Silverstein^{1,2}

¹Breast Surgical Oncology, Hoag Memorial Hospital Presbyterian, Newport Beach, California, United States,

²Breast Surgical Oncology, LAC-USC Healthcare Network, Los Angeles, California, United States

Objective After breast conservation, most local recurrences occur at or near the location of the primary cancer. This finding has led to increasing popularity of single-quadrant brachytherapy. IORT is a single dose given in the operating room. It can be used as the complete course of radiation therapy or as a boost. We explored whether digital mammography, ultrasonography, and contrast-enhanced MRI could be used preoperatively to select patients who met our protocol requirements for single-dose IORT.

Methods A prospective, IRB-approved, clinical trial of IORT using the Xofig Axxent System was designed. To be included, patients had to have an invasive carcinoma (ductal or lobular) or DCIS spanning 30 mm or less (measurement included all foci of disease), lymph nodes had to be negative [N0(i+) ok], and final margin width had to be at least 2 mm. Patients who failed 1 or more criteria were advised to undergo whole-breast, external beam radiation therapy in addition to IORT, which became the boost dose. All patients had preoperative digital mammography, contrast-enhanced MRI (unless contraindicated) and ultrasonography of the involved breast and axilla.

Results From April 2010 through September 2013, 213 patients were enrolled (216 breasts). Thirteen breasts had positive sentinel nodes on frozen section and were not treated with IORT; 201 patients (203 breasts) were treated. Overall, 68 of 216 (31.5%) breasts failed 1 or more pathologic criteria. Twenty (9.3%) patients failed due to tumor size. One hundred forty-eight breasts (68.5%) were successfully treated and required no additional whole-breast radiotherapy or re-excision. Thirty-three patients underwent whole-breast radiation therapy in addition to IORT; 6 patients opted for mastectomy. There have been no recurrences (0%), but follow-up is short (median, 12 months).

Criteria	On Final Pathology
Positive nodes	28 (13.0%)
Tumor extent >30 mm	20 (9.3%)
Margin width <2 mm	35 (17.2%)
Failed 1 or more criteria	68 (31.5%)

Conclusion Preoperative imaging with digital mammography, ultrasonography, and contrast-enhanced MRI was accurate 68.5% of the time in selecting patients who met our criteria for IORT. Imaging, however, cannot be expected to find small metastases in lymph nodes and plays only a minor role in determining margin width. When selecting patients based on tumor size alone, imaging was accurate 90.7% of the time. IORT is particularly attractive for older patients, patients living in rural communities with poor access to radiation treatment centers, and those with

busy lifestyles who find it difficult to attend daily treatments for 6 to 7 weeks. If long-term recurrence rates remain low and adequate reimbursement occurs, IORT will increase in popularity.

Extent of Microinvasion in DCIS Is Not Associated With Sentinel Lymph Node Metastases

Cindy Matsen¹, Allison Hirsch², Anne Eaton³, Michelle Stempel¹, Alexandra Heerdt¹, Hiram Cody¹, Monica Morrow¹, George Plitas¹

¹Breast Service, Department of Surgery, Memorial Sloan-Kettering Cancer Center, New York, New York, United States, ²Sloan-Kettering Institute, Memorial Sloan-Kettering Cancer Center, New York, New York, United States, ³Department of Epidemiology and Biostatistics, Memorial Sloan-Kettering Cancer Center, New York, New York, United States

Objective DCIS with microinvasion (DCISM) is defined as ≤ 1 mm of invasive cancer in a background of DCIS and is found in 0.7%-2.4% of all breast cancer patients. The microinvasion may be unifocal or multifocal. To date, no pathologic or demographic factor has been shown to be predictive of risk of lymph node metastases in DCISM patients. We hypothesized that extent of microinvasion (unifocal vs multifocal) may identify a subset of patients at increased risk for sentinel lymph node metastases.

Methods From a prospective, single-institution database, we retrospectively identified 429 patients with DCISM who underwent SLN biopsy between June 1997 and December 2010. After excluding 12 with an unknown number of invasive foci, we collected demographic and pathologic characteristics on patients with 1 (n = 238) and more than 1 (n = 179) invasive focus. We used univariate logistic regression to test associations between demographic and pathologic characteristics and a positive SLN biopsy, and Fisher exact test to compare rates of macrometastasis, additional nodal metastasis, and chemotherapy. Patients with contralateral disease and patients missing chemotherapy data (n = 8) were excluded from calculation of chemotherapy rates.

Results See following table for results comparing SLN features between unifocal and multifocal DCISM patients. Completion ALND was performed on all patients (6) with SLN macrometastases and 9/26 (35%) of those with SLN micrometastases, and additional positive nodes were identified in 2/6 (33%) and 0/9 (0%), respectively (p = .143). Chemotherapy was used more frequently in patients with positive (n = 30) vs negative (n = 379) SLN (63% vs 3%, p < .001) and in negative SLN patients with multifocal (n = 216) vs unifocal (n = 163) DCISM (7% vs 1%, p = 0.003).

Conclusion We demonstrate that extent of microinvasion was not univariately associated with SLN positivity and could not discriminate a subset of DCISM patients for whom SLN biopsy could be avoided. It remains unclear whether extent of microinvasion has any meaningful impact on clinical outcomes in patients with DCISM.

Comparison of SLN Results Between Unifocal and Multifocal DCISM Patients

Extent of Microinvasion	# Patients	SLN Positive*	Macrometastasis‡
1 focus	238	18 (7.6%)	3/18 (17%)
>1 focus	179	14 (7.8%) †p = 0.922	3/14 (21%) †p = 1.0
Total	417	32 (7.7%)	6/32 (19%)

*Includes only patients with H&E-detected SLN micro (pN1mi) and macro (pN1) metastases

†p value for comparison of variable between unifocal and multifocal groups; ‡ within SLN positive group, remaining patients had micrometastasis.

Back to Basics: Traditional Nottingham Grade Mitotic Scores Alone Are Significant in Predicting Survival

Ann McCullough¹, Amylou Dueck², Tolgay Ocal¹, Thomas Lidner¹, Richard Gray³, Wasif Nabil³, Donald Northfelt⁴, Karen Anderson⁴, Barbara Pockaj³

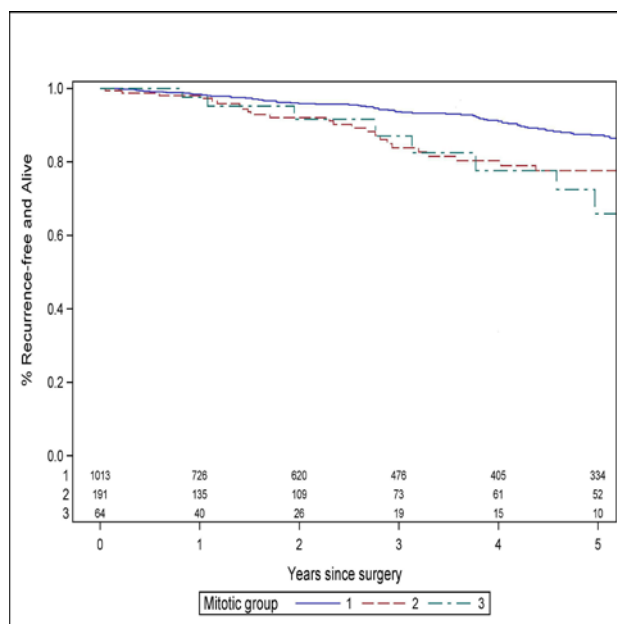
¹Pathology, Mayo Clinic Arizona, Scottsdale, Arizona, United States, ²Biostatistics, Mayo Clinic Arizona, Scottsdale, Arizona, United States, ³Surgery, Mayo Clinic Arizona, Scottsdale, Arizona, United States, ⁴Medical Oncology, Mayo Clinic Arizona, Scottsdale, Arizona, United States

Objective Proliferative activity in breast carcinoma is a major component of all prognostic assays, now redundantly quantified in multigene assays in newer molecular profiling tests (Oncotype DX). One component to traditional

breast carcinoma histological grading is the single-parameter proliferative measure, a mitotic count. The mitotic activity of invasive breast carcinomas may be undervalued; therefore, an evaluation of the prognostic significance of mitotic score as a single parameter in predicting breast cancer prognosis was performed.

Methods Retrospective analysis of a single institutional cohort of newly diagnosed estrogen receptor positive (ER+), HER-2 negative (HER-2-) unilateral invasive breast carcinomas was performed. Mitotic scores from the 3-part Nottingham combined histological grade were compared to clinical parameters. Mitoses were counted on Olympus BX50 microscopes (field diameter 0.55 mm, in ten 400x fields) and assigned a score of 1 (up to 8 mitoses/10 hpf), 2 (9-16 mitoses/10 hpf), or 3 (17 or more mitoses/10 hpf).

Results A total of 1268 ER+, HER-2- invasive breast carcinoma patients were identified, with a median follow-up time of 2.6 years (range, 0-11.7 years). Higher mitotic score was significantly associated with younger age, higher grade, angiolymphatic invasion, higher stage, larger tumor size, and the use of chemotherapy. Infiltrating lobular, tubular, and mucinous carcinomas were associated with a low mitotic score. Progesterone receptor status was not influenced by mitotic score. Mitotic score alone was not statistically significant in modeling time to local/ regional recurrence ($p = 0.29$), but was significant in modeling relapse-free survival/RFS ($p < 0.001$) and overall survival/OS ($p = 0.02$), with higher mitotic scores being associated with worse outcomes (see figure). Mitotic score was more significant than grade for both RFS and OS.



Conclusion First-generation molecular profiling assays for estrogen receptor positive invasive breast carcinomas derive much of their predictive power from quantitation of proliferation associated gene data refined into a single score. Sometimes overlooked in the profusion of molecular data, the time-tested, zero-cost, mitotic count encoded in the Nottingham combined histological grade is a good single-parameter predictor of survival and should always be separately reported as a component of standard grading.

Tumor Response Ratio Better Predicts Overall Survival in Neoadjuvant Chemotherapy Patients With Non-Metastatic Breast Cancer

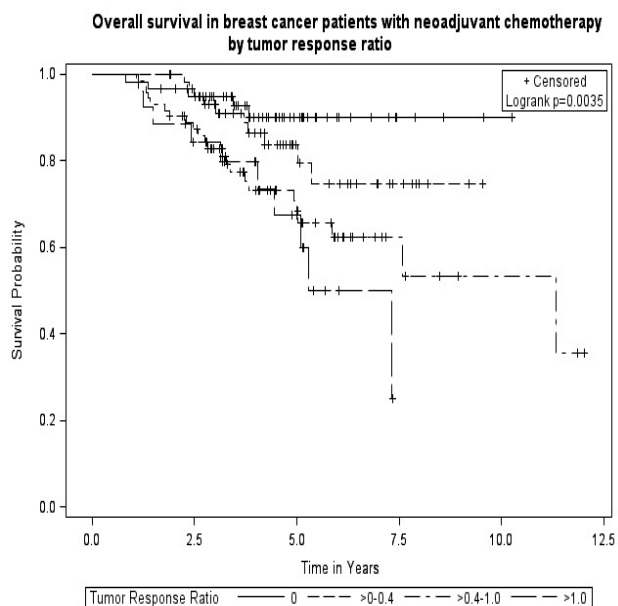
Marian Miller, Rebecca Ottesen, Joyce Niland, Laura L. Kruper, Steven L. Chen, Courtney Vito
City of Hope National Medical Center, Duarte, California, United States

Objective Neoadjuvant chemotherapy (NAC) is a common strategy employed for locally advanced breast cancers. In-breast pathologic complete response (pCR) is a well-documented predictor of improved overall survival (OS); however, prognosis of those with partial response remains unclear. We sought to define whether tumor response ratio (TRR) was a better predictor of OS than overall pathologic stage.

Methods A retrospective review of institutional data collected for the National Comprehensive Cancer Network

database was performed, identifying women diagnosed between 1997 and 2010 with primary, unilateral, stage I-III breast cancer, who underwent NAC as well as pre-treatment imaging. Tumor size was determined by the diameter of the largest lesion seen on MRI. When MRI was unavailable, ultrasound measurements were used. Patient demographics, tumor characteristics, and survival data were analyzed. The TRR was calculated as residual in-breast disease/size on pre-NAC imaging. Post-treatment overall pathological stage (yStage) was determined after definitive surgery. Kaplan-Meier curves were constructed to compare OS and evaluated using the log-rank test. A Cox proportional hazard model was performed for multivariable analysis, controlling for age at and year of diagnosis, clinical N stage, her2neu and hormone receptor status, comorbidity, grade, and lymphovascular invasion (LVI).

Results The cohort consisted of 311 women with primary, unilateral breast cancer diagnosed between 1997 and 2010 who underwent NAC, 218 of whom (70%) had evaluable pre-treatment imaging. TRR was calculated and divided into 4 groups, 0 (pCR), >0-0.4, >0.4-1.0, and >1.0 (growth on NAC). TRR was predictive of OS ($p = 0.0035$) (see figure), whereas yStage ($p = 0.23$) and pre-NAC T stage ($p = 0.87$) were not. In multivariable analysis to control for potential confounders, TRR with 4 groups continued to be significant ($p = 0.0066$).



Conclusion In patients undergoing NAC and receiving pre-treatment imaging, yStage and pre-NAC T stage are not predictive of overall survival. TRR, which takes into account both pre-treatment and residual disease, more accurately predicts overall survival.

The 21-Gene Recurrence Score Influences Treatment Recommendations for Patients With Node-Positive Breast Cancer

Jeffanne Millien¹, Claire Edwards¹, Rebecca Kaltman², Anita P. McSwain¹, Lisa McGrail², Christine B. Teal¹

¹Breast Surgery, George Washington University Medical Center, Washington, District of Columbia, United States,

²Hematology/Oncology, George Washington University Medical Center, Washington, District of Columbia, United States

Objective Oncotype DX is a PCR-based test that analyzes 21 genes related to tumor growth, invasion, and hormone receptor sensitivity on invasive breast tumors. The derived recurrence score (RS) estimates the probability of breast cancer recurrence within 10 years. Its influence on clinical decision-making regarding the need for adjuvant chemotherapy in patients with node-negative breast cancer is well established. The extent to which RS changes management in node-positive patients is unknown. The aim of this study is to determine the effect of RS on treatment recommendations for breast cancer patients with positive lymph nodes.

Methods Clinical cases, including patient age, race, tumor size, nuclear grade, histopathology, ER, PR and Her2/NEU receptor status as well as the presence and size of axillary metastasis, were presented to breast cancer specialists (3 surgical and 2 medical oncologists) at a weekly tumor board. Participants were asked to estimate the RS range (low, low intermediate, high intermediate, or high) based on the clinical information provided in each case. Participants then came to a consensus for appropriate adjuvant therapy for each patient. The group was then

informed of the RS, and a new consensus was reached regarding recommended adjuvant therapy. The ability to estimate RS range and changes in treatment recommendations were evaluated.

Results Based on clinic and laboratory variables, breast cancer specialists estimated RS correctly 59% of the time. Adjuvant therapy recommendations changed in 16 of 25 (66.7%) cases once the RS was revealed. In 11 (45.8%) cases, the recommendation was changed to hormonal therapy alone after the RS was revealed. In 4 (16.7%) cases for which chemotherapy was initially recommended, the recommendation was changed to a less intensive regimen or referral to a clinical trial.

Conclusion RS changes management in a significant proportion of patients with node-positive disease. While RS has previously been shown to influence clinical management in node-negative patients, these data suggest that it may influence management even more frequently in node-positive patients. Larger studies are necessary to confirm this conclusion.

Ptosis and Nipple-Sparing Mastectomy

Sunny D. Mitchell^{1,3}, *Peter Beitsch*², *Sheldon Feldman*³, *Shawna Willey*⁶, *Donna Marie Manasseh*⁴, *Gary Unzeitig*⁵

¹Breast Surgery, White Plains Hospital, White Plains, Connecticut, United States, ²Dallas Breast Center, Dallas, Texas, United States, ³Breast Surgery, Columbia University College of Physicians & Surgeons, New York, Texas, United States, ⁴Breast Surgery, Maimonides, New York, New York, United States, ⁵Laredo Breast Care, Laredo, Texas, United States, ⁶Breast Surgery, Georgetown, Washington, District of Columbia, United States

Objective The American Society of Breast Surgeons (ASBrS) nipple-sparing mastectomy registry (NSMR) is a prospective, IRB-approved, nonrandomized multi-institutional registry assessing surgical techniques, utilized metrics, oncologic outcome, and aesthetic outcome of nipple-sparing mastectomies. We analyzed the preoperative breast characteristic of ptosis for individuals who underwent a nipple-sparing mastectomy and were entered into the ASBrS NSMR.

Methods This abstract specifically analyzes degree of ptosis in patients undergoing a nipple-sparing mastectomy. We specifically compared incision type, reconstruction type, infection rate, cup size, patient satisfaction, and cosmetic outcome as they relate to degree of preoperative ptosis.

Results Fifty-five surgeons from 44 institutions are participating in the ASBrS NSMR. A total of 471 patients underwent 780 mastectomies with indications of cancer (339), prophylaxis (440), and unknown (10). Degree of ptosis was defined as: none (n = 301), pseudo ptosis (n = 9), Grade 1 (n = 261), Grade 2 (n = 105), or Grade 3 (44). Types of reconstruction included: DIEP flap (n = 49), Latissimus dorsi flap (2), immediate implant (253), TRAM flap (5), and tissue expander (451). Incision types utilized included: inframammary (301), periareolar or hemibatwing (17), previous lumpectomy scar (9), previous mastopexy scar (5), radial (133), radial with periareolar extension (172), wise mastopexy incision (7), other (64), and unknown (72) (see following table). Of those who reported patient satisfaction (60% of total N), 93% reported their outcome was excellent/good. Similarly cosmetic outcome, reported by surgeon, (reported on 60% of N) resulted in 95% excellent/good.

Conclusion Ptosis is not a contraindication to a nipple-sparing mastectomy. Nipple-sparing mastectomy with immediate reconstruction may be successfully performed on a breast, with or without ptosis, utilizing a variety of reconstruction techniques via a variety of incisions. Rate of infection does not vary by presence of or degree of ptosis. Although patient satisfaction and cosmetic outcome (assessed by surgeon) was available on only 60% of patients, ptosis appears to have no bearing on patient satisfaction or cosmetic outcome.

continues

Characteristic	All Subjects	None	Pseudo Ptosis	Grade 1	Grade 2	Grade 3	Unknown
Enrolled Cases (Breasts)	780	301	0	261	105	44	60
Number Subjects with Bilateral Mastectomy	309	130	3	99	42	20	15
Number of Subjects	471	171	6	162	63	24	45
Indication							
Cancer Indication N (%)	330 (42.9)	118 (39.5)	6 (66.7)	105 (40.7)	42 (41.2)	20 (45.5)	39 (67.2)
Prophylaxis Indication N (%)	440 (57.1)	181 (60.5)	3 (33.3)	153 (59.3)	60 (58.8)	24 (54.5)	19 (32.8)
Unknown N (%)	10	2	0	3	3	0	2
Incision Technique							
Inframammary N (%)	301 (38.6)	141 (46.8)	5 (55.6)	102 (39.1)	30 (28.6)	4 (9.1)	19 (31.7)
Peri-areolar ellipse, or hemi-batwing N (%)	17 (2.2)	6 (2.0)	0 (0.0)	3 (1.1)	0 (0.0)	6 (13.6)	2 (3.3)
Previous lumpectomy scar N (%)	9 (1.2)	2 (0.7)	0 (0.0)	3 (1.1)	2 (1.9)	2 (4.5)	0 (0.0)
Previous mastopexy scar N (%)	5 (0.6)	4 (1.3)	0 (0.0)	0 (0.0)	0 (0.0)	1 (2.3)	0 (0.0)
Radial N (%)	133 (17.1)	32 (10.6)	2 (22.2)	51 (19.5)	26 (24.8)	4 (9.1)	18 (30.0)
Radial w/ Peri-areolar extension N (%)	172 (22.1)	90 (29.9)	1 (11.1)	50 (19.2)	22 (21.0)	4 (9.1)	5 (8.3)
Wise mastopexy incision N (%)	7 (0.9)	0 (0.0)	0 (0.0)	2 (0.8)	1 (1.0)	4 (9.1)	0 (0.0)
Other N (%)	64 (8.2)	8 (2.7)	0 (0.0)	21 (8.0)	17 (16.2)	14 (31.8)	4 (6.7)
Unknown N (%)	72	18	1	29	7	5	12
Cup Size							
A N (%)	113 (15.7)	73 (24.9)	0 (0.0)	33 (13.1)	3 (2.9)	0 (0.0)	4 (19.0)
B N (%)	282 (39.3)	147 (50.2)	5 (62.5)	81 (32.3)	27 (26.2)	10 (23.8)	12 (57.1)
C N (%)	243 (33.8)	64 (21.8)	1 (12.5)	114 (45.4)	50 (48.5)	9 (21.4)	5 (23.8)
D+ N (%)	80 (11.1)	9 (3.1)	2 (25.0)	23 (9.2)	23 (22.3)	23 (54.8)	0 (0.0)
Unknown N (%)	62 (8.6)	8 (2.7)	1 (12.5)	10 (4.0)	2 (1.9)	2 (4.8)	39 (185.7)
Reconstruction Technique							
DIEP N (%)	49 (6.4)	11 (3.7)	0 (0.0)	24 (9.2)	8 (7.7)	6 (13.6)	0 (0.0)
Latissimus dorsi flap N (%)	2 (0.3)	0 (0.0)	0 (0.0)	0 (0.0)	2 (1.9)	0 (0.0)	0 (0.0)
Permanent Implant N (%)	253 (33.2)	107 (36.1)	0 (0.0)	83 (31.9)	34 (32.7)	23 (52.3)	6 (12.0)
TRAM N (%)	5 (0.7)	0 (0.0)	0 (0.0)	3 (1.2)	2 (1.9)	0 (0.0)	0 (0.0)
Tissue Expander N (%)	451 (59.2)	176 (59.5)	8 (100.0)	150 (57.7)	58 (55.8)	15 (34.1)	44 (88.0)
Other N (%)	2 (0.3)	2 (0.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Unknown N (%)	18	5	1	1	1	0	10
Infection							
Yes N (%)	29 (4.7)	13 (5.3)	0 (0.0)	3 (1.5)	6 (7.4)	3 (7.5)	4 (8.3)
No N (%)	583 (95.3)	232 (94.7)	4 (100.0)	191 (98.5)	75 (92.6)	37 (92.5)	44 (91.7)
Unknown N (%)	168	56	5	67	24	4	12

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Urinary Concentrations of ADAM 12 From Breast Cancer Patients Pre- and Post-Surgery vs Cancer-Free Controls: A Clinical Study for Biomarker Validation

BreAnn Neiger^{1,2}, Michael Bouton^{2,1}, Neville Alberto^{2,1}

¹University of North Dakota, FARGO, North Dakota, United States, ²Sanford Hospital, Fargo, North Dakota, United States

Objective Breast cancer is the most common cancer in women of the United States. Great strides have been made in screening and treatment of breast cancer. There are no prognostic indicators to aid in the treatment of breast cancer, or reliable early-detection tumor markers. The ADAM 12 (A Disintegrin and Metalloproteinase) protein has been found to be a potential biomarker for breast cancer. The aims of this study are to establish the viability of urinary ADAM 12 as a screening marker for breast cancer and explore the effects of surgical tumor removal on the levels of urinary ADAM 12.

Methods A total of 68 patients were recruited from our facility. We obtained IRB approval. Thirty-seven patients had been diagnosed with breast cancer; either ductal carcinoma in situ (DCIS) or invasive breast cancer (IBC). Thirty-one age-matched controls were also recruited. Inclusion criteria included females over 21 years old who were recently diagnosed with breast cancer. They had no history of other cancer diagnoses except nonmelanoma skin cancer. The patients were to have surgery as their initial course of treatment after multidisciplinary planning. Exclusion criteria included pregnancy and advanced-stage breast cancer. Commercially available ELISA assays were used to measure the level of ADAM 12 protein from the patients' urine samples. Samples were taken prior to any treatment and approximately 2 weeks following surgery, as well as from the controls.

Results No significant statistical difference was found in the concentration of ADAM 12 protein between our breast cancer patients and control patients. We also did not find any statistically significant difference between the ADAM 12 concentrations of DCIS and IBC patients pre-surgery. We did see a 400%-500% increase in the level of ADAM

12 after our breast cancer patients underwent surgery ($p < 0.0001$) in both the DCIS and IBC patients regardless of their type of surgery. We also observed that patients who underwent a mastectomy had 764.5% increased levels of ADAM 12 compared to preoperative levels, while lumpectomy patient's levels increased by 322.2% ($p = 0.0271$). **Conclusion** We found our results to be contrary to previously published studies on the ADAM12 protein in breast cancer patients. We did not see a correlation with ADAM12 protein urine levels and extent of breast cancer in our patients. We did see an across-the-board increase in urinary ADAM12 protein concentrations after surgery of any type (lumpectomy, mastectomy, with or without sentinel lymph node dissection, or axillary node dissection) for breast cancer. Not only did it increase after surgery but significantly increased more in mastectomy patients vs lumpectomy patients. This raises the question of ADAM12 being more of an inflammatory response marker, rather than a breast cancer marker. Further studies will be needed to clarify this.

Prevalence and Histopathology of Additional Lesions Found With MRI in Breast Cancer Patients

Maria E. Nelson, Rola Saouaf, Shahrbanoo F. Noori, Joshua L. Chan, Marian M. Varda, Parisa Mirzadehgan, James Mirocha, Armando E. Giuliano

Department of Breast Surgery, Cedars-Sinai Medical Center, Los Angeles, California, United States

Objective Magnetic resonance imaging (MRI) is increasingly used preoperatively for breast cancer. MRI is sensitive in identifying multifocal/multicentric lesions unrecognized by conventional assessment. The purpose of this study is to investigate the prevalence and histopathology of these additional lesions found on preoperative breast MRI.

Methods Breast cancer patients who had preoperative MRI at our Breast Center from January 1, 2012 through December 31, 2012, were identified. Those patients who had additional lesions on MRI were studied. We evaluated the prevalence and histopathology of additional lesions, as well as patient characteristics, lesion size, qualitative breast density scores, molecular markers, laterality, and any resultant change of operation.

Results Preoperative breast MRI was performed for 275 patients. MRI showed additional lesions in 66 (24.0%), 25/66 (37.8%) under age 50 and 41/66 (62.1%) older than 50 (N.S.). Of the additional lesions, 27/275 (9.8%) were benign: 10 (3.6%) fibroadenomas, 4 (1.5%) flat epithelial atypia, 4 (1.5%) benign breast tissue, 2 (0.7%) fat necrosis, 1 (0.4%) fibroadenomatosis, 1 (0.4%) fibrocystic, 1 (0.4%) hemorrhage cyst, 2 (0.8%) hyperplasia, 6 (2.2%) atypical ductal hyperplasia or atypical lobular hyperplasia (ADH/ALH). Eight lesions (2.9%) were ductal carcinoma in situ; 1 (0.4%) was lobular carcinoma in situ (LCIS), and 17 (6.2%) were invasive cancers – 15 (5.5%) invasive ductal carcinoma (IDC), 1 (0.4%) invasive lobular carcinoma (ILC), and 1 (0.4%) mixed IDC and ILC. Of the 26 cancers, 21 (80.7%) were ER positive, 19/26 (70.1%) were PR-positive, and 2/17 (11.8%) invasive cancers were Her2-positive. Additional lesions were seen more often in dense breasts. Only 1 of 55 (1.8%) who had density score recorded had a qualitative mammographic density score of 0-25%, 12/55 (2.2%) had scores of between 26-50%, 28/55 (50.9%) had scores of 51-75%, 14/55 (25.4%) had scores of 76-100% (N.S.). Of 26 cancers that were found as additional lesions, the size distribution was 3 (11.5%), ≤ 0.5 cm; 5 (19.2%), 0.5-1.0 cm; 7 (26.9%), 1.1-2.0 cm; and 2 (7.7%), 2.1-5.0 cm (N.S.). Most additional lesions were ipsilateral (73.1%). Only 17/275 (6.2%) led to a change in operative management of their cancer; 8/275 (2.9%) led to unilateral or bilateral mastectomies.

Conclusion Preoperative MRI detects additional lesions in nearly a quarter of women. While most of these can be considered insignificant, there was a change in management in 6.2% of cases, including a change to mastectomy in 2.9%. Women must be informed of the potential for additional investigations and operations with the use of preoperative breast MRI.

Comparison of Nodal Metastasis Between BRCA-Mutation Carriers and Non-BRCA-Mutation Patients With Breast Cancer

Shahrbanoo F. Noori, Alexandra Gangi, Maria E. Nelson, Michael Choi, Parisa Mirzadehgan, Alison K. Bonk, James Mirocha, Farin Amersi, Armando E. Giuliano

Surgery, Cedars-Sinai Medical Center, Los Angeles, California, United States

Objective Few studies have assessed predictors of nodal disease among breast cancer patients with BRCA mutations. This study evaluates whether nodal status differs between breast cancer patients who are BRCA mutation carriers compared to those who do not have a BRCA mutation. We hypothesized that the BRCA mutation itself does not confer an increased risk for nodal disease.

Methods A prospective database identified patients with breast cancer who underwent genetic testing and were treated with sentinel lymph node biopsy or axillary dissection. Patients with noninvasive cancer, and those who

received neoadjuvant chemotherapy were excluded. Comparative variables included age and tumor characteristics, such as size, grade, lymphovascular invasion (LVI), ER, PR, HER2-neu, and nodal status. Analysis was performed on the available data.

Results Two hundred thirty-five patients with breast cancer underwent genetic testing for BRCA germline mutations. Of these, 74 (31.4%) were found to express BRCA 1 or 2 mutations, and 161 (68.5%) patients were verified to have normal BRCA genes. Average age of BRCA mutation carriers was 49.7 years (range, 25-80) compared to 52.7 years (range, 24-79; $p = 0.089$) for those without the BRCA mutations. Of the 74 BRCA mutation carriers, 43 patients (58.1%) expressed the BRCA 1 mutation, 29 (39.1%) expressed the BRCA 2 mutation, and 2 patients expressed both. Among the entire 235 patients tested, 92 (39.1%) were found to have nodal disease. In univariable analysis, only LVI and tumor size correlated with presence of nodal metastasis. In 20 patients with LVI, 19 (95.0%) had nodal disease, compared to 70/206 (34.0%) patients without LVI ($p < 0.0001$). Of the 89 patients with tumors ≥ 2 cm, 55 (61.8%) had nodal metastasis. In comparison, of those with tumors < 2 cm, 37 of 146 (25%; $p < 0.0001$) had nodal metastasis. Of the 74 BRCA mutation carriers, 34 (45.9%) had nodal metastasis compared to 58 of the 161 (36%; $p = 0.15$) patients without a BRCA mutation. BRCA mutation carriers with nodal disease were more likely to have poorly differentiated tumors than those without mutations who had nodal disease (24/33 [72.7%] vs. 27/57 [47.4%] $p = 0.027$). Moreover, BRCA mutation carriers were more likely to have ER negative (11/34 [32.4%] vs 6/57 [10.5%] $p = 0.013$), PR negative (13/34 [38.2%] vs 11/57 [19.3%] $p = 0.052$), and HER2-neu negative tumors (29/31 [93.5%] vs 39/55 [70.9%] $p = 0.014$) compared to nonmutation carriers. In comparison to BRCA 2, BRCA 1 mutation carriers were more likely to have ER-negative (8/18 [44.4%] vs 3/13 [18.8%], $p = 0.085$), as well as PR-negative tumors (9/18 [50.0%] vs 4/16 [25.0%], $p = 0.095$).

Conclusion The BRCA mutations are not themselves predictive of nodal metastasis. An observed trend toward increased nodal disease in these patients is likely due to the prevalence of more aggressive tumors among BRCA mutation carriers.

Predictors of Pathologic Complete Response to Neoadjuvant Chemotherapy in Stage II and III Breast Cancer: the Impact of Chemotherapeutic Regimen

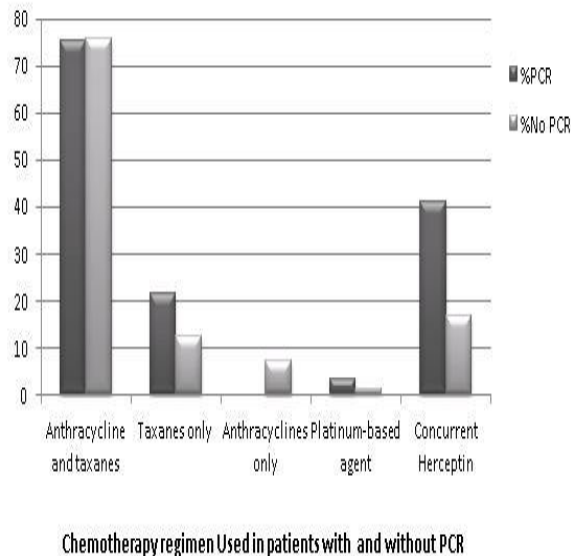
Iheoma Nwaogu¹, Oluwadamilola M. Fayanju¹, Yan Yan², Donna B. Jeffe³, Julie A. Margenthaler¹

¹Surgery, Washington University School of Medicine, St. Louis, Missouri, United States, ²Biostatistics, Washington University School of Medicine, St. Louis, Missouri, United States, ³Medicine, Washington University School of Medicine, St. Louis, Missouri, United States

Objective Although predictors of pathologic complete response (pCR) following neoadjuvant chemotherapy have been extensively studied, the heterogeneity of patient populations in previous studies with regard to disease stage and type of neoadjuvant chemotherapy received has limited the broader application of these studies' findings to the management of patients receiving neoadjuvant systemic therapy. Here, we examine predictors of pCR in a more homogenous patient population and compare and contrast the chemotherapeutic regimens received by patients whose tumors did and did not undergo pCR.

Methods We conducted a retrospective review of 879 patients to identify those with a first primary diagnosis of stage II or III breast cancer who received some form of neoadjuvant (ie, administered prior to definitive surgical resection) chemotherapy from 2006–2010. Patients who received only neoadjuvant endocrine therapy were excluded from our analysis. Patient, tumor, and treatment characteristics, including type of chemotherapy received, were compared between patients whose tumors underwent pCR and those whose tumors did not using chi-square and Fisher exact tests, with 2-sided P values < 0.05 considered significant.

Results Of the 333 patients who met inclusion criteria, pCR was documented in 61 patients (18.3%). Compared with patients not achieving PCR, more patients with pCR were stage II (80.3% vs 68%, $p = 0.053$); had poorly differentiated, ie, grade 3, tumors (82% vs 59.2%, $p = 0.00052$); and had tumors that were HER2/neu-amplified (41% vs 23.5%, $p = 0.0078$). There were higher proportions of patients with invasive lobular carcinoma (ILC, 14.7% vs 3.2%, $p = 0.093$) and inflammatory breast cancer (IBC, 6.3% vs 1.6%, $p = 0.214$) among patients who did not experience pCR; however, these associations did not achieve statistical significance. With regard to neoadjuvant treatment (see following figure), patients with pCR had higher rates of Herceptin administration in conjunction with chemotherapy (41.0% vs 16.9%, $p = 0.000071$). None of the patients receiving solely anthracycline-based therapy achieved PCR in our study.



Conclusion Our study demonstrates that for stage II and III breast cancer, higher grade, lower stage, and HER2/neu receptor amplification are associated with pCR. Concurrent use of Herceptin and the inclusion of taxanes are also associated with improved pCR rates.

Venous Thromboembolism Following Breast Reconstruction in Patients With Breast Cancer: A NSQIP Analysis

Iheoma Nwaogu¹, Terence Myckatyn¹, Yan Yan², Julie A. Margenthaler¹

¹Surgery, Washington University School of Medicine, St. Louis, Missouri, United States, ²Biostatistics, Washington University School of Medicine, St. Louis, Missouri, United States

Objective It is well appreciated that malignancy significantly increases the risk of venous thromboembolism (VTE), but previous studies have noted a low incidence of VTE in patients undergoing mastectomy. The current study aims to examine the impact of breast reconstruction on VTE incidence in a population of breast cancer patients undergoing breast surgical procedures and the risk factors associated with VTE in this population.

Methods All patients undergoing breast operations for breast cancer were identified in the 2007–2011 American College of Surgeons-National Surgical Quality Improvement Program database. The patients were divided into 4 treatment categories: Lumpectomy, Mastectomy Alone, Mastectomy With Reconstruction, and Reconstruction Alone. Missing data were filled using multiple imputation. VTE incidence was compared across the groups and potential risk factors for VTE were analyzed using chi-square and Fisher exact tests.

Results A total of 68,285 patients were identified – 26,752 (39%) Lumpectomy, 24,720 (36%) Mastectomy Alone, 12,094 (18%) Mastectomy With Reconstruction, and 4719 (7%) Reconstruction Alone. The overall incidence of VTE was 0.27%. The incidence of VTE was highest in the Reconstruction and Mastectomy With Reconstruction groups (0.47% and 0.46%, respectively), compared to 0.32% in the Mastectomy Alone group and 0.1% in the Lumpectomy group ($p < 0.0001$). Independent risk factors for VTE included inpatient status (0.42% vs 0.14% for outpatient, $p < 0.0001$), prior operation in the 30 days preceding breast surgery (0.56% vs 0.26% for none, $p = 0.002$), higher BMI ($p < 0.0001$), increased operative time ($p < 0.0001$), and increased length of hospital stay ($p < 0.0001$). Smoking history was associated with a lower incidence of VTE (0.14% vs 0.29% for nonsmokers, $p = 0.012$). No statistically significant association was found between VTE and patient age, race, pregnancy status, venous catheterization, alcohol use, and previous radiotherapy.

Conclusion Our study confirms an overall low incidence of VTE in the breast cancer population. Breast reconstruction, inpatient status, higher BMI, increased operative time, prior operation within 30 days preceding breast surgery, and nonsmoking status are independent risk factors for VTE. The association of lower VTE rates with smoking may be a result of more aggressive VTE prophylaxis in this patient population. Further investigation is warranted to understand this relationship. The above findings are useful to guide future recommendations regarding VTE prophylaxis for the breast cancer patient population.

To Excise or to Not Excise, Presentation and Management of Pseudoangiomatous Stromal Hyperplasia (PASH)

Samilia Obeng Gyasi, Gabriela Rosa, Yitian Liu, Rowe Jordi, Jill Dietz, Stephen Grobmyer, Stephanie Valente
Cleveland Clinic, Cleveland, Ohio, United States

Objective Pseudoangiomatous stromal hyperplasia (PASH) is thought to be a hormonally sensitive, benign, proliferative lesion that has been implicated in supporting tumorigenesis through epithelial cell-stromal interactions. Management of PASH lesions identified on core needle biopsy (CNB) has not been well established. The objective of this study was to conduct a retrospective review to evaluate the presentation, diagnosis, and management of PASH and risk of subsequent breast cancer at a large academic breast cancer center.

Methods Pathology slides of patients diagnosed with PASH by core needle biopsy at our institution from 1992-2009 were retrospectively identified and prospectively re-reviewed by a single pathologist. A retrospective chart review was then performed to obtain clinical, histopathologic, and radiographic data pertinent to presentation, diagnosis, and management of PASH. The patients were grouped based on whether they underwent excision or observation of their PASH lesion. The clinicopathologic data of the 2 groups were compared assessing for differences between the groups and the development of a subsequent high risk or malignant lesion.

Results Seventy-one slides of women with PASH were reviewed and 52 had a sole diagnosis of PASH on their CNB. The average age of presentation was 47.6 years. About half the women were premenopausal and presented with an abnormality on routine imaging. There were 33 women who were observed and 19 who underwent operative management. Patients who underwent operative excision were younger ($P = 0.003$) and more likely to present with a palpable lesion ($P = 0.007$). Of the 19 women who had surgical excision, none were found to have additional high-risk or cancerous lesions on final pathology. Conversely, 3 of the women in the observation group developed a contralateral breast cancer within 3 years of CNB. A total of 21% (7/33) of women in the observation group were followed with a short-term mammogram at 6 months. The remaining 26 were followed with at least an annual mammogram. The lesions in all of these women in the observation group remained stable, requiring no additional intervention.

Conclusion A comparison of clinical history and histopathologic factors of patients with PASH showed that age and the presence of a palpable lesion were the only statistically significant factors between patients undergoing operative versus nonoperative management at our institution. The decision for management had the same long-term outcome regardless of operative management or observation. Specifically, none of the patients with PASH only on CNB developed an ipsilateral breast cancer or high-risk lesion. Our study suggests that patients presenting with only PASH on CNB can be safely managed with observation and annual mammography.

Disparities in Male Breast Cancer – The Florida Experience

Bridget O'Brien, Tulay Koru-Sengul, Constantine Saclarides, Dido Franceschi, David J. Lee, Feng Miao, Stacey Tannenbaum, Margaret M. Bryne, Eli Avisar
University of Miami Miller School of Medicine, Miami, Florida, United States

Objective Male breast cancer (MBC) is a rare condition, accounting for approximately 1% of all breast cancers. As the prevalence of both male and female breast cancer has been increasing over the past decade, it is important for clinicians to identify at-risk patient populations. Although racial and ethnic disparities in female breast cancer have been well described, there is little research describing population-based disparities in MBC. Florida has a large multi-ethnic population and the highest rates of male breast cancer in the United States. We described the disparities in male breast cancer survival in Florida using data from 1996-2007.

Methods Data from the Florida Cancer Data System, the Agency for Health Care Administration, and the U.S. Census were linked for male breast cancer patients ($n = 1,591$). Survival time was our primary endpoint, with adjustments for sociodemographic status, neighborhood-based poverty measures, clinical and hospital characteristics, and co-morbidity measures based on linkage with in- and out-patient treatment records. Survival time was modeled using both univariate and multivariable Cox regression models.

Results Five-year survival was 65.7% (95% confidence interval [62.8-68.4]). In final multivariable models, significant demographic predictors included: other race vs. whites (2.26 [1.20-4.25]) and single/divorced/separated/widowed (30.8%) vs. married (69.2%). Overall mean survival time (MST) in years was 7.9, but shorter in Blacks (5.5) than Whites (8.1), and in non-Hispanics (7.9) than Hispanics (8.4). MST increased sharply from patients living in areas of lowest socioeconomic status (SES) to highest (5.7, 7.4, 8.2, 9.0). Patients with low SES also presented at a more advanced stage with only 42.9% of low-SES patients presenting with

localized disease vs 48.3% - 50.1% for the higher SES groups. Similarly, those with low SES presented more often with distant disease (9.7%), compared to the highest SES (3.6%). Only 2.9% to 3.0% of the middle-high to highest SES did not receive surgical treatment, compared to 4.8% to 6.3% in the low to middle-low SES. Perioperative 30-day mortality was also highest in the low-SES group (2.3%) vs the higher SES groups (<1%). Current and former tobacco use was also associated with reduced survival: (1.56 [1.18-2.04]) and (1.27 [1.00-1.62]), respectively. 51.8% patients denied tobacco history, 31.5% had a remote history, and 16.6% were active tobacco users. The strongest clinical/treatment predictors for survival included: SEER-stage distant diagnosis (6.04 [3.80-9.61]) and no hormone therapy treatment (1.48 [1.15-1.91]). Of the 31 co-morbidities included in the model, those with a p value <0.001 included: congestive heart failure (1.78 [1.35-2.34]), metastatic cancer (2.08 [1.68-2.58]), and hypothyroidism (0.47 [0.35-0.63]).

Conclusion Two-thirds of male breast cancer patients survive at least 5-years post diagnosis compared to three quarters of women. Large disparities between SES groups were observed, including higher stage at presentation/presence of distant disease, higher rates of perioperative mortality, decreased utilization of surgical treatment, and decreased MST for lower SES. Distant stage was the strongest predictor of reduced survival reinforcing the importance of early detection. As tobacco use is also related to decreased survival, it is imperative to counsel patients on tobacco cessation. A relatively low use of hormone therapy and the protective effects of hypothyroidism need confirmation and further study.

Breast-Conserving Surgery in Bilateral Breast Cancer

Julie A. O'Brien¹, Alice Ho¹, G. Paul Wright², Michelle Stempel¹, Sujata Patil¹, Kate Krause¹, Monica Morrow¹, Mary L. Gemignani¹

¹Surgery, Memorial Sloan-Kettering Cancer Center, New York, New York, United States, ²Surgery, Michigan State University, Grand Rapids, Michigan, United States

Objective Patients with bilateral breast cancer (BBC) may present with synchronous breast cancer (SBC) or metachronous breast cancer (MBC). The optimal surgical management of patients with SBC or MBC is not well defined. The aim of this study was to evaluate uptake of breast-conserving surgery (BCS) and outcomes in patients with BBC.

Methods Institutional approval was obtained and patients were identified from a registered database. SBC was defined as an invasive BBC within 3 months of initial diagnosis. MBC was defined as an invasive BBC diagnosed ≥ 6 months from initial diagnosis. Patients diagnosed between 1999 and 2007 undergoing treatment of both invasive cancers at our institution were included. Demographics, histopathology, and treatment characteristics were examined to identify associations with BCS as surgical treatment. Interval to development of local and distant recurrence was calculated in each group; in MBC patients, local and distant recurrence was calculated at time of contralateral cancer diagnosis.

Results Of 130 BBC patients, 71 had SBC and 59 MBC. Median age was 58.8 years (range, 36-87 years) for SBC group and 52 years (range, 34-80) for MBC group. Table 1 shows pathologic findings and surgical procedure performed for each group. Majority of index and contralateral cancers had concordant pathologic findings. Median interval between cancers in the MBC group was 2.3 years (range, 0.4-6 years). MBC patients were significantly more likely to undergo BCS than patients with SBC. In the MBC group, the second (contralateral) cancer was less likely to be treated with BCS (p = 0.19). Twenty-three patients had BRCA testing; 4 of 7 SBC (5.6%) and 3 of 15 MBC (5.1%) were BRCA positive. Only 2 of 7 patients (29%) underwent BCS. Median follow-up was 8.5 years (range, 0.13-13.8 years) for SBC group and 10.6 years (range, 3.3-14.6 years) for MBC group. OS at 5 and 10 years was 85% (95% CI, 74-92 months) and 75% (95% CI, 62-84 months) for SBC patients, and 93% (95% CI, 83-97 months) and 77% (95% CI, 63-87 months) for MBC patients, respectively.

Conclusion BBC patients had concordant pathologic tumors and no difference in presentation between the 2 groups was identified. Although histopathologic characteristics did not differ significantly between SBC and MBC, SBC patients were less likely to proceed with BCS than MBC patients. However, uptake of BCS was slightly lower in MBC patients at diagnosis of contralateral breast cancer. Few patients were BRCA carriers, and thus further analysis into factors affecting decision-making is warranted.

Group	Tumor Median Size (cm) (range)	Multifocal/Multicentric n (%)*	ER+ n (%)*	HER-2/neu+ n (%)*	Lymph node + n (%)	BCS n (%)
SBC (n = 71)						
<i>Index</i>	1.2 (0.15-9)	21 (30%)	51 (73%)	6 (9%)	23 (32%)	19 (27%)
<i>Contralateral</i>	1.5 (0.2-6)	19 (27%)	54 (76%)	10 (14%)	30 (42%)	18 (25%)
MBC (n = 59)						
<i>Index</i>	1.4 (0.1-7)	17 (30%)	40 (70%)	4 (8%)	18 (31%)	31 (53%)
<i>Contralateral</i>	0.8 (0.1-6)	14 (24%)	36 (63%)	4 (7%)	21 (36%)	26 (44%)

*Percentage of available data.

Lymphatic-Venous Anastomosis to Prevent Breast Cancer-Related Lymphedema Using LYMPHA Technique: Preliminary Results of a Single-Institution Experience

Adewuni S. Ojo¹, Fatih Levent Balci¹, David Leung², Christine Rohde³, Sheldon Feldman¹

¹Breast Surgery, Columbia University Medical Center, New York, New York, United States, ²Radiology, Columbia University Medical Center, New York, New York, United States, ³Plastic Surgery, Columbia University Medical Center, New York, New York, United States

Objective With the use of sentinel node biopsy in breast cancer management, the incidence of lymphedema postoperatively is reported to be less than 15%; however, the incidence can be as high as 40% in patients undergoing axillary node dissection and axillary radiation. We report our preliminary experience using a lymphatic microsurgical preventive healing approach (LYMPHA) in preventing secondary lymphedema in high-risk breast cancer patients undergoing axillary dissection. This procedure was first described by Boccardo et al in *Annals of Surgical Oncology*, 2009.

Methods Seven women with mean age of 56 years (range, 45-75 years) underwent lymphatic-venous anastomosis performed by a surgeon skilled in microsurgery following axillary dissection for breast cancer. Using blue dye injected in the ipsilateral upper arm as a guide, the surgeon places 1 to 4 afferent lymphatics into a branch of the axillary vein, distal to a competent valve, and sutures them together using microsurgery techniques. The patients had lymphoscintigraphy preoperatively and at 3 months. They also underwent arm measurements and L-Dex bio-impedance spectroscopy for volumetric measurements of the arm pre-op, post-op at 2 weeks, 4 weeks, 3 months, 6 months with plan for 1- and 2-year post-op visits.

Results The mean +/- SD follow-up was 3.3 +/-2.1 months. All patients had baseline lymphoscintigraphy, which revealed no obstruction and absence of collateral lymphatic flow from the arm to the axilla. Five patients had follow-up imaging at 3 months, and 4 of the 5 (80%) had no change from baseline. One of the 5 (20%) had delayed lymphatic drainage on lymphoscintigraphy at 3 months, after radiation therapy (see patient #5 in following table). However, she had no significant difference in L-Dex or upper arm measurements from baseline to post-op. There was a nonsignificant mean difference in arm circumference from baseline to last follow-up visit, 0.6 cm (p = 0.33). One patient had an increase in arm circumference of 5 cm (see table). Of the 7 patients, 4 (57%) had an L-Dex measurement within normal range (defined as less than 10), while 2(29%) measurements were within intermediate range at follow-up.

Conclusion Based on our preliminary results, lymphatic-venous anastomosis using LYMPHA appears to be a promising technique for the prevention of secondary lymphedema in select patients. We will need long-term follow-up, as well as application to a larger group of women, while investigating the effects of radiation to further determine the extent of its effectiveness.

Objective Arm Measurements in Study Patients at Baseline and Most Recent Follow-Up

Patient	Breast Operation	Last Follow-Up (Months)	Baseline L-Dex	L-Dex at Last Exam	Baseline Pre-Op Mid Upper Arm Measurements for Affected Side (cm)	Mid Upper Arm Measurements for Affected Side at Last Exam (cm)	Difference in Arm Measurements From Baseline to Last Exam
1	Partial mastectomy	6	3.6	11.3	38.0	31.0	7.0
2	Mastectomy	6	10.0	43.6	32.5	29.6	2.9
3	Mastectomy	3	0.2	0.9	24.0	24.0	0
4	Mastectomy	3	4.9	-2.9	37.0	42.0	-5.0
5	Mastectomy	3	7.7	7.7	31.0	30.5	0.5
6	Partial mastectomy	1	0.5	5.9	29.4	30.2	-0.8
7	Partial mastectomy	1	-2.0	4.5	32.0	32.0	0

Fibrin Sealant to Reduce Drainage After Axillary Dissection

Oded Olsha¹, Tal Hadar¹, Ribhi Abu Dalo¹, Naomi Verocherinsky², Itamar Ashkenazi³

¹Surgery, Shaare Zedek Medical Center, Jerusalem, Israel, ²Nursing Services, Shaare Zedek Medical Center, Jerusalem, Israel, ³Surgery, Hillel Yaffe Medical Center, Hadera, Israel

Objective After axillary dissection, drains are left in place for 5 to 10 days until 24 hour drainage decreases to a predetermined amount, almost always less than 50 ml per day. The harmonic scalpel (Harmonic Focus, Ethicon Endo-Surgery, Cincinnati, OH) and electrothermal bipolar vessel sealing (Ligasure, Covidien, Dublin, Ireland) have shown promise in reducing axillary drainage when compared with unipolar diathermy, but are expensive. TachoSil (Nycomed, Linz, Austria) is a fibrin sealant that has proven efficacy in the control of surgical hemorrhage in a variety of tissues. There is evidence suggesting that it may also reduce axillary drainage and it is less expensive by 30%-40% than instruments used for vessel sealing. Fibrin sealant was used as standard in axillary dissection and the number of days of axillary drainage were recorded for each patient as well as any adverse effects.

Methods The use of fibrin sealant in patients undergoing axillary dissection was prospectively documented. A patch 9.5 cm x 4.8 cm in size was placed over the axillary vein to cover the vein and the space between pectoralis minor and the chest wall medially, and the area over the exit of the intercostobrachial nerve and axillary vein laterally. Axillary drains were removed when drainage was less than 50 ml/24 hours or if there was leakage around the drain sufficient to stain the patient's clothing.

Results Twenty-three consecutive patients undergoing axillary dissection who had fibrin sealant placed at the end of the procedure were included in this study. Seven had neoadjuvant chemotherapy. One of the patients had sentinel node biopsy before axillary dissection, and the rest had axillary dissection on the basis of known lymph node metastases. One additional patient had axillary dissection without breast surgery for axillary recurrence a year after mastectomy and negative sentinel node biopsy. Twelve patients had a simultaneous mastectomy. All 12 patients with concurrent mastectomy had an additional drain under the skin flaps and 7 other patients had breast drains as part of their oncoplastic resections. The average number of lymph nodes removed was 25 (median, 23; range, 10 to 59). The average number of metastatic lymph nodes was 6 (median, 3; range, 0 to 59). Axillary drains were removed at a median of 4 days (mean, 5.0; range, 1 to 14). Fifteen (65%) of the axillary drains were removed on or before the fourth day (see table). Complications were axillary seroma that did not require drainage (1), axillary cellulitis that resolved with oral antibiotics (2), fever without an identifiable source (1), breast flap seroma (2) of which 1 was drained, and infection under breast flaps requiring open drainage (2).

Conclusion The use of fibrin sealant in axillary dissection limited the duration of axillary drainage compared with that quoted in the literature and may be an easy, useful and less expensive alternative to vessel-sealing instruments.

Duration of Axillary Drainage Using Fibrin Sealant in 23 Patients

Drain Removed Postoperative Day	No. of Patients	Cumulative (% of total)
1-2	2	9
3-4	13	65
5-6	3	78
7-8	4	96
9-14	1	100

Surgical Treatment of Borderline and Malignant Phyllodes Tumors: the Effect of the Extent of Resection and Tumor Characteristics on Patient Outcomes

Edwin O. Onkendi¹, Rafael E. Jimenez², Grant M. Spears³, William S. Harmsen³, Karla V. Ballman³, Tina J. Hieken¹

¹Surgery, Mayo Clinic, Rochester, Minnesota, United States, ²Pathology, Mayo Clinic, Rochester, Minnesota, United States, ³Biomedical Statistics and Informatics, Mayo Clinic, Rochester, Minnesota, United States

Objective Malignant phyllodes tumors (MPT) are rare fibroepithelial neoplasms constituting <1% of breast neoplasms. The aim of this study was to define the optimal surgical treatment of these lesions, as well as factors associated with outcome.

Methods We retrospectively identified 67 patients with borderline (14) and malignant (53) phyllodes tumors treated at our institution between 1971 and 2008. Pathology slides were reviewed to confirm the diagnosis in all cases. Patient and tumor features were analyzed. Cox proportional hazards models were used to determine associations of treatment and patient/disease characteristics associated with disease-free survival (DFS) and reported as hazard ratios (HRs) with 95% confidence intervals (CIs).

Results All patients were female with a median age of 46 years. Overall, 31 patients were treated by wide local excision (WLE), of whom 26 were treated by WLE with margins ≥ 1 cm and 5 by WLE with margins <1 cm. Thirty-five patients were treated by mastectomy. Four patients received adjuvant radiotherapy: 2 following WLE and 2 following mastectomy with microscopically positive margins. After a median follow-up of 10 years (range, 1 to 34 years), 17 patients (25%) developed recurrent disease (9 after mastectomy and 8 after WLE). Larger tumor size (>5 cm), mitotic rate ≥ 10 per 10 HPF, stromal overgrowth, and high stromal cellularity were associated with a greater likelihood of disease recurrence while the degree of cytologic atypia was not (see table). There was no difference in DFS for patients treated by mastectomy vs WLE (HR = 1.51; 95% CI: 0.63-3.60; $p = 0.35$). There was no discernible difference in DFS for WLE by margin extent <1 cm vs ≥ 1 cm, $p = 0.53$.

Conclusion We found no difference in disease-free survival for patients with borderline and malignant phyllodes tumors treated by WLE vs mastectomy. Margin width did not impact disease-free survival. Stromal overgrowth, mitoses $\geq 10/10$ HPF, large tumors >5 cm, and high stromal cellularity were associated with an increased risk of recurrence, suggesting that different therapeutic strategies for these high-risk patients are needed.

Effect of Age and Tumor Characteristics on Tumor Recurrence

Patient and Tumor Features	No Recurrence N (%)	Recurrence N (%)	Hazard Ratio (95% CI)	P Value
Age per 10 years	45.7 ± 16.0	50.8 ± 10.6	1.27 (0.95, 1.71)	0.11
Tumor size, cm				
< 5	30 (66.7)	7 (36.8)	1.00 (reference)	0.04
5-10	7 (15.6)	8 (42.1)	3.51 (1.27, 9.69)	
>10	8 (17.8)	4 (21.1)	3.01 (0.88, 10.37)	
Mitoses per 10 HPF				
< 10	22 (56.4)	4 (21.1)	1.00 (reference)	0.04
≥ 10	17 (43.6)	15 (79.0)	3.24 (1.07, 9.76)	
Stromal overgrowth				
Absent	39 (86.7)	10 (45.5)	1.00 (reference)	< 0.0001
Present	6 (13.3)	12 (54.6)	7.13 (2.91, 17.46)	
High stromal cellularity				
No	41 (91.1)	17 (77.3)	1.00 (reference)	0.011
Yes	4 (8.9)	5 (22.7)	3.71 (1.35, 10.21)	
Moderate/marked atypia				
Absent/mild	27 (60.0)	15 (68.2)	1.24 (0.50, 3.04)	0.78
Moderate/marked	18 (40.0)	7 (31.8)	1.00 (reference)	

Biology: Most Important Factor in Stage of Presentation in African American Women*

Tawakalitu Oseni, Peter Soballe

Naval Medical Center San Diego, San Diego, California, United States

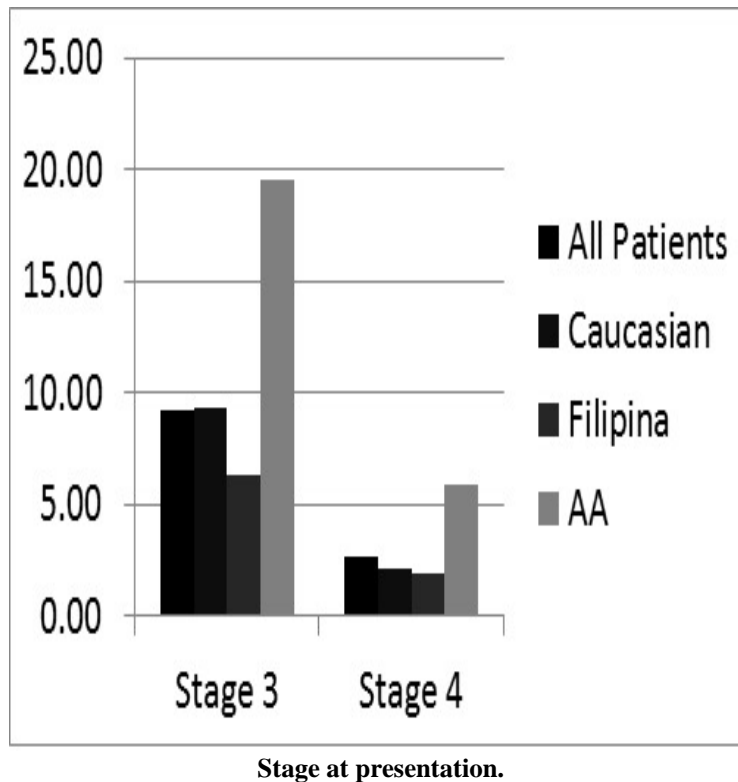
Objective African American (AA) women present with more aggressive breast tumors and at later stages than Caucasian women. Many factors have been proposed to explain these findings, including socioeconomic status, cultural beliefs, and access to medical care. The aim of this project was to determine if, in a model that provided equal access to care and equal screening, stage at presentation would be equivalent.

Methods In this cross-sectional study, the tumor registry at our institution from 2007 to 2012 was queried. Eligible included all women diagnosed and treated with breast cancer at our institution.

Results A total of 629 women were treated for breast cancer from 2007 to 2012. Overall, 26%, 36%, and 25% of women presented with stage 0, 1, and 2 disease, respectively; 12% presented at stage 3 or 4. Caucasian women followed this profile closely with 24%, 37%, and 28% of women presenting with stage 0, 1, and 2 disease respectively. Eleven percent of Caucasian women presented with stage 3 or 4 disease. In comparison, 16%, 35%, and 23% of African American women presented with stage 0, 1, and 2 disease, but 25% presented with stage 3 and 4 disease. Filipina women closely mirrored the institution curve (see following figure). When evaluated by hormone receptor (HR) status, 31% of African American women presented with HR-negative tumors, more than double the rate of HR-negative tumors in Caucasians. Of the 629 women treated for breast cancer, 38% of women received chemotherapy. However, only 35% of Caucasian women and Filipinas received chemotherapy vs 61% of African American woman.

Conclusion In a military health system with equal access to care and standard screening recommendations, African American women present with breast cancer at later stages and with more hormone-receptor negative tumors. Tumor biology may be the most significant factor in influencing stage at presentation for African American women presenting with breast cancer.

continues



*The views expressed in this article are those of the author(s) and do not necessarily reflect the official policy or position of the Department of the Navy, Department of Defense, or the U.S. Government. The views expressed in this article are those of the author(s) and do not necessarily reflect the official policy or position of the Department of the Navy, Department of Defense, or the U.S. Government.

False-Positive Extramammary Findings in Breast MRI: Another Cause for Concern

Shilpa Padia, Mary E. Freyvogel, Stephen Grobmyer, Stephanie Valente, Jill Dietz

Breast Surgery, The Cleveland Clinic, Cleveland, Ohio, United States

Objective Breast MRI has repeatedly been shown to have a high false-positive rate for additional findings in the breast, resulting in additional breast imaging and biopsies. We hypothesize that breast MRI is also associated with a high rate of false-positive findings outside of the breast, requiring additional evaluation, interventions, and delays in treatment.

Methods We completed a retrospective review of all breast MRIs performed on breast cancer patients in 2010 at a single institution. MRI reports were analyzed for extramammary findings. The timing and yield of the additional procedures and tests was also analyzed.

Results Three hundred twenty-seven breast cancer patients (average age = 53.5 ± 11.1 years) had a breast MRI. Incidental extramammary findings were reported in 34/327 patients (10.4%). The 34 extramammary findings were located in the liver (n = 20, 58.9%), thoracic cavity (n = 12, 35.3%), kidneys (n = 1, 2.9%), musculoskeletal system (n = 3, 8.8%), and neck (n = 1, 2.9%). Seventeen of the 34 patients (50%) received additional radiographic imaging, 3 (8.8%) received additional laboratory testing, 2 (5.8%) received additional physician referrals, and 2 (5.8%) received a biopsy of the finding. The average time to additional procedures in these patients was 15 days. None of the incidental extramammary findings were associated with breast cancer or other malignancy.

Conclusion Breast MRI was associated with a high rate (10.4%) of extramammary findings, which led to costly additional imaging studies, referrals, and tests. These findings were not associated with breast cancer or other malignancies. Extramammary findings highlight an unrecognized adverse consequence of breast MRI.

Axillary Reverse Lymphatic Mapping Reduces Patient-Perceived Incidence of Lymphedema After Axillary Dissection in Breast Cancer

Jennifer Pasko², Jennifer R. Garreau¹, Margie Glissmeyer¹, Nathalie Johnson¹

¹Surgical Oncology, Legacy Good Samaritan Hospital, Portland, Oregon, United States, ²General Surgery, Oregon Health and Science University, Portland, Oregon, United States

Objective Axillary reverse mapping (ARM) facilitates identification of arm lymphatic channels during axillary dissection. It has been suggested that this technique may decrease the incidence of lymphedema. The purpose of our study was to determine whether use of ARM has decreased the subjective incidence of lymphedema.

Methods One hundred forty-two patients who underwent axillary dissection (> than 10 nodes) between 2009 and 2012 at a community hospital were identified. Questionnaires were mailed to those patients. Questions were posed with regard to their upper extremity symptoms following reverse mapping and axillary dissection.

Results Of the 142 surveys mailed, 30 were returned undelivered. This left 112 mailed with 46 answered for a response rate of 41%. There was a reported incidence of lymphedema of 39% in the overall group. Of the 22 who reported reverse mapping (ARM), the incidence of lymphedema was only 27% (6/22) vs 50% (12/24) in the traditional dissection (TD) group. In the ARM group, only 4/22 are using a compression garment vs 11/24 in the TD group. Complaints of inner arm numbness were equal in both groups. Numbers did not achieve statistical significance.

Conclusion ARM may reduce the incidence of patient-reported lymphedema. ARM may correlate with reduced use of compression garments, suggesting that incidence of clinical lymphedema may be lower in the reverse mapping group. Additional studies with greater patient numbers are warranted.

Atypical Ductal Hyperplasia on Percutaneous Biopsy: Predicting Low Risk of Cancer Upgrade

Alvaro Pena¹, Rushin Brahmhatt¹, Robert Fazio², Tanya L. Hoskin³, Daniel W. Visscher⁴, Sejal S. Shah⁴, Tina J. Hieken¹, Judy C. Boughey¹, James W. Jakub¹, Amy C. Degnim¹

¹Surgery, Mayo Clinic, Rochester, Minnesota, United States, ²Radiology, Breast Imaging Unit, Mayo Clinic, Rochester, Minnesota, United States, ³Biomedical Statistics and Informatics, Mayo Clinic, Rochester, Minnesota, United States, ⁴Anatomic Pathology, Mayo Clinic, Rochester, Minnesota, United States

Objective Atypical ductal hyperplasia (ADH) identified on percutaneous breast biopsy is a high-risk lesion with a variable upgrade frequency to cancer (~10-30%) with surgical excision. Routine surgical excision is questioned due to growing concern about overtreatment and excessive costs. This study evaluates the use of clinical and imaging features to predict risk of upgrade to cancer.

Methods After IRB approval, a single-institution retrospective review was performed of patients who underwent surgical excision of ADH diagnosed by core needle biopsy from October 2008 to June 2013. During this time, surgical excision was routine for all ADH on core biopsy. Clinical and imaging features were gathered by review of electronic records and images. The association of these features cancer upgrade was assessed with logistic regression.

Results Two hundred thirty-six biopsies were included in 232 patients with ADH on core biopsy with subsequent surgical excision, with median age 56 (range, 38-86) years. Imaging findings were as follows: calcifications only (171/236 = 72.5%); mass, asymmetry, or architectural distortion without calcifications (48/236 = 20.3%); both calcifications and mass/asymmetry/distortion (12/236 = 5.1%); other (5/236 = 2.1%). The median number of cores obtained per biopsy was 10 (range, 1-24), and size of the biopsy needle was 9 G in 25%, 11 G in 59%, 14 G in 15%, and 18 G in 1%. Thirty lesions were upgraded to cancer at excision (26 DCIS, 4 invasive cancer), for an overall upgrade rate of 12.4% (95% CI: 9.1% - 17.6%). On univariate analysis, the estimated percent of lesion removed ($p = 0.006$) and the pre-biopsy lesion size ($p = 0.02$) were each significantly associated with upgrade and also strongly correlated with each other ($r = -0.61$). Cancer upgrade was less frequent with greater percentage of the lesion removed by core biopsy: upgrade rate was 23% with <50% of the lesion removed by core biopsy, 10% with 50-75% removed, and 7% with >90% removed. By categories of lesion size, the proportions with upgrade were 3.3% in those <5 mm, 9.9% for 5-10 mm, 15.8% for those 11-15 mm, and 22.5% for those >15 mm ($p = 0.009$). Lesions with imaging findings of only calcifications showed 11.1% upgrade compared to 15.0% among those with mass/asymmetry/distortion ($p = 0.39$). Upgrade rates decreased with increasing size of biopsy needle (nonsignificant trend, $p = 0.09$), with upgrade rates of 23%, 13%, and 6%, for 14G, 11G, and 9G, respectively. Two multivariate models were assessed, both including age and imaging finding of calcifications only. In the first model, estimated percent of lesion removed was also included and was the only independent predictor of upgrade [OR, 4.1 (95% CI:

1.4-11.9) for <50% removed; OR, 1.44 (95% CI: 0.4-4.14) for 50-75% removed; reference, 90% removed; p = 0.02]. In the second model, lesion size was included and found to be the only independent predictor of upgrade [OR, 1.23 (95% CI: 1.05-1.44) per 5-mm increase, p = 0.01].

Conclusion More complete lesion removal during core needle biopsy and smaller pre-biopsy lesion size on imaging predict lower risk of upgrade to cancer following core needle biopsy showing ADH. Future prospective studies are necessary to determine safety of clinical observation rather than surgical excision for low-risk ADH lesions.

Surgical Margin Reporting in Breast-Conserving Surgery: Does Compliance With Guidelines Affect Re-excision and Mastectomy Rates?

Sarah Persing¹, Brian Sprague¹, Ted A. James^{1,2}, Peter Callas¹, John Mace¹, Mairin Jerome¹, Michelle M. Sowden^{1,2}, Andrew J. Goodwin^{1,3}, Donald L. Weaver^{1,3}

¹The University of Vermont College of Medicine, Burlington, Vermont, United States, ²Department of Surgery, Fletcher Allen Health Care, Burlington, Vermont, United States, ³Department of Pathology, Fletcher Allen Health Care, Burlington, Vermont, United States

Objective For patients with breast cancer, margin status is an important factor guiding decisions to re-excise or perform a mastectomy following breast-conserving surgery (BCS). The College of American Pathologists (CAP) developed guidelines to standardize pathology reporting; however, compliance with these margin documentation guidelines has been shown to vary. The aim of this retrospective study was to determine whether varying levels of compliance with CAP guidelines affects re-excision and mastectomy rates for women undergoing BCS.

Methods Using the statewide Vermont Breast Cancer Surveillance System (VBCSS) database, we identified 1,423 patients diagnosed with breast cancer between 1998 and 2006 who underwent BCS with negative margins after initial surgery. The diagnoses included invasive carcinoma (ductal or lobular), ductal carcinoma in situ (DCIS), or mixed invasive/DCIS. CAP compliance was categorized as either maximal (all 6 margins reported), minimal (distance to closest negative margin reported), or noncompliant (distance to closest negative margin not documented). Statistical analyses were performed, comparing the frequency of re-excision and mastectomy after initial BCS according to level of CAP margin-reporting guideline compliance.

Results Of the 1,423 cases reviewed, 629 (44%) were maximally compliant, 487 (34%) were minimally compliant, and 307 (22%) were noncompliant with CAP protocols. Patients who had noncompliant margin-reporting following their initial surgeries were 1.9 times (95% CI, 1.4-2.6; p < 0.001) more likely to undergo re-excision and/or mastectomy than patients whose reports were maximally compliant. Level of compliance was most strongly associated with the frequency of mastectomy; noncompliant margin reporting was associated with a 3.8-fold (95% CI, 2.3-6.3; p < 0.001) increase in mastectomy rates, compared to maximally compliant reporting. This trend persisted after adjusting for potential confounders. The frequency of re-excision and/or mastectomy was also elevated for minimally compliant reporting compared to maximally compliant reporting (see following table).

Conclusion Our study demonstrates that the level of CAP guideline compliance in pathology reporting may influence surgeons' decisions to re-excise or perform a mastectomy. Maximally compliant reporting with documentation of all 6 margins had lower rates of re-excision and mastectomy compared to noncompliant reports. Additionally, compliance with reporting guidelines may represent a surrogate marker for other system-level factors influencing re-excision and mastectomy rates. Our findings suggest that standardizing guideline compliance may help identify parameters for re-excision and mastectomy following BCS.

Pairwise Comparisons of Levels of Compliance and Re-excision and/or Mastectomy

	Unadjusted			Multivariable Adjusted*		
	Odds Ratio	95% CI	P-Value	Odds Ratio	95% CI	P-Value
Re-excision or mastectomy						
Maximally compliant	1	Ref	Ref	1	Ref	Ref
Minimally compliant	1.65	1.24, 2.19		1.6	1.14, 2.24	0.01
Non-compliant	1.91	1.39, 2.64		1.66	1.12, 2.47	0.01
Re-excision						
Maximally compliant	1	Ref	Ref	1	Ref	Ref
Minimally compliant	1.55	1.13, 2.11	0.006	1.59	1.10, 2.31	0.01
Noncompliant	1.12	0.77, 1.63	0.55	0.93	0.57, 1.50	0.75
Mastectomy						
Maximally compliant	1	Ref	Ref	1	Ref	Ref
Minimally compliant	1.8	1.07, 3.03	0.03	1.46	0.84, 2.54	0.18
Noncompliant	3.78	2.27, 6.28		2.67	1.50, 4.75	

*Adjusted for age, procedure year, cancer type, grade, and tumor size.

Contemporary Upgrade Rates on Excisional Breast Biopsy for Radiology-Pathology Discordant Core Biopsies

Barish Poole¹, Julie Wechsler², Pulin Sheth³, Stephen F. Sener², Debu Tripathy⁴, Mary Yamashita³, Lina Wang⁵, Christy Russell⁴, Meade Johnson³, Linda Larson³, Julie E. Lang²

¹Keck School of Medicine, University of Southern California, Los Angeles, California, United States, ²Division of Breast & Soft Tissue Surgery, Department of Surgery, USC Norris Comprehensive Cancer Center & Los Angeles County Medical Center (LAC+USC), Los Angeles, California, United States, ³Division of Breast Imaging, Department of Radiology, USC Norris Comprehensive Cancer Center & Los Angeles County Medical Center (LAC+USC), Los Angeles, California, United States, ⁴Division of Hematology & Oncology, Department of Medicine, USC Norris Comprehensive Cancer Center & Los Angeles County Medical Center (LAC+USC), Los Angeles, California, United States, ⁵Pathology, USC Norris Comprehensive Cancer Center & Los Angeles County Medical Center (LAC+USC), Los Angeles, California, United States

Objective In recent years, vacuum-assisted core-needle biopsy (VAB) technique has been increasingly used to perform breast biopsies instead of automated gun core needle biopsy (CNB). Because the incidence rate of discordant core biopsies and subsequent malignancy after surgical excision of discordant abnormalities are not well characterized, this study was done to determine these rates at our 2 institutions.

Methods Medical records from January 2008 to June 2013 were retrospectively reviewed to identify female patients who underwent excisional breast biopsy for a BI-RADS 4 or 5 lesion found to be benign and discordant on core-needle biopsy. Patients were included from 2 centers, one a large safety-net teaching hospital where attending-supervised residents shared responsibility for radiological procedures and concordance determination and the other a private academic cancer center where an attending radiologist performed both biopsy and correlation for each patient. Clinicopathologic data were gathered and statistical analysis performed using descriptive statistics.

Results A total of 8,081 core biopsies were performed from January 2008 to June 2013—5,919 in the public setting and 2,162 in the private setting. Eighty-one patients fit our inclusion criteria—55 at the public facility and 26 at the private facility. In total, our 2 hospitals performed a mean of 14.7 excisional biopsies per year for discordant findings. The median age was 49. Eighty-one patients underwent 101 core-needle biopsies, resulting in discordant results, representing 74 of 5,919 biopsies (1.3%) at the public facility and 27 of 2,162 biopsies (1.2%) at the private facility. Six of 81 (7.4%) patients were found to have malignant pathology after excisional biopsy (2 invasive, 4 in situ). The malignancy rate in the public setting was lower than in the private setting (5.5% vs 11.5%; p = 0.38). Of 54 lesions in the public setting for which method of biopsy was known, 37 (68.5%) biopsies were VAB and 17 (31.5%) were CNB. All biopsies done in the private setting were VAB. The median time from last biopsy to surgery was 151 days at the public facility and 32 days at the private facility. Five of 72 (6.9%) patients with a BI-RADS 4

lesion and 1 of 9 (11.1%) patients with a BI-RADS 5 lesion were upgraded to malignancy after excisional biopsy. Four of 63 (6.3%) lesions biopsied by VAB were upgraded, compared to 2 of 17 (11.8%) biopsied by CNB. Neither variation in malignancy upgrade rates stratified by BI-RADS score or biopsy technique was statistically significant ($p = 0.52$ and $p = 0.60$).

Conclusion The overall rate of radiology/histology discordance was similar at the 2 facilities. After core biopsy for BI-RADS 4 and 5 abnormalities demonstrated benign but discordant findings, excisional biopsy revealed a malignancy rate of 7.4%. Although the malignancy rates in the excised specimens at the public hospital were half that at the private hospital, they were not significantly different. This study did reveal that at the public hospital the median time between last biopsy and excision was 151 days, which will become the focus of a quality improvement initiative.

Do Primary Care Physicians Perform Clinical Breast Exam Prior to Ordering a Mammogram?

Debra Pratt¹, Mita Patel¹, Colin O'Rourke², Michael Cowher¹

¹Breast Services, Cleveland Clinic, Cleveland, Ohio, United States, ²Quantitative Health Sciences, Cleveland Clinic, Cleveland, Ohio, United States

Objective Both the American Cancer Society and the National Comprehensive Cancer Network recommend annual clinical breast exam (CBE) along with screening mammogram (SM) from age 40 onward. However, patients with breast mass or other symptoms should have diagnostic mammograms (DM) during workup. In a recent review of 900 breast cancer patients at our institution, 331 (36.8%) had self-identified a mass at the time of diagnosis. Of these, 11% had a bilateral SM instead of DM. This finding led us to question whether primary care physicians (PCP) perform a CBE prior to ordering a mammogram.

Methods The question "Did you have a breast examination by your medical provider prior to your mammogram order?" was included in the questionnaire patients completed before their mammograms. We reviewed these questionnaires for both SM and DM performed at our facility from January 2013 to June 2013. The mammogram type, ordering physician specialty, and presence of symptoms on the day of mammogram were recorded.

Results Of 6,109 mammograms, 4,823 were ordered by PCPs: OB-GYN, Family Practice, or Internal Medicine. A CBE was performed prior to 64.82% of the DM and 67.22% of the SM. There was a statistically significant difference between the specialties of PCP (see following table). OB-GYN physicians performed CBE in 81.6%, while Internal Medicine and Family Practice doctors performed CBE 45% and 50.5%, respectively. Of patients with self-reported breast symptoms, 8.7% had an SM ordered.

Conclusion Whether diagnostic or screening, one third of women report not having a CBE prior to mammogram. For women with palpable but mammographically occult masses, this lack of CBE by their PCP risks a delay in diagnosis of breast cancer. In addition to the lack of CBE leading to the incorrect type of mammogram being ordered, there are also increased unnecessary costs if an SM is performed separately prior to an indicated DM. The reasons for the lack of breast examination was not evaluated in this study, and further study should examine both patient and physician factors that may lead to this. PCPs should perform breast examination to determine if the patient is an SM candidate or if a DM is indicated.

Clinical Breast Exams by Mammogram Type, for PCPs

Factor		Total	No CBE		CBE Given		Test Statistic	P value (c)
			N	Percent	N	Percent		
Mammogram type		4823					2.39	0.12
	Diagnostic	1336	470	35.18	866	64.82		
	Screening	3487	1143	32.78	2344	67.22		
Specialty		4823					624.54	
	IM	1233	673	54.58	560	45.42		
	FM	897	444	49.5	453	50.5		
	OB/GYN	2693	496	18.42	2197	81.58		

c = Pearson's chi-square test with Yates' continuity correction

Pseudoangiomatous Stromal Hyperplasia (PASH) on Needle Biopsy Does Not Require Surgical Excision

Adam Protos^{2,3}, Kim Nguyen³, Jamie Caughran^{1,2,3}, Michael Naski¹, Jessica Keto^{1,2,3}

¹Comprehensive Breast Program, Mercy Health System, Grand Rapids, Michigan, United States, ²General Surgery, Grand Rapids Medical Education Partners, Grand Rapids, Michigan, United States, ³General Surgery, Michigan State University, Grand Rapids, Michigan, United States

Objective Pseudoangiomatous stromal hyperplasia (PASH) is an uncommon, benign localized fibrotic lesion. The relationship of PASH to breast cancer and its precursors have not been well characterized. Historically, PASH has been difficult to differentiate from angiosarcoma. This difficulty has led to recommendations of surgical excision when PASH is identified in a needle biopsy to exclude angiosarcoma or other high-risk lesions. We sought to identify the incidence of upgraded pathology on surgical excisional biopsy after PASH was identified in a needle biopsy.

Methods A 10-year retrospective review of a single institution was conducted, including all cases of PASH confirmed on core-needle biopsy. The data set was then divided into patients who underwent excisional biopsy and those who were followed with imaging alone. The incidence of subsequent malignancy or high-risk pathology on histologic analysis or the presentation of suspicious imaging was then investigated, as well as the duration of follow-up.

Results A total of 38 patients were found to have PASH on core-needle biopsy. Demographic data collected included age (mean, 48.7 years), personal history of breast cancer (9.3%), family history of breast cancer (19.3%), history of breast lumps (43.8%) and palpable vs mammographic presentation (23.7% vs 76.3%, respectively). Histologic and pathologic associations were also examined. Twenty patients (52.6%) were treated with surgical excision and 18 (47.4%) were followed with imaging alone. The 2 groups were of similar age (excisional group, 47.25 years; imaging, 50.44 years), however, differed significantly on their presentation. Of patients in the excisional biopsy group, 40% presented with a palpable mass. Only 5.6% of patients presenting with imaging findings underwent surgical excision. The mean follow-up times for the excisional biopsy vs imaging-only groups were 37 and 33 months, respectively. No upgraded diagnoses of malignancy or high-risk pathology following confirmation of PASH were identified in either group (95% CI, 0-9.4%).

Conclusion PASH is a benign breast lesion which has traditionally been thought of as a high-risk lesion requiring excision. However, excisional biopsy or follow-up imaging of all patients resulted in no new pathology, including malignancy or high-risk lesions at 3-year follow-up. This challenges traditional management strategies for PASH and may result in sparing patients from unnecessary and costly surgical intervention. Larger, prospective trials assessing demographic and histologic characteristics with longer follow-up time are essential in further stratifying patients' risk for the possible development of future malignancy.

Sentinel Node Frozen-Section Diagnosis for Infiltrating Lobular Breast Cancer Is More Than Ever a Worthwhile Endeavor

James Recabaren^{1,2}, Gabriel Akopian²

¹Surgery, University of Southern California, Pasadena, California, United States, ²Surgery, Huntington Hospital, Pasadena, California, United States

Objective The benefit of intraoperative frozen section for breast axillary sentinel node evaluation has been reported extensively in peer-reviewed literature. If the sentinel node is found to be positive, the benefit of intraoperative analysis is either the performance of an immediate axillary dissection (ALND) or inclusion in a Z0011-based dissection-sparing group. When reported, the proportion of invasive lobular carcinoma approximates only 8-12% of the total breast cancer histology. However, recent data also suggest that the incidence of invasive lobular carcinoma has increased in the last decade. Many pathology departments believe that invasive lobular carcinoma is more difficult to detect by intraoperative frozen analysis because of the "benign looking" appearance of the metastatic cancer cells. This could have a major impact on overall sentinel node evaluation as the incidence of invasive lobular breast cancer continues to increase.

Methods Using a prospective database (January 1998-February, 2003), the sentinel node frozen-section results of 507 consecutive patients were analyzed. The patients with invasive lobular carcinoma (ILC) and invasive ductal carcinoma (IDC) were divided into 2 cohorts. The sensitivity of the intraoperative frozen-section results was compared to the final pathologic diagnosis. The frozen-section results of the 2 groups were analyzed by standard statistical methods.

continues

Results There were a total of 507 patients eligible for analysis. Seventy-seven patients were excluded by the study criteria (noninvasive disease, frozen-section not performed, and other histology). Fifty patients (12%) had confirmed invasive lobular carcinoma with an intraoperative frozen-section performed. The remaining 380 patients (88%) had invasive ductal carcinoma with intraoperative frozen section performed. The sensitivity of intraoperative frozen section in the ILC group was 94.7% and 92.3% in the IDC group. The difference between the frozen-section sensitivity in the 2 groups failed to be statistically significant ($p = 0.72$ by Pearson's chi-square test).

Conclusion Invasive lobular carcinoma is increasing in incidence. As long as intraoperative frozen-section evaluation of sentinel node is supported by the literature, the accuracy for invasive lobular carcinoma will continue to be questioned. We propose that intraoperative frozen-section evaluation for invasive lobular carcinoma is noninferior when compared to invasive ductal carcinoma. Intraoperative frozen-section evaluation of invasive lobular carcinoma should not be abandoned.

Axillary Burden of Disease Following False-Negative Preoperative Axillary Evaluation

Chantal Reyna, Anne Frelick, Nazanin Khakpour, Christine Laronga, Marie Lee, John Kiluk
H. Lee Moffitt Cancer Center, Tampa, Florida, United States

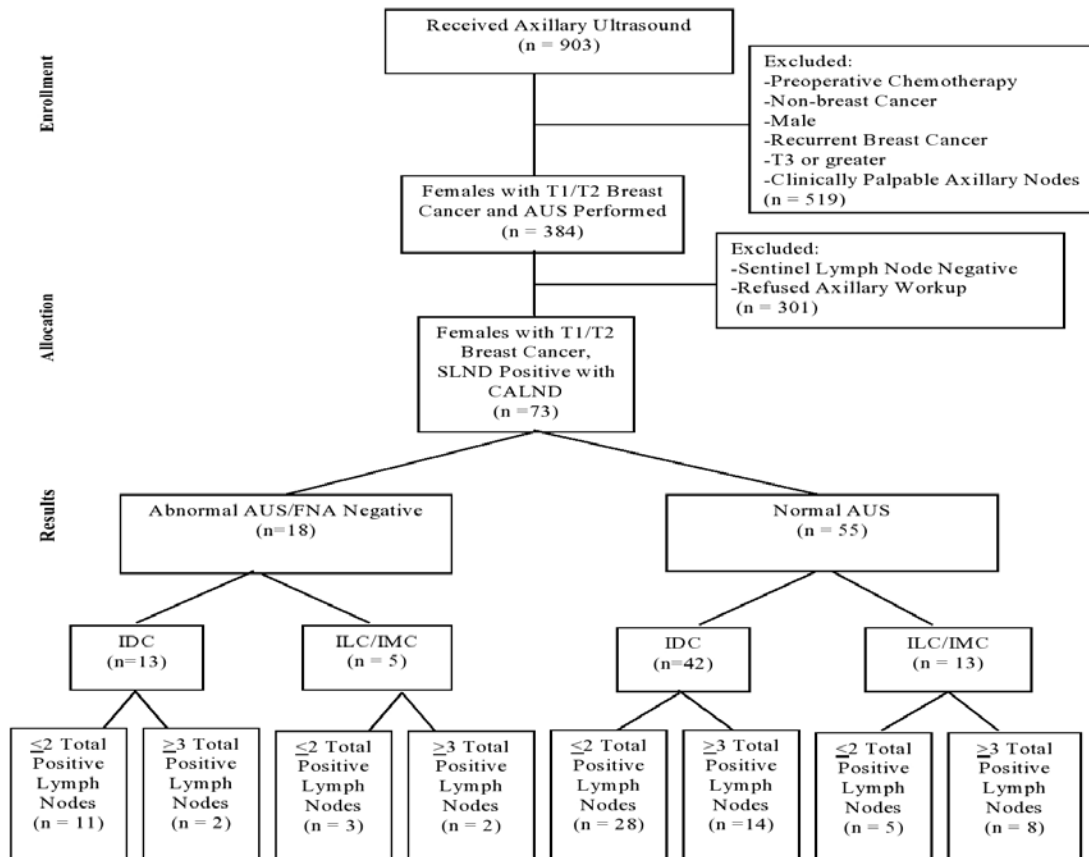
Objective Recent advances have markedly impacted axillary management in breast cancer. Preoperative AUS and FNA have a sensitivity of 79-100% and specificity of 96-100% for axillary metastasis. Our hypothesis is that a false-negative AUS and FNA is predictive of minimal axillary disease at definitive surgery.

Methods After IRB approval, a single-institution, retrospective chart review of female breast cancer patients receiving preoperative AUS from 2004-2013 was performed. Preoperative chemotherapy, recurrent breast cancer, T3 or greater disease, clinically palpable nodes, and inconclusive FNA (2 cases) were excluded. Patients with a subsequent positive sentinel node biopsy (SLN) and completion axillary dissection (CALND) were selected for further evaluation. Minimal axillary disease was defined as ≤ 2 positive nodes after SLN and CALND. Clinical, radiologic, and pathologic data were collected and analyzed by chi-square using Fisher exact test.

Results A total of 903 AUS were performed; 384 fit inclusion criteria. The false-negative rate of AUS was 47% and 45% for AUS plus FNA. The overall negative predictive value (NPV) of a negative AUS/FNA workup was 78%. Seventy-three cases had positive SLN followed by CALND. Fifty-five of these 73 patients (75.3%) had invasive ductal carcinoma (IDC); 18 (24.6%) had invasive lobular or invasive mammary carcinoma (ILC/IMC). There was no difference in AUS sensitivity between IDC and ILC ($p = 0.76$) for axillary disease. When stratified by histology, the NPV of a negative axillary work-up (AUS +/-FNA) was 71% for minimal nodal disease in IDC, compared to 44% for the ILC/IMC group. Nineteen of 55 (34.5%) with IDC had non-SLN metastasis after ALND; 10/18 (55.5%) ILC/IMC had NSLN metastasis ($p = 0.17$). Only 16 patients (29.0%) of the IDC group had ≥ 3 positive lymph nodes (range, 3-10), while 10 of the ILC/IMC group had (55.5%) ≥ 3 positive lymph nodes (range, 3-17) ($p = 0.05$).

Conclusion Use of preoperative AUS and FNA is increasing, as axillary nodal extension remains an important finding due to its impact on treatment. Our study demonstrates a high NPV of AUS/FNA for IDC, and in false-negative evaluations, the pathologic burden of axillary disease is low, with fewer than 2 positive nodes in the majority of cases at CALND. These results could not be replicated in non-IDC cases. Histology should be considered when considering CALND after negative AUS/FNA.

Figure 1. Consort Diagram of the Axillary Burden of Disease Following False Negative Preoperative Axillary Evaluation



Metaplastic Breast Cancer: Mastectomy Offers Greater Recurrence-Free Survival

Aaron S. Rickles¹, Melissa Kostrzebski¹, Rachel Farkas¹, Daniel X. Choi², Xi Wang³, Kristin Skinner¹

¹Surgery, University of Rochester, Rochester, New York, United States, ²Surgery, United States Air Force, Travis AFB, California, United States, ³Pathology, University of Rochester, Rochester, New York, United States

Objective Metaplastic breast cancer is a rare but aggressive form of breast cancer. We reviewed our experience with metaplastic carcinoma to identify factors associated with outcome.

Methods Pathology archives were reviewed to identify all cases of metaplastic carcinoma treated at our institution between 1994 and 2012. Clinical and pathologic features were collected and tested for predictors of recurrence (local-regional or distant), as well as differences between types of surgery. Univariate analysis was performed using chi-square, Fisher exact, and Student *t* test, where appropriate. Kaplan-Meier curves and Cox proportional hazards ratios were used to determine differences in long-term survival. The primary outcome was recurrence-free survival.

Results Thirty-nine patients were treated for metaplastic breast cancer with a median follow-up of 44 months. The clinicopathologic features are shown in the following table. Most tumors were triple negative; 15.4% were node positive, most presented as a palpable mass, and the mean tumor size was 24.5 mm. Breast-conserving therapy (BCT) was used in 16 (41%) patients and 23 (59%) were treated with mastectomy. The only significant predictor of recurrence was a positive surgical margin and type of surgery. Despite the fact that the mastectomy group had larger tumors (28.6 mm vs 18.8 mm, $p = 0.051$), and more lymph node positive disease (26.1% vs 0.0%, $p = 0.064$), patients undergoing mastectomy were significantly less likely to have a local-regional recurrence (31.3% vs 0.0%, $p = 0.008$). There was no statistically significant difference in all other clinical and pathologic features between the BCT and mastectomy groups. On survival analysis, there was no statistically significant difference in overall

survival; however, the mastectomy group had greater 5-year recurrence-free survival (82% vs 51%, log-rank = 0.039) and 5-year local recurrence-free survival (100% vs 65.5%, log-rank = 0.007) compared to BCT (HR = 0.262, 95% CI = (0.056, 0.954)).

Conclusion Metaplastic breast cancer has a high risk of disease recurrence, especially when a breast-conserving approach is used. Mastectomy offers improved 5-year recurrence-free survival compared to BCT and should be recommended as the initial surgical treatment.

Clinical and Pathologic Characteristics

Variable	BCT N = 16 (%)	Mastectomy N = 23 (%)	P Value	Recurrence N = 11 (%)	No Recurrence N = 28 (%)	P Value
Mean age (SD)	62 (16)	59 (13)	0.478	61 (18)	59 (13)	0.732
Premenopausal	5 (33.3)	6 (27.3)	0.728*	4 (36.4)	7 (26.9)	0.699*
Palpable mass	15 (93.8)	17 (85.0)	0.613*	11 (100.0)	21 (84.0)	0.290*
Palpable LN	0 (0.0)	4 (20.0)	0.126*	1 (9.1)	3 (13.0)	1.000*
ER+	4 (25.0)	1 (4.8)	0.144*	3 (27.3)	2 (7.7)	0.144*
PR+	2 (12.5)	2 (9.5)	1.000*	1 (9.1)	3 (11.5)	1.000*
Her2+	0 (0.0)	0 (0.0)	1.000*	0 (0.0)	0 (0.0)	1.000*
LVI	1 (7.7)	4 (21.1)	0.245	2 (22.2)	3 (13.0)	0.568
SLNB	11 (68.8)	11 (50.0)	0.248	5 (45.5)	17 (63.0)	0.471*
ALND	3 (18.8)	14 (63.6)	0.006	5 (45.5)	12 (44.4)	1.000*
Radiation therapy	13 (81.3)	9 (12.9)	0.015	6 (54.5)	16 (64.5)	0.296
Chemotherapy			0.437			0.797
Adjuvant	10 (62.5)	13 (61.9)		6 (54.5)	17 (65.4)	
Neoadjuvant	5 (31.3)	4 (19.1)		2 (18.2)	3 (11.5)	
Hormonal therapy	2 (13.3)	3 (15.0)	1.000*	1 (10.0)	4 (16.0)	1.000*
Mean tumor size, mm (SD)	18.8 (6.3)	28.6 (21.3)	0.051	24.4 (19.3)	24.6 (16.8)	0.976
Positive axillary LN	0 (0.0)	6 (26.1)	0.064*	2 (18.2)	4 (14.3)	1.000*
AJCC STAGE			0.227			0.321
I	9 (56.3)	8 (38.1)		5 (45.5)	12 (46.2)	
II	7 (43.8)	10 (47.6)		4 (36.4)	13 (50.0)	
III	0 (0.0)	3 (14.3)		2 (18.2)	1 (3.8)	
Positive margin	2 (12.5)	1 (4.6)	0.557*	3 (27.3)	0 (0.0)	0.018*
Local-regional recurrence	5 (31.3)	0 (0.00)	0.008*	NA	NA	
Distant recurrence	4 (25.0)	4 (17.4)	0.694*	NA	NA	
Recurrence	7 (43.8)	4 (17.4)	0.146*	NA	NA	
Death	7 (43.8)	7 (43.8)	0.563	NA	NA	

BCT, breast-conserving therapy; SD, standard deviation; LN, lymph node, ER, estrogen receptor, PR, progesterone receptor, LVI, lymphovascular invasion, SLNB, sentinel lymph node biopsy, ALND, axillary lymph node biopsy, AJCC, American Joint Committee on Cancer, NA, not applicable

*Fisher exact test

Contralateral Prophylactic Mastectomy Rate Stable at Major Canadian Breast Cancer Center: Is It a Health Systems Issue?

Amanda Roberts¹, Lakhbir Sandhu¹, Tulin Cil², David R. McCready², Stefan Hofer³, Toni Zhong³

¹University of Toronto, Toronto, Ontario, Canada, ²General Surgery, University Health Network, Toronto, Ontario, Canada, ³Plastic Surgery, University Health Network, Toronto, Ontario, Canada

Objective During the past decade, the percentage of women undergoing contralateral prophylactic mastectomy (CPM) in the United States (U.S.) has steadily increased over time. This increase may be due to patient factors, such as younger age and family history of breast cancer, or institution factors, such as increased access to breast reconstruction. This trend of increased CPM use has almost exclusively been described from U.S.-based data. European data are inconsistent with U.S. findings. In Canada, CPM rates may be influenced by medico-social and health system differences. The primary objective of this study is to examine trends regarding the use of CPM and to compare characteristics of patients undergoing CPM to patients undergoing unilateral mastectomy (UM) alone at a single institution in the Canadian universal single-payer health care system.

Methods A single-institution retrospective cohort study was completed after research ethics board approval. The population of interest included women of any age who underwent at least a UM for primary unilateral breast cancer between January 1, 2004, and December 31, 2010. Patients who underwent CPM on the same day as the UM were isolated to create 2 distinct cohorts: women who underwent UM alone and women who underwent UM with CPM. Patients with known bilateral disease at the time of their primary surgery were excluded. Patient and procedure characteristics were compared across groups using R software.

Results A total of 686 patients met inclusion criteria for this study (CPM = 38, 5.5%; UM = 648, 94.5%). The percentage of CPMs per year varied between 1.1% and 10.6%, but there was no increase over time. Women who underwent CPM were younger (median age CPM = 50 years [range, 28–67]; UM = 53 years [range, 28–88]) and more likely to have a family history of breast cancer (CPM 74.3% vs UM 40.1%, $p < 0.001$). The 2 groups were not significantly different with respect to receipt of neoadjuvant chemotherapy (CPM 39.5% vs UM 27.0%, $p = 0.14$). BRCA status was largely unknown within the 2 groups. The operating surgeon did not influence the rate of CPM ($p = 0.43$). CPM was significantly associated with immediate reconstruction (CPM 44.7% vs UM 6.3%, $p < 0.001$). Over a mean follow-up of 2.5 years, there was no difference in ipsilateral recurrence rates between the 2 groups (CPM 7.9% vs UM 4.0%, $p = 0.21$).

Conclusion CPM rates at a large Canadian academic breast center do not demonstrate the rising trend over time observed in the U.S. The finite resources and presence of a universal single-payer health system may influence these differences. Factors affecting patient decision-making may be similar across health systems, as patients who chose CPM were younger and more often had a family history of breast cancer--in keeping with U.S. and European findings.

Breast Conservation in the Setting of Contemporary Multimodality Treatment Provides Excellent Outcomes for Patients With Occult Primary Breast Cancer

Natasha M. Rueth, Dallah M. Black, Angela R. Limmer, Emmanuel Gabriel, Bruno D. Fornage, Basak E. Dogan, Mariana Chavez Mac Gregor, Min Yi, Kelly K. Hunt, Eric A. Strom

MD Anderson Cancer Center, Houston, Texas, United States

Objective Occult breast cancer presenting as axillary metastasis (TON+) is rare, resulting in wide variations in practice patterns. Many patients are still treated with modified radical mastectomy rather than breast conservation. It was our objective to evaluate recurrence and survival rates of patients with TON+ breast cancer who underwent contemporary multimodality treatment, assessing for outcome differences in breast conservation vs mastectomy.

Methods We performed a retrospective review of patients diagnosed with TON+M0 breast cancer from 2000-2012. All patients had evidence of axillary metastasis, no identifiable primary tumor in the breast, and no evidence of distant metastasis. We excluded patients with tumors in the axillary tail of the breast; those with previously undiagnosed tumors identified on assessment of mastectomy specimens, patients with an additional nonbreast primary cancer diagnosis, and patients with a history of breast cancer or ductal carcinoma in situ. Breast conservation was defined as axillary lymph node dissection with no definitive breast surgery. We evaluated patient, tumor, treatment, and outcome variables. Patients were assessed for local recurrences, and regional and distant metastasis. Overall survival was calculated using the Kaplan-Meier method.

Results Of 4,298 patients diagnosed with axillary metastases during the study period, 36 met study criteria. Most patients (77.8%) had metastasis in 1-3 axillary lymph nodes; 2 patients (5.6%) had adenopathy in

supra/infraclavicular lymph node basins. Fifty percent of the tumors (n = 18) were estrogen receptor positive; 12 (33.3%) were triple-negative. All patients were evaluated with diagnostic mammography. Thirty-five patients had breast ultrasound (97.2%) and 33 (91.7%) had an MRI. Thirty-four patients (94.4%) were treated with chemotherapy, most in the neoadjuvant setting (n = 25, 73.5%). Twenty-seven patients (75.0%) were treated with breast conservation (see following table). The median follow-up was 64 months, and 83.3% of patients had follow-up within the last 2 years. There were no local or regional failures. One patient developed systemic recurrence >5 years after diagnosis. At last follow-up, 35 patients (97.2%) were alive with no evidence of disease, resulting in a 5-year overall survival rate of 100%. There were no significant survival differences comparing breast conservation to mastectomy (p = 0.7).

Conclusion Breast conservation –performed with contemporary breast imaging, systemic chemotherapy, breast radiation, and axillary dissection – has excellent rates of local control and overall survival for women with T0N+ breast cancer. Future guideline recommendations and practice patterns should take these results into consideration, emphasizing breast conservation for appropriately selected women with occult primary breast cancer.

Local, Regional, and Systemic Treatment Patterns for Women With T0N+M0 Breast Cancer

Treatment		n	%
RT to breast/chest wall			
	Yes	33	91.7
	No	2	5.5
	Unknown	1	2.8
RT to nodal basins			
	Yes	28	77.8
	No	6	16.7
	Unknown	2	5.5
Systemic chemotherapy			
	Neoadjuvant	25	69.4
	Adjuvant	8	22.2
	Given, sequence unknown	1	2.8
	No chemotherapy	1	2.8
	Systemic chemotherapy unknown	1	2.8
Trastuzumab-based therapy			
	Yes	4	11.1
	No	29	80.6
	Unknown	3	8.3
Hormonal therapy			
	Yes	16	44.5
	No	17	47.2
	Unknown	3	8.3
Surgery			
	Breast conservation	27	75.0
	Bilateral mastectomy	5	13.9
	Unilateral mastectomy	4	11.1

RT = radiation therapy

Association of Progesterone Receptor Status With Oncotype Dx Scores in Patients With Breast Cancer

*Anita Sambamurty*³, *Christine B. Teal*¹, *Rebecca Kaltman*², *Jeffanne Millien*¹, *Anita P. McSwain*¹, *Claire Edwards*¹

¹Surgery, The George Washington University Medical Center, Washington, District of Columbia, United States,

²Oncology, The George Washington University Medical Center, Washington, District of Columbia, United States,

³The George Washington School of Medicine, Washington, District of Columbia, United States

Objective The Oncotype DX Breast Cancer Assay is a 21-gene diagnostic test that is designed for patients with early-stage, estrogen-receptor positive breast cancer. Physicians use Recurrence Scores to determine benefit of chemotherapy in order to guide treatment recommendations. Since 2008, quantitative scores for estrogen receptor (ER) and progesterone receptor (PR) have been included in the reports. This study investigates whether PR status has an association with Oncotype DX Recurrence Scores and, specifically, whether there are higher levels of intermediate or high Recurrence Scores associated with negative PR status. While PR status is included in the panel of genes that make up the Oncotype DX Recurrence Score, this study aims to establish the degree to which the PR level impacts the Recurrence Score.

Methods Oncotype DX and pathology reports were gathered for breast cancer patients who had undergone surgery and had Oncotype DX testing from March 2008 to October 2013. The PR status was recorded as positive or negative based on the Oncotype DX quantitative analysis, with negative defined as PR score < 5.5 units. PR status by pathology was considered negative if ≤5% of cells stained positive for PR. The rates of intermediate or high Recurrence Scores were compared, based on Oncotype DX PR status. Also, PR status based on Oncotype DX result was compared to final pathology.

Results There were 325 Oncotype DX tests performed on 291 patients. There were 27 patients with more than 1 tumor and, therefore, multiple Recurrence Scores. Of the 325 tests, 283 (87.1%) had positive PR status and 42 (12.9%) were negative. There were 65 (23.3%) intermediate and 8 (2.8%) high Recurrence Scores in the PR-positive group for a total of 73 of 283 (25.8%). There were 25 (59.5%) intermediate and 9 (21.4%) high Recurrence Scores in the PR negative group, for a total of 34 of 42 (80.8%, $p < 0.01$ for PR-positive vs PR-negative by chi square). Of the 27 patients with more than 1 tumor, 6 (22.2%) had at least 1 tumor with a low Recurrence Score and 1 tumor with an intermediate or high score. There were 7 tumors with PR-negative status by Oncotype DX that were PR positive on pathology. All 7 (100%) had intermediate or high Recurrence Scores. There were 20 tumors with PR-positive status by Oncotype DX that were PR-negative on pathology, of which 7 (35%) had intermediate or high scores.

Conclusion Oncotype DX PR negative status strongly correlates with intermediate or high Recurrence Scores. This was found even in patients who had PR-positive results on pathology. This study also found that 22% of patients with multiple tumors had a combination of low and intermediate or high Recurrence Scores, supporting the use of Oncotype DX testing for all tumors.

Screening for Emotional Distress in Surgical Breast Cancer Patients

*Jane R. Schubart*¹, *Matthew Emerich*², *Michelle Farnan*³, *J. Stanley Smith Jr.*¹, *Gordon L. Kauffman Jr.*¹, *Rena B. Kass*¹

¹Surgery, Penn State College of Medicine, Hershey, Pennsylvania, United States, ²Penn State College of Medicine, Hershey, Pennsylvania, United States, ³Breast Imaging, Penn State College of Medicine, Hershey, Pennsylvania, United States

Objective While the importance of addressing psychological distress in women with breast cancer has been clearly established, barriers to care remain, including under-recognition of the need for psychological care, as well as possible inciting factors. This pilot study assessed the levels of patient distress and impact on clinic throughput time.

Methods From April through August 2012, 149 breast cancer patients at an academic medical center were screened with the Emotions Thermometers (ET), a patient-rated visual 0-10 scale that measures distress, anxiety, depression, anger, burden, and need for help. Also, patients indicated their most pressing cancer-related concerns. Clinic visit time was computed, excluding patients without accurate available check-in/out times or visits greater than 90 minutes. This was compared to a control group of breast cancer patients during the same time period.

Results Median age was 57 years (29-92) and median time-since-diagnosis was 2.5 years (0.2-3.8 years). Using a previously validated cutpoint ≥ 4 for any thermometer, we found emotional difficulty in the following proportions: distress, 22%; anxiety, 28%; depression, 18%; anger, 14%; burden, 16%; and need for help, 10%. Thirty-five percent scored above the cutpoint on at least 1 thermometer. We found higher levels of distress in all domains associated with younger age at diagnosis; although p values were significant (<0.05), these correlations were not

large in magnitude (Spearman correlations ranging from -0.17 to -0.22). More extensive surgery (bilateral mastectomy vs unilateral mastectomy vs lumpectomy) was correlated with higher levels of psychosocial distress on all thermometers ($p < 0.02$). Reconstructive surgery did not impact the results. Most often cited concerns, experienced by $>20\%$, included eating/weight, worry about cancer, sleep problems, fatigue, anxiety, and pain. Mean clinic visit time for evaluable patients screened using the ET ($n = 109$) was 43.9 min (SD, 18.6), compared to 42.6 min (SD, 16.2) for the control group ($n = 50$).

Conclusion Utilizing the ET, more than one third of women screened met criteria for psychological distress. Younger age at diagnosis and more extensive surgery were risk factors. The ET is a simple validated screening tool that identifies patients in need of further psychological evaluation without impacting clinic throughput time.

Does Imaging Modality Affect Pathology Upgrade Rates for Atypical Lesions Following Image-Guided Core Needle Biopsy?

Rachel B. Scott¹, Tsetan Dolkar², Ramapriya Vidhun², Valerie Staradub¹

¹Surgery, Danbury Hospital, Danbury, Connecticut, United States, ²Pathology, Danbury Hospital, Danbury, Connecticut, United States

Objective Studies have demonstrated that atypical lesions identified by routine imaging modalities have a significant upgrade rate on final excision, likely due to sampling error. The objective of this study was to evaluate whether the utilization of a more sensitive imaging modality, such as magnetic resonance imaging, alters the upgrade rate of such lesions, potentially altering recommendations for routine surgical excision.

Methods A single-institution retrospective review of all image-guided core needle biopsies between January 2008 and December 2012 was performed. Inclusion criteria included female gender, atypical pathology at core needle biopsy (ADH, ALH, FEA), and available pathology from surgical excision. The results were stratified by imaging modality, initial pathologic diagnosis, and pathology at final excision. An upgrade is defined as any lesion seen of final pathology of higher order than the initial diagnosis at core needle biopsy.

Results A total of 571 patients underwent image-guided core needle biopsies demonstrating atypical pathology between January 2008 and December 2012. Of these, 283 were excluded based on initial core needle biopsy demonstrating either in situ or invasive disease. Another 39 were lost to follow-up after initial biopsy and 40 were excluded because the initial imaging modality was unknown. Thus, results from 137 eligible patients are presented below.

Imaging Modality of Detection	Negative	No Change	Upgrade From FEA to ADH/ALH	Upgrade From ALH to LCIS	Upgrade From ADH to DCIS	Upgrade From Atypia to Invasive Carcinoma	
Mammogram	3 (3.4%)	57 (64.7%)	6 (6.8%)	6 (6.8%)	11 (12.5%)	5 (5.6%)	88
Ultrasound	1 (4%)	17 (68%)	2 (8%)	1 (4%)	4 (16%)	0 (0%)	25
Magnetic resonance imaging	0 (0%)	14 (77.8%)	0 (0%)	2 (11%)	2 (11%)	0 (0%)	18
Mammogram & ultrasound	0 (0%)	2 (33.3%)	0 (0%)	0 (0%)	0 (0%)	4 (66.7%)	6
	4	90	8	9	17	9	

Conclusion While the majority of patients presenting with atypia on core needle biopsy have no change in diagnosis at surgical excision, the overall upgrade rate in our study was 31%, thus reinforcing the recommendation for routine surgical excision. The exceptions may be FEA and ALH, where the upgrade rates were significantly lower and no lesion in either category was upgraded to DCIS or invasive carcinoma in this study. The imaging modality of primary identification did not seem to affect the upgrade rate. However, when a lesion was seen on both mammogram and ultrasound, the upgrade rate to an invasive carcinoma was significantly higher than for any single modality. The numbers in this study are small and this data should serve as a basis for which to conduct larger studies on the upgrade rate of FEA (particularly as identified on MRI scan), which may not require excision, as well

as the combined modality of mammogram and ultrasound, where more data may strengthen the recommendation to excise the lesion for full characterization.

Outcomes Following Elevation of Serratus Anterior Fascia During Prosthetic Breast Reconstruction

Akhil K. Seth, Elliot M. Hirsch, John Y. Kim, Neil A. Fine

Division of Plastic Surgery, Northwestern University, Feinberg School of Medicine, Chicago, Illinois, United States

Objective Achieving optimal inferolateral coverage is critical to successful prosthetic breast reconstruction. Serratus anterior fascia (SF) elevation, a promising alternative to muscle flaps and allograft implantation, has not been rigorously studied. This study evaluates complication rates following mastectomy and immediate tissue expander reconstruction using serratus anterior muscle (SM) or fascia.

Methods Retrospective review of consecutive patients undergoing mastectomy with immediate tissue expander reconstruction over a 10-year period at 1 institution was performed. Patients with SM or SF elevation were selected for analysis. Reconstructions using acellular dermis were excluded. Relevant demographic and clinical data were recorded. Complications were categorized by type and end-outcome, including nonoperative (no further surgery), operative (further surgery except explantation), and explantation.

Results Elevation of SM and SF was performed in 375 (487 breasts) and 177 (255 breasts) patients, respectively. Mean follow-up was 36.3 months. SM and SF patients were demographically similar, but SF had higher intraoperative fill volumes ($p < 0.0001$) and required fewer postoperative expansions ($p < 0.0001$). There were no differences in complication rates between SM and SF patients. Regression analysis, adjusted for several clinical variables, revealed that SF elevation was not an independent risk factor for any complication type.

Conclusion Our review, the largest to date, demonstrates that SF elevation is a safe, feasible alternative for achieving inferolateral coverage during prosthetic breast reconstruction. Furthermore, this technique provides the benefit of greater intraoperative fill volumes, and less postoperative expansions, than SM. As a readily available alternative to routine muscle flaps and allograft implantation, SF elevation should be considered integral to any prosthetic breast reconstruction algorithm.

Complications in Breasts

Complication	Serratus Fascia (n = 255 breasts) (177 patients)	Serratus Muscle (n = 487 breasts) (375 patients)	p
Total complications*	40 (15.7)	90 (18.5)	0.36
Hematoma	2 (0.8)	13 (2.7)	0.10
Infection	12 (4.7)	26 (5.3)	0.86
Seroma	5 (2.0)	20 (4.1)	0.14
Mastectomyflap necrosis	22 (8.6)	44 (9.0)	0.89
Nonoperative	24 (9.4)	45 (9.2)	1.00
Operative	26 (10.2)	62 (12.7)	0.34
Explantation	20 (7.8)	41 (8.4)	0.88

Note: Data reported as number (percentage of breasts).

*Breasts with more than 1 complication were counted once.

Does Patient BMI Affect the Accuracy of Preoperative Axillary Ultrasound in Breast Cancer Patients?

Anushi R. Shah¹, Katrina N. Glazebrook², Judy C. Boughey¹, Tanya L. Hoskin³, Sejal S. Shah⁴, Bergquist R. John¹, Sean C. Dupont¹, Tina J. Hieken¹

¹Surgery, Mayo Clinic, Rochester, Minnesota, United States, ²Radiology, Mayo Clinic, Rochester, Minnesota, United States, ³Biomedical Statistics and Bioinformatics, Mayo Clinic, Rochester, Minnesota, United States, ⁴Pathology, Mayo Clinic, Rochester, Minnesota, United States

Objective Obesity affects 36% of American women and is a well-documented risk factor for breast cancer. Preoperative axillary ultrasound (AUS) is used routinely to stage the axilla in newly diagnosed breast cancer patients, however the impact of obesity on the usefulness of AUS is unknown. We sought to evaluate the effect of BMI on the performance characteristics of AUS.

Methods After IRB approval, we identified 1,510 invasive breast cancers in 1,455 patients from our prospective breast surgery database, operated on at our institution between 1/2010-7/2013 after exclusion of patients undergoing neoadjuvant chemotherapy and those not undergoing axillary surgery. Preoperative AUS was performed of 1,375 axillas (91%) in 1,331 patients (44 bilateral cancers). AUS was performed with a variable frequency 5-12 MHz transducer by dedicated breast ultrasonographers. We evaluated patient demographics, pathology, and imaging data. Statistical analysis was performed using JMP 10.0 and VassarStats software.

Results Of 1,331 patients, median patient age was 62 years, median BMI was 27.44 (IQR, 24.02-32.27), and 492 patients (35.8%) were classified as obese (BMI > 30). Three hundred eighty-four cases (27.9%) were lymph node positive (LN+) at operation. AUS was suspicious in 400 patients (29%), of whom 374 had US-guided axillary lymph node fine needle aspiration (FNA). FNA was positive in 124 patients (33.2%). AUS performance characteristics by BMI group are summarized in the following table. For each group stratified by BMI, AUS was strongly predictive of nodal status at operation ($p < 0.0001$). Sensitivity of AUS did not differ across BMI categories ($p = 0.99$). Specificity, however, was significantly better for overweight ($p = 0.001$) and obese ($p = 0.007$) patients vs normal BMI patients. Similarly, AUS demonstrated significantly better performance in terms of overall accuracy for overweight ($p = 0.008$) and obese ($p = 0.02$) patients compared to normal BMI patients. FNA staged 35.8% of node-positive obese patients as LN+ preoperatively.

Conclusion AUS has equivalent sensitivity and better sensitivity in obese and overweight vs normal BMI breast cancer patients. Obesity does not have an unfavorable impact on the ability of preoperative AUS to detect axillary LN metastasis. Understanding the basis for the superior specificity of AUS in obese patients merits further study. AUS with FNA is a valuable staging tool in the evaluation of newly diagnosed breast cancer patients regardless of patient BMI.

Performance Characteristics of Preoperative Axillary Ultrasound (AUS) by BMI Groups

BMI Group	N	Median Age, yr	AUS Sensitivity (CI)	AUS Specificity (CI)	AUS Accuracy	N (%) LN+ at Surgery*	N (%) of LN+ Cases Detected by Preop AUS and FNA
Normal ≤ 25	456	57	51.9% (43.1-60.4)	73.2% (67.9-77.9)	66.9%	135 (29.6%)	41 (30.4%)
Overweight 25.01-30	312	64	51.3% (41.9-60.7)	83.7% (79.0-87.5)	74.9%	115 (26.9%)	35 (30.4%)
All obese >30	492	64	52.2% (43.5-60.9)	81.8% (77.4-85.6)	73.8%	134 (27.2%)	48 (35.8%)
Class I Obesity 30.01-35	274	65	51.5% (39.1-63.6)	81.6% (75.4-86.5)	74.1%	68 (24.8%)	22 (32.4%)
Class II Obesity 35.01-40	132	65	45.5% (30.1-61.0)	76.1% (65.6-84.3)	65.9%	44 (33.3%)	14 (31.8%)
Class III Obesity >40	86	63	68.2% (45.1-85.2)	90.6% (80.0-96.1)	84.9%	22 (25.6%)	12 (54.5%)

*There was no significant difference in the proportion node-positive at operation stratified by BMI group, $p = 0.3695$

Breast Conservation vs Mastectomy for Early-Stage Breast Cancer: How Does the Department of Defense Compare?

William E. Sherman, Julie A. Rizzo, Cletus A. Arciero

General Surgery, Dwight D. Eisenhower Army Medical Center, Ft. Gordon, Georgia, United States

Objective The surgical management of early breast cancer is evolving. Breast-conservation therapy (BCT) is utilized more often in treatment of early-stage breast cancer, but rates of BCT vs mastectomy vary across the country. Previous reports revealed BCT rates in the Department of Defense (DOD) lagged behind national trends. Patients with early-stage breast cancer in the DOD Healthcare System were evaluated to assess utilization of BCT and factors that influenced this decision.

Methods The Department of Defense Automated Central Tumor Registry (ACTUR) was queried for women diagnosed with stage 0, I, or II breast cancer from January 1, 1996, to December 31, 2008. We investigated rates of BCT and factors that influenced these rates. Patients without a complete record of treatment were excluded.

Results 6,475 patients met inclusion criteria. The average rate of BCT over these years was 59%. Initial selection of BCT was significantly influenced by age and T stage. 504 patients (7.9%) scheduled for BCT ultimately underwent mastectomy. These patients were younger with higher T-staged tumors. The only factor that significantly correlated with the final cancer procedure was T stage (OR, 2.14).

Conclusion The utilization of BCT in the DOD Health Care System has been consistent over the 12 years studied. Contrary to previous reports, rates of BCT are similar to civilian institutions. Rates of BCT in the DOD appear to be influenced by stage of the tumor but not race or age.

Time to Treatment: Influence of Immediate Breast Reconstruction on Postoperative Chemotherapy

Lana Shikhman, Kate Dinh, Ashling O'Connor, Anne Larkin

Breast Surgery, University of Massachusetts, Worcester, Massachusetts, United States

Objective Review of recent literature suggests that immediate breast reconstruction has become an important part of breast cancer care. A patient's decision to proceed with this intervention should not delay timely therapeutic treatment, such as chemotherapy or radiotherapy. To address these concerns, an institutional review was carried out on all patients undergoing mastectomy, with or without immediate breast reconstruction, and the timing of the initiation of postoperative adjuvant chemotherapy.

Methods The institutional tumor registry database was reviewed over a 5-year period from 2007 to 2012. 164 patients undergoing adjuvant chemotherapy following mastectomy, with or without immediate reconstruction, were identified. A retrospective chart review was performed. Patient age, days to chemotherapy, method of breast reconstruction, and complications were recorded. Complications included hematoma, pain, infection, and flap necrosis. A Wilcoxon rank sum analysis was performed to examine statistical difference between both groups. Further analysis using a Kruskal-Wallis test was performed to measure difference between complication type and delays.

Results A total of 164 eligible patients were identified. Ninety-eight postmastectomy patients received adjuvant therapy without reconstruction (non-IR group), 66 patients received adjuvant chemotherapy following mastectomy with immediate reconstruction (IR group). The mean age of patients was 56.3 ± 11.4 in non-IR group and 49.2 ± 9.6 for IR group. The overall postoperative complication rate was 15.3% for the non-IR group and 24.2% in the IR group. The average number of days to adjuvant chemotherapy was 44.1 in the non-IR group vs 48.7 in the IR group. A p value of 0.03 was seen between groups for time to chemotherapy and a p value of 0.152 for overall complication rate was noted. The complication rate and days to chemotherapy were individually calculated for different types of reconstructions performed. Complications increased with autologous tissue reconstruction compared to implant alone. Those with complications had a statistically significant delay to initiation of chemotherapy (42.5 days vs 60.6 days, $p = 0.013$). The type of complication had no significant impact on the delays in chemotherapeutic treatment ($p = 0.175$).

Conclusion Patients undergoing immediate breast reconstruction tended to be younger and experienced more delays in starting chemotherapy than those undergoing mastectomy alone. Although these factors yielded a statistically significant length of time to the initiation of chemotherapy (mean delay of 4.6 days), there was no significant difference in complication rates between the IR and non-IR groups. Complication rates increased, however, as the reconstruction techniques escalated in complexity. These reconstructive options, as well as their potential drawbacks, must be discussed with the patient and should not be withheld due to the fear of treatment delays. Our data indicate that these delays appear to be short and without significant clinical repercussions. Careful patient

selection for immediate breast reconstruction may aid in the reduction of complication rate and thus subsequent delays in treatment initiation.

Postmastectomy Radiation for Locally Advanced Breast Cancer in the United States Varies by Race-Ethnicity and Socioeconomic Factors

Devina Siregar¹, Carolyn Behrendt², Laura L. Kruper¹, Steven L. Chen¹, Courtney Vito¹

¹Department of Surgical Oncology, City of Hope National Medical Center, Duarte, California, United States,

²Biostatistics and Epidemiology, Division of Information Sciences, City of Hope National Medical Center, Duarte, California, United States

Objective Postmastectomy radiation (PMR) is recommended for patients with locally advanced breast cancer. Unfortunately, breast cancer treatment varies by factors, such as race/ethnicity and socioeconomic status (SES). We hypothesized that these factors are associated with use of PMR for locally advanced breast cancer.

Methods Using the Surveillance, Epidemiology and End Results database, we identified women who were age ≥ 18 at diagnosis from 1998-2010 with unilateral breast cancer who underwent mastectomy, and met criteria for PMR: T3-T4 and/or N2-N3 disease. Subjects were African American (AA), Asian, Hispanic White (HW), or non-Hispanic White (NHW). Excluded were patients with prior malignancy or missing data on county-level measures of SES as defined by the following criteria: median household income (adjusted for cost of living, 2000); percent of adults $>$ age 25 without high school education (HSE); percent of women 40 or older with mammography within 2 years (“limited mammography”); and residing in metropolitan areas (MA) vs other. Logistic regression analysis evaluated race/ethnicity, SES variables, and their interactions (20 potential risk strata), adjusting statistical significance for multiple hypothesis testing.

Results Among 56,105 eligible women, (age, 45.0+7.4 years at diagnosis), 52.7% received PMR. Tumors were T3-T4 only (30.5%), N2-N3 only (46.6%), or both (22.9%). Disease was stage III (86.1%), stage IV (5.1%), and stage IIB (8.8%). Racial/ethnic distribution was AA (13.1%), Asian (7.3%), HW (11.8%), NHW (67.9%). One quarter of subjects resided in counties with median income $<$ \$40,000 (“low income”), partially overlapping with one quarter who resided where $\geq 25\%$ of adults of the subject’s race/ethnicity lacked HSE. Almost half (45.2%) of subjects resided where $\leq 70\%$ of eligible women underwent mammography within 2 years. Most (88.5%) lived in MAs. Adjusted for age, stage, T3-T4, N2-N3, inflammatory breast cancer, marital status, state, and trends over time, PMR was associated with race/ethnicity and all 4 SES variables. The association between PMR and race/ethnicity was modified significantly by income (see table). Independent of race/ethnicity and SES, use of PMR was lower with each percentage point of adults lacking HSE (OR, 0.993; 95% CI, 0.990-0.996; $p < 0.0001$) in MAs with limited mammography (0.86, 0.82-0.90, <0.0001).

Conclusion PMR is underutilized. SES-disadvantaged subjects are disproportionately affected across all racial groups. Outside of low-income counties, AA less often receive PMR than others. To promote equitable access to and utilization of PMR, further study and outreach across SES and racial boundaries is merited.

Likelihood of Receiving Postmastectomy Radiation for Locally Advanced Breast Cancer by Race and County Income Level

	Odds Ratio	95% CI	Holm-Adjusted p-value
<i>Low-income counties</i>			
African American	0.62	0.56 - 0.68	<0.0001
Asian	0.64	0.56 - 0.72	<0.0001
Hispanic White	0.75	0.65 - 0.87	<0.0001
Non-Hispanic White	0.73	0.69 - 0.77	<0.0001
<i>Non-low income counties (\geq\$40,000 annual household income, adjusted)</i>			
African American	0.85	0.79 - 0.92	<0.0001
Asian	1.11	1.02 - 1.21	0.157
Hispanic White	1.27	1.13 - 1.43	<0.0001
Non-Hispanic White	1.00		

Hereditary Cancer Risk Assessment: Establishing a Comprehensive Safety Net in a Large Multispecialty Group

Floyd A. Smith¹, Melanie Rozelle-Trosper¹, Marianne Sterling³, Mary Lou Walther^{1,3}, Arpita Swami², Lori Carrier², Henry Li³

¹Breast Surgery, The Polyclinic, Seattle, Washington, United States, ²Breast Imaging Center, The Polyclinic, Seattle, Washington, United States, ³Oncology/Hematology, The Polyclinic, Seattle, Washington, United States

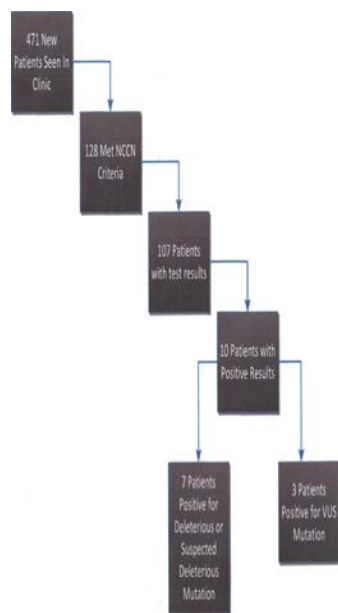
Objective In the United States, it is estimated that 1 in 400 individuals will harbor a deleterious mutation in BRCA1/2 genes. Among those affected with breast cancer, approximately 5%-10% can be associated with a hereditary component. In addition, approximately 1 in 440 individuals will have a predisposition to early-age colon, uterine, gastric, and ovarian cancer associated with Lynch syndrome and polyposis (*MLH1*, *MSH2*, *MSH6*, *PMS2*, *EPCAM*, and *MYH* genes). Benefit has been demonstrated for both oncology and unaffected patients through detection of mutations with impact on surgical, surveillance, and chemoprevention options. The purpose of this study was to develop an efficient and sustainable practice-based model to integrate assessment and testing for hereditary cancer within a 179-physician multispecialty group.

Methods In June 2012, our breast surgery program implemented a simple process to identify and screen patients for hereditary cancer using a sustainable workflow with the following components:

- A hereditary cancer risk assessment (HCRA) questionnaire was created and evaluated based on NCCN guidelines for HBOC, Lynch, and polyposis syndromes
- HCRA forms were given out to all incoming surgery, mammography, and oncology/hematology patients.
- HCRA forms were reviewed by trained nurses; patients with history that met NCCN criteria were offered risk assessment and hereditary cancer testing when appropriate.
- All patients were provided with pre-test risk assessment and informed consent.
- Test results were reviewed by physician and a detailed patient-specific management plan was communicated to the patient and primary physician.
- Upon presenting results, consultation with a certified community-based genetic counselor was offered to patients.

Preparation prior to process implementation included observation of patient flow, training on hereditary cancer syndromes, and commitment to continued process improvement.

Results In the 18 months prior to implementation, 4 patients received testing and 1 was positive for a deleterious mutation. Postimplementation revealed a 6.5% positive rate for deleterious mutations (see following figure), which is consistent with rates seen in other studies. The systematic nature of this process allows a platform for ongoing quality improvement.



HBOC Screening Results

continues

Conclusion Comprehensive screening with a systematic process for evaluating hereditary cancers identified high-risk patients in a large multispecialty clinic. In the first 16 months of this process we were able to provide personalized cancer risk management to 471 patients. Screening patients in Surgery, Oncology and Mammography resulted in a 6.5% positive rate, which will also impact management of blood relatives.

Outcomes With and Without Axillary Node Dissection (ALND) for Node-Positive Lumpectomy Patients

Rachael Snow², Caroline Johns², Weihong Sun¹, William Fulp³, Marie Lee¹, John Kiluk¹, Christine Laronga¹
¹Breast, Moffitt Cancer Center, Tampa, Florida, United States, ²USF Morsani College of Medicine, USF, Tampa, Florida, United States, ³BIOSTATISTICS CORE, Moffitt Cancer Center, Tampa, Florida, United States

Objective The ACoSOG-Z0011 trial identified women with sentinel lymph node biopsy (SLN)-positive breast cancer having breast conservation and demonstrated no difference in survival or local-regional recurrence between SLN+ALND vs SLN alone. We hypothesize that these findings can be confirmed in a retrospective SLN-positive lumpectomy population.

Methods An IRB-approved, retrospective review of women with invasive breast cancer having SLN (N1) disease at lumpectomy from January 1, 1995, to November 1, 2012, was performed with statistical analyses via exact chi-square test, Kaplan-Meier curves, and log-rank tests. Neoadjuvant therapy and noninvasive breast cancer cases were excluded.

Results Of 528 patients reviewed, 131 women with positive SLN (N1) disease and lumpectomy were identified. Twenty-eight (21.4%) received SLN alone; 103 (78.6%) received SLN+ALND. Median age was 56 yr (range: 25-96), (SLN: 62.5yr, SLN+ALND: 55 yr; p = 0.007). There were no differences between the SLN and SLN+ALND cohorts in co-morbid conditions, histology, final pathologic stage (p = 0.075), mean number of sentinel nodes retrieved (SLN: 2.14, SLN+ALND: 2.12; p = 0.90) or the mean number of positive sentinel nodes (SLN: 1.11, SLN+ALND: 1.22; p = 0.38). Median size of nodal metastasis was different between cohorts (SLN: 2.5 mm, SLN+ALND: 5 mm; p = 0.0024). There were no differences in ER/PR receptor status, but a significant difference in HER-2 receptor status was identified (p = 0.0052) as patients in the SLN-only cohort were more frequently equivocal (7%) and less frequently positive (3.5%) than the SLN+ALND cohort, which registered no equivocal statuses and a larger positive HER-2 status (18%). Rates of radiation and hormone therapy use were not significantly different between the cohorts (p = 0.53 and p = 0.41, respectively), though rates of chemotherapy receipt were (p = 0.014) (see table). With a median follow-up of 50 months (range: 1- 199), there were no statistically significant differences in local, regional, or distant recurrence (p = 0.59), or in overall survival (p = 0.53) between SLN alone and SLN+ALND.

Conclusion In a retrospective cohort of patients with clinically node-negative invasive breast cancer undergoing lumpectomy, the extent of axillary surgery for SLN (N1) disease had no impact on survival or recurrence at short-term follow-up. These data are consistent with the ACoSOG-Z0011 results.

Stage, Receptor Status, and Adjuvant Therapy Use in Sentinel Node Positive Lumpectomy Patients

	TNM Stage 1	TNM Stage 2	TNM Stage 3	ER +	HER2 Neg	Received XRT	Received Chemo	Received Hormone
SLN+ALND	6.8%	83.5%	9.7%	85.3%	81.2%	86.5%	87.8%	81.6%
SLN ONLY	21.4%	78.6%	-	96.4%	89.2%	92%	65.2%	88.8%

Omission of Sentinel Lymph Node Biopsy (SLNB) Does Not Alter Recurrence or Survival in Estrogen Receptor (ER)+ Early-Stage Breast Cancer in Women 80 Years and Older

Jennifer Steiman, Atilla Soran, Priscilla McAuliffe, Emilia Diego, Marguerite Bonaventura, Ronald Johnson, Gretchen Ahrendt, Kandace McGuire
 UPMC, Pittsburgh, Pennsylvania, United States

Objective Older age independently predicts a lower risk of sentinel lymph node (SLN) metastasis in patients with breast cancer. Accurate identification of the SLNB also decreases with increasing age. Elderly patients who undergo SLNB have increased arm complications, resulting in lower physical and mental functioning. Taken together, the utility of performing SLNB in those age 80 or older has been called into question. However, other authors report SLNB results do, in fact, alter treatment decisions and deem it necessary, regardless of age. We hypothesize that

omitting SLNB in carefully selected patients over age 80 with early-stage (T1/T2, N0, M0) ER+ breast cancer does not worsen recurrence or survival.

Methods Our institutional cancer registry was used to identify patients 80 years or older who presented from 2002-2009 with early-stage ER+, clinically node-negative (cN0) breast cancer. The most common procedure performed was a segmental mastectomy (SM) (n = 261). Those who underwent adjuvant radiation therapy (RT) and received an aromatase inhibitor (AI) were chosen for evaluation. We then retrospectively compared the outcome of patients who did or did not undergo SLNB.

Results Of 500 patients with breast cancer age 80 or above, 203 patients had reported ER+, cN0 disease and underwent SM. Of 69 patients treated with SM, RT, and AI, 38 had SLNB and 31 patients did not. No difference between the 2 groups was identified in terms of race (p = 0.97), nuclear grade (p = 0.93), histology (p = 0.38), or clinical stage (see table). In the SLNB group, a positive SLN was identified in 6/38 (16 %). A greater portion of patients who did not undergo SLNB were deceased at last follow-up (p = 0.03), but these deaths were not breast cancer specific. No significant difference in locoregional or distant recurrence (LRR/DR) was identified, with an average follow-up of 64 months. Kaplan-Meier analysis of time-to-death also revealed no significant difference (p = 0.38).

	SM+XRT+AI With No SLNB (n = 31)	SM+XRT+AI With SLNB (n = 38)	P Value
Average age	82.2 years	81.6 years	0.21
Cancer type			0.38
IDC	18 (58%)	28 (74%)	
ILC	2 (6%)	4 (11%)	
Mixed	9 (29%)	4 (11%)	
Other	2 (6%)	2 (5%)	
Clinical stage			0.26
1	27 (87%)	36 (95%)	
2	4 (13%)	2 (5%)	
Vital status			0.03
Alive	16 (52%)	29 (76%)	
Deceased	15 (48%)	9 (23%)	
*Disease-specific death	0	0	0.15
*Other	12	9	
*Unknown	3	---	
Recurrence			0.26
NED	30 (97%)	38 (100%)	
LRR	0	0	
DR	1 (3%)	0	
*Time to recur	70 months	---	
Average FU	67.7 months	59.5 months	

Conclusion In this cohort of patients 80 or older with early-stage ER+ breast cancer who underwent SM with RT and received an AI, SLNB did not affect recurrence or survival. As a result, it may be reasonable to omit SLNB in this select group.

Decision Analysis – Effects of Prophylactic Mastectomy on Life Expectancy Among Women With Nonhereditary Breast Cancer

Lauren T. Steward, Su-Hsin Chang, Graham A. Colditz, Julie A. Margenthaler

Surgery, Washington University School of Medicine, St. Louis, Missouri, United States

Objective Recent data suggest an increased rate of mastectomy with contralateral prophylactic mastectomy (CPM) despite potential eligibility for breast conservation. Previous research suggested that this practice may be occurring because women believe that CPM will prolong their survival. We sought to determine the impact of contralateral

prophylactic mastectomy on life expectancy and quality-adjusted life expectancy.

Methods In a decision analysis model, we compared bilateral mastectomy with unilateral mastectomy/breast conservation surgery among women (ages, 30 – 70) with nonhereditary breast cancer with early-stage disease (I and II). We used data from published literature about the incidence of contralateral breast cancer, locoregional recurrence, metastatic breast cancer, and survival to estimate their effects on life expectancy. We also used data from the literature of utility estimates of bilateral mastectomy, locoregional disease, and metastatic disease in order to calculate their effects on quality-adjusted life-years.

Results We calculated that bilateral mastectomy offered extremely modest gains in life expectancy, ranging from 0.08 to 0.87 years. However, bilateral mastectomy was associated with losses in quality-adjusted life-years, ranging from 0.39 to 0.272 years. Bilateral mastectomy provided the largest gain in life expectancy in young women with early-stage, hormone receptor-positive disease. Older women derived the least benefit from bilateral mastectomy. (See table.)

Conclusion Among women with nonhereditary breast cancer, bilateral mastectomy provides minimal gain in life expectancy with associated loss in quality-adjusted life-years.

Patient Characteristic	Incremental Life Expectancy With CPM (yr)	Incremental QALY With CPM (yr)
Age <30, stage I/II, ER/PR+	0.87	-2.72
Age <30, stage I/II, ER/PR-	0.84	-2.47
Age 31-40, stage I/II, ER/PR+	0.71	-2.26
Age 31-40, stage I/II, ER/PR-	0.68	-2.17
Age 41-50, stage I/II, ER/PR+	0.56	-1.82
Age 41-50, stage I/II, ER/PR-	0.50	-1.65
Age 51-60, stage I/II, ER/PR+	0.41	-1.35
Age 51-60, stage I/II, ER/PR-	0.33	-1.13
Age 61-70, stage I/II, ER/PR+	0.28	-0.96
Age 61-70, stage I/II, ER/PR-	0.25	-0.88
Age >70, stage I/II, ER/PR+	0.08	-0.39
Age >70, stage I/II, ER/PR-	0.07	-0.35

Strut-Based Brachytherapy in 113 Patients (114 Breasts) With 5-mm or Less Skin Bridge Thicknesses and Median Follow-up of 33 Months

Jon F. Strasser¹, Christopher D. Koprowski¹, Dayee Jacob¹, Robert R. Kuske², Deanna J. Attai³, Lydia Komarnicky⁴, Jay Reiff⁴, Jondavid Pollock⁵, Ernest Butler⁵, Ben Han⁶, Sudha Mahalingam⁷, Constantine Mantz⁸, Steven E. Finkelstein⁹, Robert Hong¹⁰, Maureen Lyden¹¹, Daniel Scanderbeg¹², Catheryn Yashar¹²

¹Helen Graham Cancer Center, Christiana Care, Newark, Delaware, United States, ²Arizona Breast Cancer Specialists, Phoenix, Arizona, United States, ³Center for Breast Care, Inc., Burbank, California, United States, ⁴Drexel University College of Medicine, Philadelphia, Pennsylvania, United States, ⁵Schiffler Cancer Center, Wheeling, West Virginia, United States, ⁶South Florida Radiation Oncology, Boynton Beach, Florida, United States, ⁷The Christ Hospital Cancer Center, Cincinnati, Ohio, United States, ⁸21st Century Oncology, Fort Myers, Florida, United States, ⁹21st Century Oncology Translational Research Center (TRC), Scottsdale, Arizona, United States, ¹⁰Virginia Hospital Center, Arlington, Virginia, United States, ¹¹BioStat International, Inc., Tampa, Florida, United States, ¹²Radiation Medicine and Applied Sciences, University of California San Diego, La Jolla, California, United States

Objective To evaluate the cutaneous toxicity of strut-based breast brachytherapy in patients with small skin bridge thicknesses.

Methods The SAVI Collaborative Research Group (SCRG) database was used to identify APBI patients with both reported skin bridge distances (cavity margin to skin) and evaluation of late adverse events. Patients were treated at a majority of the SCRG sites (14 institutions) using strut-based brachytherapy. All patients received monotherapy APBI (34 Gy in 10 fractions). Patients treated with strut-based brachytherapy typically utilize skin dose optimization or limitations such that the skin receives $\leq 100\%$ of the prescription dose, with an absolute limit of 120% to very small areas. Cutaneous late adverse events (grade 2 and higher: hyperpigmentation, erythema, and telangiectasias) were analyzed in both the entire reported cohort and for those patients with small skin bridge thicknesses of ≤ 5 mm, for comparison.

Results From 2007-2011, data from 468 patients (469 breasts) meeting the study criteria (reported skin bridge values and late cutaneous toxicity grading) were analyzed. Within this group, 113 patients (114 breasts) had skin distances ≤ 5 mm. Patients with both values reported had ages ranging from 40 to 92 years, with a median age of 64 years and median follow-up of 27 months. The median age and follow-up duration for those patients with ≤ 5 mm skin bridges was 62 years (range, 40-87 years), with median follow-up of 33 months. Toxicity post treatment (grade ≥ 2) for the entire group (469 breasts) was low: hyperpigmentation, 0.2%; erythema, 1.5%; and telangiectasias, 1.3%. For the ≤ 5 -mm skin bridge group: hyperpigmentation, 0.0%; erythema, 2.6%; and telangiectasias in 1.8%.

Conclusion Dose limitations/optimization to skin (typically limited to $\leq 100\%$) with strut-based therapy appears to overcome the concern regarding tumor bed/skin proximity. Late cutaneous toxicities were of low incidence regardless of skin bridge thickness (< 5 mm). While follow-up is ongoing, it appears that strut-based brachytherapy allows treatment of all otherwise eligible women with APBI, without the historical concern for small skin bridge thicknesses.

Providing Chemotherapy in Severely Resource-Limited Settings

Lauren Tannenbaum, Quinn Dufurrena, Carol Harris

Albert Einstein College of Medicine, Bronx, New York, United States

Objective Cancer is rapidly emerging as a major source of morbidity and mortality in countries with limited resources and infrastructure. Ethiopia has only 3 oncologists and 1 oncology unit for a population of 80 million. A breast cancer center was recently established in Hawassa, Ethiopia as a satellite unit to the only existing source of cancer care in the capitol city, Addis Ababa. With growing interest to treat cancer globally, safe protocols for the provision of chemotherapy are essential. Our group analyzed current safety practices in Ethiopia to ascertain the current level of resources and potential restrictions for safety and patient care.

Methods We observed the chemotherapy protocols at an oncology department and pharmacy in the United States. Subsequently, we observed the current practices in Hawassa, Ethiopia, for 4 weeks. We worked closely with the physicians and nurses to gain an understanding of their current protocols and the limitations they face. We divided the protocols for handling chemotherapy into 4 categories: storage, preparation, administration, and disposal.

Results Due to a lack of pharmacists, nurses prepare chemotherapy at the patient's bedside. The unit has no ventilated cabinet for preparation of chemotherapy and lacks a reliable electricity source. There are a limited number

of syringes, and IV tubing systems are rudimentary. The same nurse both prepares and administers the chemotherapy to all patients. Nurses use gowns, goggles, surgical masks, and nonchemotherapy-approved gloves while preparing and administering the drugs. All of the chemotherapy agents are stored in a pharmacy located outside of the oncology unit. Due to lack of reliable electricity, some medications may not have constant refrigeration. Currently there is no protocol for proper and safe disposal. Excess medication is often flushed down toilets or sinks. There is a cardboard safety box designated for sharp material; a separate disposal container is reserved for instruments that may have trace substances. The final disposal of this material is by incineration.

Conclusion By observing the current practices of a new oncology unit in Hawassa, Ethiopia, we made strides in understanding the limitations of providing chemotherapy in developing countries. There are currently no established international guidelines for storing, mixing, administering, and disposing of chemotherapy in resource-poor settings. It is necessary to establish protocols to provide chemotherapy in a manner that is safe for both patients and staff. Incorporating clinical oncology pharmacists as key members of the oncology team should be considered for safety and to enable the nurses to focus on patient care.

Breast-Specific Gamma Imaging for the Evaluation of Patients Treated with Neoadjuvant Chemotherapy for Breast Cancer

Christine B. Teal¹, Jeffanne Millien¹, Claire Edwards¹, Jocelyn Rapelyea², Jessica Torrente², Anita P. McSwain¹

¹Surgery, The George Washington University Medical Center, Washington, District of Columbia, United States,

²Radiology, George Washington University, Washington, District of Columbia, United States

Objective Breast-specific gamma imaging (BSGI) is a physiologic approach to breast cancer diagnosis and for evaluating extent of disease in newly diagnosed patients. Imaging is based on angiogenesis and metabolic activity of technetium 99-sestamibi. Other technologies, such as MRI, have proven to be useful in evaluating patient response to neoadjuvant chemotherapy. This study evaluates the effectiveness of BSGI for assessing tumor response to neoadjuvant chemotherapy.

Methods A retrospective chart review was conducted of 38 patients who had BSGI prior to neoadjuvant chemotherapy and then prior to definitive surgery for breast cancer. Abnormal foci of uptake seen on BSGI were measured in 3 dimensions and the longest axis was used for the purpose of this study. Measurements were considered to be consistent when within 5 millimeters (mm) of imaging or pathology. Measurements were also compared with imaging and pathology when within 1 centimeter (cm). Pre-chemotherapy ultrasound and mammographic measurements were compared to pre-chemotherapy BSGI measurements. Pathologic size at surgical excision was compared to post-chemotherapy BSGI measurements, and with mammography and ultrasound measurements when imaging was performed.

Results BSGI measurements were within 5 mm of pre-chemotherapy mammographic or ultrasound measurements in 21 of the 38 patients (55.3%), and were within 1 cm in 31 patients (81.6%). BSGI accurately reflected tumor size within 5 mm when compared to postoperative pathology specimens in 29 of the 38 patients (76.3%), and were within 1 cm in 33 patients (86.8%). BSGI overestimated residual tumor size in all 9 patients. There were 2 patients with no uptake on BSGI following chemotherapy with residual disease pathologically. One patient had a 5-mm invasive ductal carcinoma and the other had scattered foci of ductal carcinoma in situ on final pathology. The other 8 patients who showed no uptake on BSGI following chemotherapy had a complete pathologic response. There were 23 patients who had additional imaging with mammography and ultrasound following chemotherapy, of which 9 (39.1%) were within 5 mm of final pathological measurements and 12 (52.2%) were within 1 cm. All measurements overestimated residual disease, and most were due to calcifications seen on mammography. There were 5 patients with a complete pathologic response who had imaging with mammography and ultrasound preoperatively, of which 1 (20.0%) showed no evidence of residual disease on imaging.

Conclusion BSGI is more comparable to mammography and ultrasound in evaluating tumor size prior to neoadjuvant chemotherapy when using measurements within 1 cm rather than 5 mm. BSGI is more accurate than mammography and ultrasound in establishing tumor size within 5 mm after neoadjuvant chemotherapy, as well as for evaluating patients with a complete pathologic response. BSGI is less reliable in detecting residual microscopic disease following neoadjuvant chemotherapy. Although larger studies are necessary, use of BSGI in evaluating response to neoadjuvant chemotherapy in breast cancer patients should be considered.

The Accuracy and Evolving Role of Axillary Ultrasound Core Biopsy in Early Breast Cancer Management

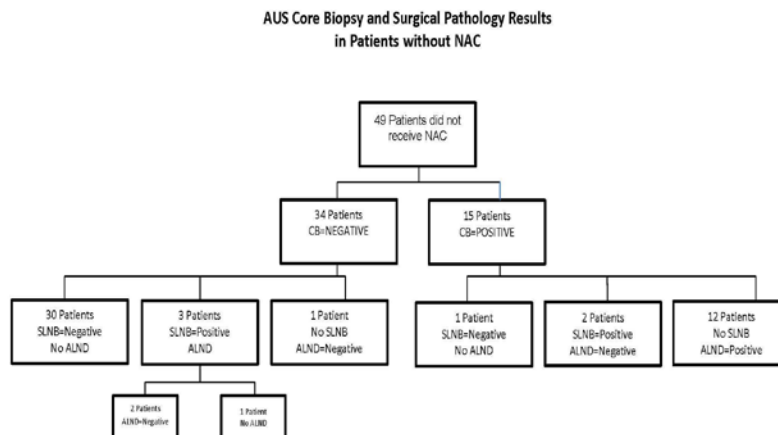
Amelia Tower¹, Kathleen M. Erb¹, Tara Grahovac², Julieta Robin¹, Thomas B. Julian¹

¹Breast Surgical Oncology, Allegheny Health Network, Pittsburgh, Pennsylvania, United States, ²Surgery, Allegheny Health Network, Pittsburgh, Pennsylvania, United States

Objective Preoperative axillary staging is widely accepted as a prerequisite to surgical management of early invasive breast cancer. However, recent trials, including ACOSOG Z0011, have advocated a conservative approach to axillary disease. In 2008, our institution analyzed the correlation of preoperative axillary ultrasound (AUS) fine needle aspiration (FNA) to surgical pathology. The aim of this study is to compare results using core biopsy (CB) to FNA, to determine the accuracy of minimally invasive biopsy, and to develop an algorithm for the use of AUS and CB in the current era of axillary disease management.

Methods An IRB-approved retrospective review of the institution's breast cancer center 2009-2013 records was used to identify patients who had AUS CB followed by sentinel lymph node biopsy (SLNB) and/or axillary lymph node dissection (ALND). Clinical, sonographic, and histological variables were assessed to identify predictors for nodal invasion at operation. CB results were compared with sentinel and axillary node pathology and with earlier FNA results. Patients were stratified on receiving neoadjuvant chemotherapy (NAC) or not. This report focuses on those patients without NAC.

Results A total of 315 patients had an AUS CB and 118 (117 women and 1 man) had breast cancer. Their average age was 54.7 years. Sixty-nine patients received NAC, while the remaining 49 patients did not. Dedicated breast radiologists performed the core biopsies and averaged 2.95 cores per patient. Abnormal nodes were described as "prominent," "enlarged," "hypoechoic," or having a "thickened cortex." The following figure shows CB results compared to the surgical specimen. Three false-negative core biopsies resulted in finding macrometastatic disease on SLNB pathology. One CB was positive without disease found on SLNB. The sensitivity and specificity of metastatic nodal involvement confirmed by AUS CB was 83% and 97%. The positive predictive value (PPV) and negative predictive value (NPV) was 93% and 91%, respectively. By comparison, prior FNA biopsies showed sensitivity of 87% and specificity of 92%. The PPV was 84% and the NPV was 75%.



Conclusion Preoperative negative AUS CB does not replace SLNB. However, the low false-negative results of AUS CB for a morphologically abnormal node could guide decisions to plan for SLN excision only, even in patient populations excluded by Z0011 criteria. The ALND could be reserved as a secondary procedure. Preoperative CB results can determine potential neoadjuvant therapy and enrollment into clinical trials. AUS CB has increased specificity, PPV, and NPV favoring its utilization over FNA.

Implementing a Screening Tool for Identifying Patients at Risk for Breast and Ovarian Cancer: A Statewide Initiative

Lucy Brannon Traxler¹, Monique L. Martin², Alice S. Kerber², Cecelia A. Bellcross⁶, Barbara E. Crane⁴, Victoria Green³, Roland Matthews⁵, Sheryl Gabram¹

¹Department of Surgical Oncology, Emory University, Atlanta, Georgia, United States, ²Georgia Center for Oncology Research and Education, Atlanta, Georgia, United States, ³Department of Obstetrics and Gynecology, Emory University, Atlanta, Georgia, United States, ⁴Georgia Public Health Department, Atlanta, Georgia, United States, ⁵Department of Oncology, Morehouse School of Medicine, Atlanta, Georgia, United States, ⁶Department of Human Genetics, Emory University, Atlanta, Georgia, United States

Objective The Georgia Breast Cancer Genomic Health Consortium, ESP is a public-private partnership created with funding from the Centers for Disease Control and Prevention (CDC) to the Georgia Department of Public Health to reduce cancer disparities among high-risk minority women. The project addresses populations of young women in Georgia at high risk for hereditary breast and ovarian cancer (HBOC) syndrome through outreach efforts focused on women ages 18 to 49 and ethnic/racial minorities. Activities performed are achieved through collaboration between the state Public Health infrastructure, the Georgia Center for Oncology Research and Education (CORE), and 2 local medical schools and 1 local university's strategic partners and existing cancer resources.

Methods The consortium provides education and collects surveillance data utilizing the Breast Cancer Genetics Referral Screening tool (B-RST) available at www.BreastCancerGeneScreen.org. The HBOC educational protocol was delivered by consortium members to 73 staff in 6 Georgia public health clinics. Clinic implementation sites were based on the disproportionate cancer burden of minority women and Ashkenazi Jewish populations. Staff were given basic information on HBOC and guided through the use of the B-RST to appropriately refer patients to genetic counseling. Staff used the tool during the collection of medical history prior to the visit. Patients that screened positive were later contacted by phone to complete a family health history assessment with a genetic service provider. Genetic testing for HBOC was facilitated, if appropriate.

Results Data was collected from November 2012 through September 2013. As of September 2013, 1,637 women have been screened. 73.4% (n = 1202) of participants self-identified as African American/Black, followed by 13.6% (n = 223) Caucasian/White, and 6.8% (n = 112) Hispanic/Latino. 86.7% (n = 1420) of patients were between 18 to 49 years old. 5.6% (n = 92) had positive screens and 62.3% (n = 38) patients received follow-up, provided a detailed family history, and received resources (see following table). Twenty-four patients met National Comprehensive Cancer Network (NCCN) high-risk guidelines, 7 received testing and 1 patient was BRCA 2 positive.

Conclusion The introduction of genomics practice within public health departments represents the future of cancer care through the provision of genetic testing and counseling to uninsured individuals resulting in access to comprehensive cancer care. The B-RST tool's successful implementation into public health clinics demonstrates the opportunity for integration of HBOC screening into primary care practice.

Patient Follow-Up	N (%)
Successfully contacted	38 (62.3%)
Contacts pending	9 (14.8%)
Meet NCCN high-risk guidelines	24 (63.2%)
Tested	7 (11.5%)
BRCA 1/2 positive	1 (1.6%)
Pending test results	2 (3.3%)

Axillary Ultrasound Accurately Excludes Clinically Significant Lymph Node Disease in Patients With Early-Stage Breast Cancer

Natalia Tucker^{1,2}, Amy Cyr¹, Feng Gao³, Williams Gillanders¹

¹Surgery, Washington University, St Louis, Missouri, United States, ²Surgery, University of Hawaii, Honolulu, Hawaii, United States, ³Biostatistics, Washington University, St Louis, Missouri, United States

Objective Sentinel lymph node biopsy (SLNB) is currently the standard of care for staging the axilla in breast cancer. However, it is an invasive procedure and is no longer considered therapeutic. We hypothesize that axillary

ultrasound (AUS) can be used to accurately exclude clinically significant lymph node (LN) disease in patients with early-stage breast cancer.

Methods We identified patients who underwent AUS from January 2007 to January 2011 using a prospective surgical database. AUS was considered abnormal based on consensus criteria. AUS findings were compared to pathology results from percutaneous LN biopsy, SLNB, or axillary node dissection. The negative predictive value (NPV), sensitivity, and specificity of AUS were calculated. False-negative AUS cases were further reviewed to determine the size of missed axillary disease. Multivariate analyses were performed to determine patient and/or tumor characteristics predictive of false-negative AUS; $p < 0.05$ was considered significant.

Results AUS was performed at diagnosis on 654 patients with breast cancer. AUS was abnormal for 269 patients; of those, 155 (58%) were verified to have axillary disease on pathology. AUS was normal in 385 patients; of those, 61 (16%) were found to have axillary disease on pathology. The sensitivity and specificity of AUS alone were 72% and 74%, respectively. The NPV of AUS was 84%. The mean size of a missed metastasis was 4.8 mm. Of the patients in whom axillary disease was missed on AUS, 21 had only micrometastases. Excluding those patients, the sensitivity and NPV of AUS improved to 79% and to 89%, respectively. Multifocality and tumor size were associated with false-negative AUS.

Conclusion AUS accurately excludes patients with clinically significant LN disease in 89% of patients. Given a changing paradigm in which tumor biology is increasingly used to determine adjuvant treatment and in which SLNB is used primarily to provide staging information, AUS may provide a noninvasive alternative to surgical lymph node staging.

Variation in Recurrence Patterns With Treatment in Patients With DCIS

Faaiza Vaince^{1,2}, Tam T. Mai^{1,2}, Michael Lagios³, Melvin J. Silverstein^{2,1}

¹Surgical Oncology- Breast, University of Southern California, Los Angeles, California, United States, ²Surgical Oncology, Hoag Memorial Hospital Presbyterian, Newport Beach, California, United States, ³The Breast Cancer Consultation Service, Tiburon, California, United States

Objective Ductal carcinoma in situ (DCIS) is commonly treated using local excision with or without postoperative radiation therapy. Radiation therapy is known to reduce the local recurrence rate by a relative 50%. We were interested in whether the pattern of local recurrence (invasive vs noninvasive, quadrant of recurrence, time to recurrence) varied with the addition of radiation therapy.

Methods Using a prospective database, 1,120 patients with pure DCIS who underwent breast-conserving surgery (1980-2013) were analyzed for type of local recurrence (invasive vs DCIS), median time to recurrence, quadrant of recurrence (same or different), and breast cancer specific survival. DCIS patients who underwent excision alone were compared with DCIS patients who underwent excision with adjuvant radiation therapy. Probabilities of local recurrence were derived using the Kaplan-Meier Method. Probabilities were compared using the log-rank test.

Results See table for summary of results.

Conclusion Our data confirm an approximate 50% reduction in local recurrence if radiation therapy is given and are consistent with the published prospective randomized data. However, the pattern of recurrence in irradiated patients differed significantly from excision-only patients. Irradiated patients who recurred took about twice as long to recur. This was true for both invasive and DCIS recurrences. When irradiated patients recurred, they had a higher percentage of invasive recurrences. This may have contributed to a slightly but significantly lower 10-yr breast cancer-specific survival. The different nature, location, and timing of recurrence between the 2 populations have implications in how patients should be followed and counseled regarding recurrence. Additional long-term awareness is warranted in irradiated patients who may recur much later, and do so more frequently with an invasive carcinoma.

continues

Recurrence Patterns by Treatment in DCIS Patients

	Excision Alone	Excision Plus Radiation Therapy	P Value
No. of patients	691	429	
Mean age of patients	51.7	49.9	NS
Mean grade of DCIS	2.47	2.44	NS
Average follow-up	77 mo	100 mo	<0.01
No. of all breast recurrences	125	72	NS
No. of invasive recurrences	47 (38%)	41 (57%)	<0.01
No. of DCIS recurrences	78 (62%)	31 (43%)	<0.01
Median time to any recurrence	37 mo	66 mo	<0.01
Median time to invasive recurrence	55 mo	101 mo	<0.01
Median time to DCIS recurrence	26 mo	45 mo	<0.01
No. of same quadrant recurrences	113/125 (90%)	53/72 (74%)	<0.01
No. of different quadrant recurrences	12 (10%)	19 (26%)	<0.01
No. of invasive recurrences in different quadrant	8/47 (17%)	15/41 (37%)	0.04
Median time to same quadrant recurrence	36 mo	56 mo	<0.01
Median time to different quadrant recurrence	48 mo	141 mo	<0.01
10-yr probability any local recurrence	29%	18%	<0.01
10-yr probability invasive local recurrence	13%	10%	NS
10-yr breast cancer specific survival	99.7%	98.5%	0.03

NS = Not statistically significant.

Patterns of Psychosocial Distress in Newly Diagnosed Breast Cancer Patients and Their Partners Vary by Education and Income Levels

Courtney Vito¹, Courtney Bitz², Karen Clark², Philip Ituarte¹, Laura L. Kruper¹, Steven L. Chen¹, Matthew Loscalzo²

¹Surgical Oncology, City of Hope National Medical Center, Duarte, California, United States, ²Supportive Care Medicine, City of Hope National Medical Center, Duarte, California, United States

Objective Screening for psychosocial distress (PD) in cancer patients is mandated by the American College of Surgeons Commission on Cancer. Despite this, widespread screening is not commonly available, instead favoring problem-focused interventions as distress arises. PD occurs in caregivers, though no formal screening guidelines exist. Patterns of PD across demographics in cancer patients and their primary support person (partner) are not well understood. This study evaluates patterns of PD in patients and partners.

Methods Partners Clinic is a novel clinic designed to address PD and interpersonal communication in the newly diagnosed breast cancer patient and their self-identified partner. Each was individually screened for psychosocial stressors using SupportScreen, a touch screen tool, at initial clinic intake. Participants identified common psychosocial stressors, rated their magnitude of distress (0 = no distress to 4 = very high distress), and could request assistance in either written form or live consultation with different multidisciplinary team members. Patients and partners then met with social workers for training in communication and problem-solving immediately prior to meeting with the surgeon. Using data from clinic inception, October 2010, through September 2013, PD scores were summed across 29 individual stressors and analyzed with ANOVA by age, race/ethnicity, income, and education levels.

Results Of 103 participating patient-partner pairs, each member of 94 pairs completed PD inventories. Patients expressed higher levels of distress when queried about feeling anxious ($p = 0.014$), being able to care for themselves ($p = <0.001$), and managing emotions ($p = 0.003$) than partners. Otherwise, rates of distress were not significantly different between the groups. PD did not vary by age ($p = 0.380$) nor race/ethnicity ($p = 0.258$). PD varied by annual

income 0-\$40,000 > \$40,000-\$100,000 > \$100,000+ (p = 0.049). Education level was strongly predictive of overall distress (p = 0.012) (see table).

Conclusion PD decreases with increasing income level as financial concerns regarding medical care decrease. College-educated patients and partners are disproportionately affected by PD at the time of breast cancer diagnosis compared to others with higher or lower education levels. This may reflect distress created by their increased ability to independently accumulate knowledge about disease but not necessarily ability to fully comprehend its relevance to their case or cope with it. This may also reflect current national trends with college education not predictive of higher income and employment levels. All patients and partners should be screened for PD appropriate to their education levels and receive tailored interventions.

Predicted Distress Scores in Patients and Partners by Education Level

p = 0.012		
Education Level	Mean Distress Score (0-116)	95% Confidence Interval
Less than high school	10.4	-2.62-23.5
High school graduate	16.5	11.0-22.1
Some college education	14.2	9.9-18.5
College graduate	24.9	19.5-30.0
Graduate school	15.1	8.0-22.1

Descriptive Findings on the Utility of Indocyanine Green and Isosulfan Blue in the Mapping of Arm-Draining Lymphatics and Nodes

Irene L. Wapnir, Shushmita M. Ahmed, Nicole S. Choy, Catherine Porter, Shannon Meyer
Department of Surgery, Stanford University, Stanford, California, United States

Objective Arm lymphedema occurs in up to 15% of patients receiving axillary node dissections and up to 7% after sentinel node resection only. The identification of arm-draining lymphatic channels and lymph nodes in the axilla can theoretically be to lessen the occurrence of arm lymphedema. Axillary reverse mapping (ARM) with isosulfan blue (ISB) has been used in axillary staging procedures for breast cancer (Boneti et al, 2008). Because blue dye is favored for sentinel node mapping by many surgeons, there is a need for a similar dye. Indocyanine green (ICG) is a water-soluble dye with a peak absorption at 800-810 nm (infrared range). Our objective was to compare the anatomic distribution of ISB and ICG with respect to the identification of lymphatics and arm-draining nodes in breast cancer nodal staging procedures.

Methods Patients undergoing sentinel node resection and/or axillary node dissection were considered eligible and signed informed consent. Preoperatively, all patients were injected a periareolar fashion with radiotracer. Intraoperatively, 0.5-1.5 mL ICG solution and 3-5 mL of ISB were injected subcutaneously in the upper inner third of ipsilateral arm. Intraoperatively, sentinel nodes were identified by gamma probe and examined for the presence of blue and imaged with the SPY ELITE® camera to detect fluorescence. The axilla was visually explored to identify blue lymphatics or nodes, as well as imaged with the camera to detect fluorescent structures.

Results For this preliminary analysis, 13 women who underwent lumpectomy and sentinel node biopsy, with or without axillary node dissection, were included. The mean age at surgery was 57.5 years. Four (31%) patients received neoadjuvant therapy. Altogether, arm-draining lymphatics and/or nodes were identified in 10 (77%) patients. In vivo SPY imaging identified fluorescent arm-draining lymphatics and/or nodes in 9 patients. Of note, some cases exhibited a single lymphatic channel on imaging, while others demonstrated innumerable lymphatic vessels. ISB identified 8 of the same cases as ICG, in addition to another case with a blue node that was not fluorescent. Nine sentinel nodes were detected by radioactive counts and, of these, 3 were only hot, 2 had faint blue discoloration and low fluorescence, 2 were faintly blue only, and 2 were fluorescent plus blue, or had an adjacent blue-leading lymphatic originating in the arm. The other 4 were suspicious by palpation, 2 of which were positive for metastasis, but neither was blue nor fluorescent. Thus, 2 of 13 (15%) sentinel node specimens showed visible overlap with arm-draining lymphatics or nodes.

Conclusion These preliminary data show 89% overlap between ISB and ICG in lymphatic mapping of the arm and a 15% overlap with mapping of sentinel nodes. Thus, it is potentially possible to replace ISB with ICG infrared camera imaging for this procedure.

Sensitivity of MRI for Detection of Occult Lesions in Newly Diagnosed Breast Cancer

Julie Wecsler¹, Akshara Raghavendra², Lingyun Ji³, Susan Groshen³, Debu Tripathy², Mary Yamashita⁴, Pulin Sheth⁴, Stephen F. Sener¹, Christy Russell², Heather MacDonald¹, Julie E. Lang¹

¹Division of Breast and Soft Tissue Surgery, Department of Surgery, USC Norris Comprehensive Cancer Center and Los Angeles County Medical Center, Los Angeles, California, United States, ²Division of Hematology and Oncology, Department of Medicine, USC Norris Comprehensive Cancer Center and Los Angeles County Medical Center, Los Angeles, California, United States, ³Department of Biostatistics, USC Norris Comprehensive Cancer Center, Los Angeles, California, United States, ⁴Division of Breast Imaging, Department of Radiology, USC Norris Comprehensive Cancer Center and Los Angeles County Medical Center, Los Angeles, California, United States

Objective The appropriate use of preoperative magnetic resonance imaging (MRI) in patients with newly diagnosed breast cancer remains a topic of debate. We aimed to determine the usefulness of MRI in the detection of occult multicentric, multifocal, and contralateral lesions not seen by ultrasound (US) or mammography.

Methods We performed a retrospective analysis of patients who underwent preoperative MRI for newly diagnosed stage 0-III breast cancer and were then treated surgically from 2006-2012. Medical records were reviewed from 2 centers, one a public safety-net teaching hospital and the other a private academic cancer center. Patients who received neoadjuvant chemotherapy were excluded.

Results Six hundred three patients were identified who fit inclusion criteria. Median age at diagnosis was 55 years. Mammography, US, and MRI identified 173 contralateral lesions in 141 patients. Of these lesions, 53 were not biopsied after repeat imaging and multidisciplinary board review. A total of 20 (3.3%) patients had biopsy-proven contralateral lesions. When MRI was compared to standard imaging with ultrasound and mammography, contralateral lesions were seen on MRI alone in 11 patients (1.8%). Eight patients (1.3%) had contralateral lesions seen by all imaging modalities and 1 patient (0.2%) had contralateral lesions seen only on US and/or mammography. MRI detected contralateral lesions in more patients compared to US/mammography ($p = 0.003$). No statistical significance was found on analysis of age, race, or histology with respect to identification of contralateral lesions on MRI. Sensitivity and specificity for MRI in detection of confirmed contralateral lesions were 95% and 79.1%, respectively. Records were available for analysis of multicentricity as seen on imaging in 572 patients. A total of 97 patients (17%) were identified as having multicentricity across all imaging modalities. MRI alone identified occult multicentricity in 46 patients (8%). Combined MRI, US, and mammography identified multicentricity in 25 patients (4.4%). Multicentricity was seen on US and mammogram alone in 26 patients (4.5%). MRI detected multicentricity in more patients compared to US and/or mammography ($p = 0.012$). Sensitivity and specificity for MRI in detection of confirmed multicentric lesions were 71.1% and 92.7% respectively ($n = 582$). Mammographic breast density and multicentricity was analyzed in 578 patients for whom records were available. Fifty-one (8.8%) of patients with either extremely dense or heterogeneously dense breasts were found to have multicentricity on MRI, compared to 21 patients (3.6%) with fatty or scattered fibroglandular breasts ($p = 0.01$). Records were available for analysis of multifocality in 572 patients. Seventy patients (12.2%) were found to have multifocal disease on MRI alone, compared to 55 patients (9.5%) on MRI and US and/or mammography and 55 patients (9.6%) on US and/or mammography alone. Although MRI appeared to detect more lesions than US and/or mammography, this excess was not statistically significant ($p = 0.105$). Sensitivity and specificity of MRI in detection of confirmed multifocal lesions were 41.6% and 86.6%, respectively ($n = 582$).

Conclusion We found an overall contralateral malignancy rate of 3.3% with 1.8% of these lesions detected by MRI alone in 603 consecutive patients with newly diagnosed breast cancer. MRI detected occult multicentricity in 8% and occult multifocality in 12.2% of patients. MRI detected more occult contralateral and multicentric lesions than conventional imaging. We propose to use this dataset to construct a regression model to predict for patients in whom MRI is more likely to detect occult contralateral, multicentric, and multifocal disease.

Calcifications on Mammogram Do Not Correlate With Tumor Size After Neoadjuvant Chemotherapy

Anna Weiss, Yaya Romero, Katherine Lee, John Einck, Youn Jeong Kim, Haydee Ojeda-Fournier, Sarah Blair
General Surgery, UCSD, San Diego, California, United States

Objective Neoadjuvant chemotherapy is effective at downstaging locally advanced breast cancers. Calcifications are indicative of malignancy, but can also represent necrotic tissue as cancer cells die and release calcium. Current treatment guidelines require excision of these calcifications, based on preoperative imaging, as they are believed to represent the total tumor burden. The objective of this study is to examine the correlation between imaging,

specifically extent of calcification, and actual tumor size following neoadjuvant chemotherapy.

Methods We retrospectively reviewed our prospective database on all patients at University of California, San Diego, who underwent neoadjuvant chemotherapy in the treatment of advanced-stage breast cancer 2007-2013. Inclusion criteria were patients with invasive carcinoma on biopsy. Patients were included who had no residual disease, carcinoma in situ, and/or invasive disease on final pathology at the time of surgical resection. Demographics were recorded, including age, stage, lymph node status, estrogen/progesterone receptor status, and HER2neu positivity. Pearson correlation coefficients were computed between breast imaging measurements and pathological measurements. Difference between correlations was assessed via chi-square test.

Results One hundred thirty-seven patients were treated with neoadjuvant chemotherapy. Average age was 51. Seventy-three patients had positive lymph nodes before neoadjuvant treatment. Sixty-seven patients were ER+, 54 PR+, and 39 HER2neu+. Fifty-three of these patients had calcifications on imaging before and/or after neoadjuvant chemotherapy (Calc+ group). In patients in the Calc+ group, the extent of disease on imaging before and after neoadjuvant chemotherapy was 5.1 cm and 4.4 cm on mammogram, 3.6 and 1.5 cm on ultrasound, and 5.8 and 2.5 cm on MRI. Calcifications measured 3.7 cm before and 3.5 cm after chemotherapy, and final pathological size was 2.3 cm. Eighty-four patients did not have calcifications on imaging (Calc- group). In Calc- group extent of disease on imaging before and after chemotherapy measured 4.3, then 2.3 cm on mammogram; 3.4, then 1.5 cm on ultrasound; 4.9, then 2.4 cm on MRI; and final pathology revealed average tumor size of 2.3 cm. Extent of disease on breast MRI had the best correlation with disease on surgical pathology in both groups and was not significantly different (0.55 vs 0.48; $p = \text{NS}$). Preoperative mammogram of the calc- group was more likely to correlate with viable tumor on final pathology at surgical resection (calc- 0.46 vs calc+ -0.1; $p < 0.001$). The extent of calcifications on preoperative imaging did not correlate with viable tumor on pathology ($r = -0.1$); for example, 25 of the calc+ patients had increased calcification after neoadjuvant chemotherapy; 6 of these had complete pathologic response.

Conclusion MRI imaging correlated well, but calcification measurements were poorly correlated to tumor size on final pathology. If calcifications are present, current surgical treatment aims to excise all calcifications. However, poor correlation of calcification to tumor size suggests that surgeons keep this information in mind when counseling patients for surgical planning. Future studies may examine this issue more closely in a prospective trial.

Cost Analysis of Nipple-Sparing Mastectomy: Must New Always Be More Expensive?

Barbara Wexelman, Holly Martinson, Rong Tang, Kevin Hughes, Suzanne Coopey, Michele Gadd, Michelle Specht, Barbara L. Smith

Surgical Oncology, Massachusetts General Hospital, Boston, Massachusetts, United States

Objective Early adoption of new medical technology and techniques usually requires increased resources of money and time. Nipple-sparing mastectomy (NSM) has theoretical potential for cost-savings compared to traditional skin-sparing mastectomy (SSM), as the larger skin envelope increases the options for single-stage reconstruction procedures, reducing expansion visits and subsequent surgeries. We seek to compare costs related to NSM vs SSM and the downstream health finance effects for the first postoperative year.

Methods One hundred seventy-two NSMs and 123 SSMs were performed at our institution in 2012 by 5 breast surgical oncologists. Twenty representative cases of each type were selected for retrospective chart review matching the proportion of bilateral mastectomies and reconstructions as in the entire series. Factors influencing cost, including operative time, type of implantable devices used, length of stay, number of post-op visits, and additional surgeries for each patient, were collected. A basic cost model was developed for the operation and outpatient care for 12 months follow-up. Independent t tests were used to assess statistical difference.

Results The operative cost and 1-year follow-up of the NSM patients was not significantly more expensive than standard SSM. Operative cost was calculated at \$30/min, with additional costs added for implanted devices (tissue expanders, acellular dermal matrix, Vicryl Mesh) using 80% of the published retail price of the device to account for most hospital discounts. Length of stay (2.4 days NSM vs 2.1 SSM) was not statistically different and the mean number of additional surgeries for complications or revisions (0.6 vs 0.6) was the same between groups. The NSM cohort had 2.4 fewer postoperative outpatient visits (8.6 vs 11.0), though this was not statistically significant. Acellular dermal matrix products were a source of significant cost in the NSM group.

Conclusion In our cohort, NSM was not significantly more expensive than traditional SSM. Opportunities for cost savings may be obtained in NSM with decreased OR time and decreased post-op visits. Continued collaboration with our plastic surgery colleagues regarding choice of less expensive implantable devices at time of mastectomy may provide additional opportunities for cost savings.

Cost Factors of Nipple- vs Skin-Sparing Mastectomy

	Skin-Sparing Mastectomy	Nipple-Sparing Mastectomy	P value
N	20	20	
Average #sides per case	1.7	1.7	
Length of stay (days)	2.4	2.1	0.26
Type of reconstruction			
Tissue expander	5 (25%)	5 (25%)	
Immediate implant	12 (60%)	14 (70%)	
FLAP	3 (15%)	1 (5%)	
Biologic acellular dermal matrix	8 (40%)	13 (65%)	
Vicryl Mesh	6 (30%)	6 (30%)	
OR time (min)	309.8	272.4	0.20
Post-op visits (# visits)	11.0	8.6	
Avg number of additional surgeries (revisions, reop complications)	0.6	0.6	
Model costs	\$14,339.35	\$14,683.70	0.84

Cost Assumptions: \$30/min cost of OR time; \$50/ office visit postop; \$1100 per tissue expander (20% discount of retail price); \$3817 per acellular dermal matrix sheet, use 2 sheets in BL cases (25% discount of retail price); \$300 per Vicryl sheet; \$30/ nipple permanent pathology analysis.

Do Racial Disparities Exist in Prophylactic Surgery for BRCA Mutation Carriers?

Barbara Wexelman, Kristen Shannon, Devanshi Patel, Suzanne Coopey, Kevin Hughes, Michelle Specht, Barbara L. Smith, Michele Gadd

Surgical Oncology, Massachusetts General Hospital, Boston, Massachusetts, United States

Objective Ethnic minority women undergo genetic testing for hereditary breast cancer syndromes at lower rates than white patients. Economic barriers and poorer access to testing may be responsible for this disparity. Although the majority of white patients found to have a BRCA1 or BRCA2 mutation choose prophylactic surgery to reduce risks of breast and ovarian cancer, there is little data on uptake of prophylactic surgery in minority populations. We looked for potential racial disparities in uptake of prophylactic breast and ovarian surgery after positive BRCA1/2 mutation testing.

Methods We performed a retrospective chart review of all patients who underwent BRCA testing at our institution from 2001-2011. Black and Hispanic BRCA mutation carriers were compared to white BRCA mutation carriers. Date of BRCA testing, personal history of breast cancer, and dates of prophylactic oophorectomy (BSO) and prophylactic mastectomy (PMast) were identified. Time from positive genetic test to BSO and PMast was calculated in days. Male patients and patients with ovarian cancer at presentation were excluded from the analysis.

Results 4857 patients underwent BRCA testing at our institution from 2001-2011. Of these, 549 had a deleterious BRCA1 or BRCA2 mutation. Excluding ovarian cancer and male patients, 8 African American and 12 Hispanic BRCA mutation carriers were identified and compared with a cohort of 30 white BRCA mutation carriers. In our population, the minority patients had a higher personal cancer rate (85%) than the white patients (66.6%, $p = 0.07$). Black and Hispanic women trended toward lower rates of BSO (75% vs 90% for white women), but this was not statistically significant. Time from BRCA diagnosis to BSO was similar between minority women (215 days) when compared to white women (208 days). There was no difference in the proportion of minority women choosing prophylactic mastectomy compared to white women, with white women having a longer time to PMast than the minority patients by more than 2 months.

Conclusion When a BRCA mutation was identified, ethnic minority BRCA mutation carriers at our institution elected risk reducing prophylactic surgery at rates similar to white BRCA mutation carriers. Improving access of high risk minority patients to genetic testing may improve outcomes.

Rates of Prophylactic Oophorectomy and Mastectomy by Race

		All (%)	Black/ Hispanic (%)	White (%)	P value
N		50	20	30	
Mean age at BRCA testing (yr)		45.4	44.0	46.3	
Personal breast cancer history		37 (74.0)	17 (85.0)	20 (66.6)	0.07
BSO	Performed pre-testing	6 (12.0)	4 (20.0)	2 (6.7)	
	Prophylactic/post-testing	36 (72.0)	11 (55.0)	25 (83.3)	
	Young pt	4 (8.0)	3 (15.0)	1 (3.3)	
	Total BSO performed	42 (84.0)	15 (75.0)	27 (90.0)	0.15
	BSO not performed	4 (8.0)	2 (10.0)	2 (6.7)	
	Mean time to BSO (days)	210.2	215.1	208.0	0.41
	Range (days)	4 to 788	77 to 413	4 to 788	
Prophylactic mastectomy	Performed pre-testing	2 (4.0)	0	2 (6.7)	
	Prophylactic/ post-testing	33 (66.0)	14 (70.0)	19 (63.3)	
	Total PMast performed	35 (70.0)	14 (70.0)	21 (70.0)	0.47
	PMast not performed	15 (30.0)	6 (30.0)	9 (30.0)	
	Mean time to PMast (days)	428.4	390.8	456.1	0.91
	Range (days)	16 to 2017	24 to 1861	16 to 2017	

Addressing Breast Cancer Disparities Through Targeted Neighborhood Door-to-Door Outreach: The Impact of Breast Health Education and Preventative Screening in Underserved Areas

Mindy M. Williams^{1,2}, Stephanie E. Hoogenbergen², Andrea D. Ivory², James M. Pann², Julie G. Wilkinson², Carmen J. Calfa^{1,2}

¹Division of Breast Surgical/Medical Oncology, Memorial Healthcare System, Hollywood, Florida, United States,

²Women's Breast Health Initiative, Miami Lakes, Florida, United States

Objective In 2013, an estimated 232,340 women in the U.S. will be diagnosed with breast cancer and 39,620 will die from the disease. Researchers have been seeking ways to increase mammography utilization among underserved populations. There is still little known about the productivity of the various types of outreach and how one might evaluate this work. We proposed a quantifiable neighborhood door-to-door breast cancer awareness and education intervention, followed by screening mammograms and a continuum-of-care outreach program. We hypothesize that this targeted approach will lead to increased breast health awareness, increased screening rates, and possibly a higher rate of detection in an underserved population.

Methods Between 02-04-2011 and 10-20-2012, 15 outreach door-to-door campaigns were performed by trained volunteers in underserved communities in 3 Florida counties: Miami-Dade, Broward, and Palm Beach. Participants were women who resided in the targeted neighborhoods, received a breast health educational package, and responded to the intake questionnaire. Every household with a woman in residence received an educational package based on the American Cancer Society early detection guidelines. Volunteers used an intake sheet questionnaire to record data related to breast health. Questions identified if a woman was over the age of 40, and if she was eligible to receive a screening mammogram. At the end of each campaign, a mobile mammography unit visited the neighborhoods and provided screening mammograms to pre-qualified women. Campaign impact was quantified using follow-up phone call surveys to women who received the breast health educational packages and agreed to participate in the phone survey.

continues

Results See table below.

2011-2012 Aggregate Data as NUMBER (%)

Households visited	21,638	100
Unanswered doors (received breast health educational door hanger)	13,162	60.8
Households that answered the door	8,476	39.2
Breast health educational packages given to households with women	7,824	92.3
Households with at least 1 woman resident ≥ 40 years of age	6,698	85.6
Households with at least 1 woman ≥ 40 years of age without insurance*	4,382	65.4
Screening mammogram appointments [^]	619	14.1
Screening mammograms completed [^]	414	9.4
New immediate diagnoses of breast cancer	1	0.24
Follow-up phone surveys completed [§]	1,748	22.3
Using the contents of the breast health educational package [§]	1,451	83.0
Found contents of the breast health educational package helpful [§]	1,416	81.0
Home visit raised awareness of importance of breast health [§]	1,398	80.0
Have spoken with other women about breast health [§]	1,101	63.0

*Estimated based on households with women that did not have insurance.

[^] Not all women >40 without insurance were eligible; exclusion criteria included pregnancy, breast feeding, recent mammogram, breast surgery, or biopsy.

[§] Surveys of women households that received the breast health educational package were obtained during the door-to-door visit to ensure contact information, agreement to participate. Follow-up phone survey was conducted to participants who answered or returned the call.

Conclusion The door-to-door outreach model provided screening rates of 9.4% in our targeted, underserved population that otherwise would not have had a screening mammogram during this time. Goal for future outreach is to increase this rate. When community members (peer educators/lay health advisors) deliver the educational tools personally and facilitate mammography screening, outreach efforts are effective and can close the gap in health disparities. While the 2011-2012 campaigns did not result in a higher cancer detection rate immediately, with continued longer term follow-up the detection rate may increase. Phone survey results demonstrated that this outreach program impacted not only those targeted directly, but also through a halo effect, the entire community.

Radiation Therapy in Patients With Breast Cancer and Connective Tissue Disease

Niamey Wilson, Gary Freedman, Carla Fisher

Hospital of the University of Pennsylvania, Philadelphia, Pennsylvania, United States

Objective Radiotherapy is often used in breast cancer as an adjunct for local disease control in patients wishing to undergo breast conservation therapy. However, it is generally contraindicated in patients with connective tissue diseases (CTDs). We sought to characterize the nature of CTDs in our referral population, to determine risk factors for certain CTD subtypes, and to assess the proportion of CTD patients who received radiation therapy.

Methods Retrospective review of patients seen in our health system from January 1980 through December 2012. We identified patients with both a diagnosis of breast cancer and connective tissue disease based upon ICD-9 codes. Comparisons of age across CTDs were performed with Student *t* test. Chi-square testing was used to determine the association of CTD subtype and radiation exposure.

Results We identified 188 women with both breast cancer and connective tissue disease. The mean (SD) age was 63.8 (11.5) years, and 55 (30%) were black. In the full cohort, 72 women (38%) carried a diagnosis of Sjogren's/sicca syndrome. Systemic lupus erythematosus (SLE) was present in 68 (36%). Dermato- or polymyositis was present in 20 (11%) patients, and 17 patients (9%) had systemic scleroderma. Unspecified connective tissue disease was documented in 28 (15%) of patients. The majority of patients, 171 (91%), had only 1 connective tissue disease diagnosis, but 16 (9%) had 2 and 1 (0.5%) had 3 connective tissue disease diagnoses. Black race was

strongly associated with SLE with 51% of black women having this connective tissue disease, compared to 30% of non-black women ($p = 0.007$). Of 145 women for whom data was available, 89 (61%) were treated with radiation therapy; most of these patients underwent lumpectomy. There was no significant difference between the subtypes of CTD regarding likelihood of receiving radiation therapy ($p > 0.05$ for all comparisons).

Conclusion CTD is common among women being treated for breast cancer, with Sjogren's/sicca syndrome predominating in our population. Black women with breast cancer may be more likely to have SLE than other connective tissue diseases. Despite standard contraindications to radiotherapy for patients with CTD, we find that a significant proportion do receive this therapy as part of their breast cancer treatment.

Granulomatous Mastitis: A 15-Year Trend Toward Nonoperative Management

Carol S. Woo, Mary Catherine Madden, Benjamin W. Pockock

General Surgery, Elmhurst Hospital, Elmhurst, New York, United States

Objective Granulomatous mastitis (GM) is an inflammatory disease of the breast most commonly of unknown etiology. Its management and treatment includes a combination of medication and surgery. The purpose of this study was to examine a possible trend toward eliminating operative procedures for patients with this disease.

Methods At a single, large teaching hospital, a computer search was conducted using key words: "granulomatous" and "mastitis" for the time period of 1998 to the present. Over 1400 cases were captured. Of these, 65 patients were eligible for the study. These cases were examined by a retrospective chart review.

Results Granulomatous cases not involving the breast and nongranulomatous mastitis cases were eliminated. On retrospective chart review, cases found to be an incidental finding on pathology were also eliminated from the study, leaving a total of 65 cases. All 65 patients were confirmed to have both pathological and clinical granulomatous mastitis. All were treated at a single teaching hospital over a 15-year period, from 1998 to the present. During this time, we found a total of 56 core needle biopsies were performed in the clinic and 47 surgical procedures were completed on these patients. A trend toward nonoperative management over time was observed (see Figure 1). However, on a Cochran-Armitage test this trend was not found to be statistically significant.

Conclusion On a retrospective chart review over a 15-year period, we observed a trend toward nonoperative management. Although this observation was not found to be statistically significant, we maintain that it is an important observation. Most of the current literature describes a combination of medication, usually antibiotics and/or NSAIDs, and surgery for GM patients. At our institution, we are moving toward treating GM patients exclusively in the clinic. In fact, since 2010, all of the GM patients were diagnosed by core biopsy alone and treated exclusively in the clinic. Given that GM can mimic an inflammatory or locally advanced breast cancer, accurate diagnosis is critical. This may require multiple core biopsies. Once cancer is sufficiently ruled out, these patients may be adequately treated by local wound care and medication, thus avoiding the morbidity associated with anesthesia and potential deformity associated with surgery.

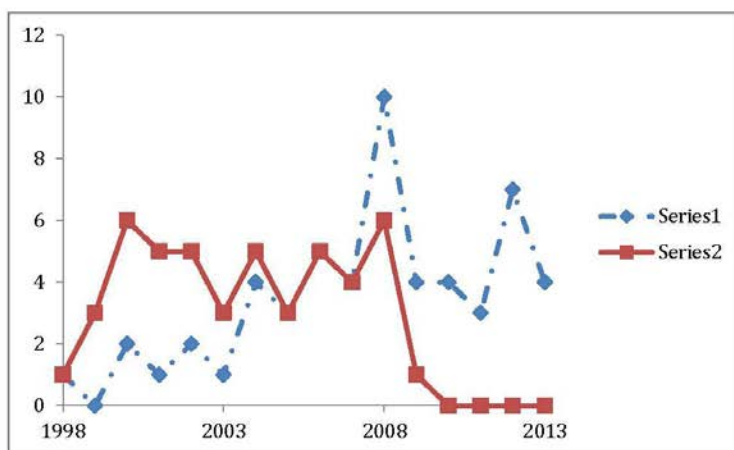


Figure 1. Series 1: # core biopsy; Series 2: # surgery

MammaPrint As a Predictor of Local-Regional Recurrence: Findings From a United States Early-Stage Breast Cancer Patient Cohort

*Katharine Yao*¹, *Mary Turk*¹, *Robert Goldschmidt*², *Karen Kaul*², *Lisette Stork-Sloots*³, *Femke De Snoo*³, *Massimo Cristofanilli*^{4,5}

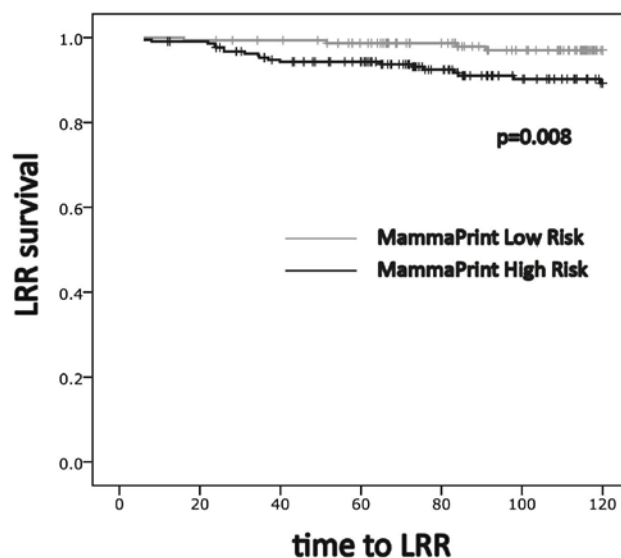
¹Department of Surgery, NorthShore University Health System, Evanston, Illinois, United States, ²Department of Pathology, NorthShore University Health System, Evanston, Illinois, United States, ³Medical Affairs, Agendia, Amsterdam, Netherlands, ⁴Department of Medical Oncology, Fox Chase Cancer Center, Philadelphia, Pennsylvania, United States, ⁵Department of Medical Oncology, Thomas Jefferson University Hospital, Philadelphia, Pennsylvania, United States

Objective MammaPrint is included in oncology guidelines for Distant Metastasis Free Survival (DMFS) risk stratification of early-stage breast cancer (Azim et al. *Ann Oncol*; 2013). Given the strong association between DMFS and locoregional recurrence (LRR), MammaPrint was studied for predicting LRR after adequate surgery (Beitsch et al, ASBS 2012; Nijenhuis et al, ECCO 2013). The aim of this study is to validate risk stratification by MammaPrint for LRR in an independent U.S. patient cohort.

Methods Three hundred seventy-four frozen/FFPE tumor samples from patients with stage T1-III, N0-Ib breast cancers were obtained from 2 separate cancer centers in the United States from 1992-2010. Median follow-up was 9.7 years. We analyzed the LRR rate and included known risk factors at the time of diagnosis, such as stage, nodal status, tumor size, grade, treatment, ER status, in addition to MammaPrint classification.

Results Median age of the patient cohort was 56 years, 74% of patients were ER positive, 17% HER2 positive. All patients underwent surgical excision and adjuvant therapy according to NCCN guidelines. Two hundred sixty-eight (72%) patients were treated with breast-conserving therapy (BCT), had negative margins, and received postlumpectomy radiation; and 104 (28%) patients had a mastectomy (2 pts unknown surgery procedure). MammaPrint classification identifies 42% of the patients as low risk and 58% as high risk. After 10 years of follow-up, 23 LRR events had occurred. Patients classified as high risk by MammaPrint had a significantly higher risk of LRR compared to MammaPrint low risk patients ($p = 0.014$). MammaPrint classification had a similar prognostic value for patients treated with BCT or mastectomy. MammaPrint low-risk patients had a local-regional recurrence risk of 3.0% at 10 years (95% CI, 0.1-5.9%) whereas MammaPrint high-risk patients had a local-regional recurrence risk of 10.8% at 10 years (95% CI, 6.1-15.5%). Univariate analysis revealed that positive nodal status, high grade, negative ER status, chemotherapy use, and MammaPrint high-risk classification were statistically significant predictors of local-regional recurrence. When multivariate analysis was performed, only nodal status remained significant.

Conclusion This study in an independent U.S. patient population confirms the ability of MammaPrint to identify a subgroup of breast cancer patients who have a low risk of LRR and would be possible candidates for partial breast irradiation.



Surgical Decision-Making for Breast Cancer: Treatment Choices and Preferences Prior to Surgery

Katharine Yao¹, Marha Van Haitsma⁴, Kelsey Watson², Kristin Wroblewski³, Sarah Rabbitt¹, Swati Kulkarni²

¹Surgery, NorthShore University HealthSystem, Evanston, Illinois, United States, ²Surgery, University of Chicago, Chicago, Illinois, United States, ³Health Studies, University of Chicago, Chicago, Illinois, United States, ⁴Survey Lab, University of Chicago, Chicago, Illinois, United States

Objective The incidence of contralateral prophylactic mastectomy (CPM) is rising in the U.S. The reasons for this increase are unclear. We hypothesized that patients have preconceived treatment preferences for CPM. To test our hypothesis, we developed a survey based on cognitive interviews of patients who had completed treatment for their breast cancer.

Methods A 55-item survey was administered to newly diagnosed breast cancer patients (n = 41) at 2 institutions prior to surgery. Answers to the survey were tallied and stratified by certain demographic factors, risk perception, and anxiety/depression as measured by the Generalized Anxiety Disorder Screener (range, 0-6) and Patient Health Questionnaire (range, 0-6).

Results The median age of the cohort was 60 years. Eight (20.0%) were self-reported stage 0 disease, 14 (35.0%) stage I, 7 (17.5%) stage II, 5 (12.5%) stage III. Six (15.0%) patients didn't know their stage. Fifteen (36.6%) patients were African American and 25 (61.0%) white. Thirty-six percent and 28% of patients exhibited symptoms of anxiety and/or depression, respectively. Five women (12.1%) had a CPM, 13 (31.7%) had a unilateral mastectomy, and 23 (56.1%) had a lumpectomy. Eighteen (43.9%) patients had thought about their surgery choice before they were diagnosed with cancer and 8 (20.0%) knew they wanted a CPM as soon as they were diagnosed with breast cancer. Nineteen (47.5%) considered a CPM after they were diagnosed. Of the 27 (67.5%) patients who either wanted or considered a CPM, 5 (18.5%) patients actually underwent CPM. When asked who first brought up CPM, 22 (53.7%) patients stated that nobody brought up CPM, 6 (14.6%) stated they first brought it up, 9 (22.0%) stated their doctor brought it up, and 4 (9.8%) indicated that their friends or relatives brought it up. Interestingly, 11 (29.7%) of the patients knew someone personally who had a CPM but of the patients who wanted a CPM, only 18% knew someone who had a CPM in contrast to 32% of patients who did not want or consider a CPM. Twelve percent of patients believed their pre-cancer risk for breast cancer had been above average, but 25.0% of patients who wanted a CPM thought this vs only 7.1% of patients who did not want a CPM. Thirty-seven percent of patients were very/extremely worried about getting breast cancer again and getting cancer elsewhere in their body. Among those wanting CPM, 50% were very/extremely worried about getting breast cancer again and getting cancer elsewhere in their body compared to 32% of patients not wanting a CPM.

Conclusion Nearly 50% of patients surveyed had thought about their surgery choice prior to diagnosis; over 60% either knew they wanted a CPM or considered it along their decision-making process. Patients wanting a CPM had a higher risk perception than others and more anxiety about breast cancer recurrence. However, the numbers in our study are small. Future analysis will require a larger number of patients to determine if these patterns persist.

Partial Breast Reconstruction for Medial Quadrants Using the Omental Flap

Hisamitsu Zaha

Breast Surgery, Nakagami Hospital, Okinawa, Japan

Objective Indication of breast-conserving surgery (BCS) has been increased due to various oncoplastic techniques. Generally, volume replacement technique is needed when the breast size is small or the resection volume is large. The lateral chest wall perforator flap has recently gained the popularity because of its minimal donor-site morbidity; however, it is generally difficult for the autologous flaps to replace the defect in the medial quadrants. We have experienced 170 cases of oncoplastic surgery using the laparoscopically harvested omental flap (OF), mainly for the partial breast reconstruction, since April 2002. Unlike other autologous flaps, the medial quadrants are an elated field for the OF because of its anatomical advantage. We review our experience with immediate partial breast reconstruction after BCS for the medial quadrants using the OF.

Methods The subjects were 51 patients with tumors in the lower or upper medial quadrant who underwent immediate partial breast reconstruction with the OF between April 2002 and July 2013. For the tumor in the lower medial quadrant, a wide excision (>20% of the breast tissue) was performed through a skin incision along the medial inframammary fold. The OF was laparoscopically harvested, and a small subcutaneous tunnel was created from the medial end of the inframammary incision toward the xyphoid process. A small laparotomy was made and the OF was extracted through the subcutaneous tunnel. The defect in the lower medial quadrant could be filled without any additional scar. For the tumor in the upper medial quadrant, various skin incisions were used for wide excision, and

an additional small incision (about 3 cm) was made on the inframammary fold. The OF was extracted with the same manner, and filled the defect in the upper medial quadrant.

Results The mean operative time was 3 hours and 45 minutes. The mean volume of resected breast tissue was 170 g. The OF could reach anywhere in the breast, and replace the defects without any difficulties. The surgical margin was positive in only 1 patient. Complication rate is 7.8 %, and all of them were minor and treated conservatively. Cosmetic results were mostly satisfactory, with a soft breast that was natural in appearance. Scars on the inframammary fold and donor-site were negligible. The only 1 local recurrence had occurred so far.

Conclusion The OF is an attractive volume replacement technique for difficult quadrants of the breast with minimal donor-site morbidities and deformities.

Factors Affecting the Accuracy of Sonoelastography: Age and Tumor Size

Nicole M. Zaremba, Mersadies Martin, Alan T. Davis, David Anderson, Sarah M. Schafer, Harvey Bumpers
Surgery, Michigan State University, Lansing, Michigan, United States

Objective Sonoelastography (SE) is a complimentary modality to ultrasonography (US) which superimposes a color on the US image. The most commonly used visual scoring system, Tsukuba Elasticity Score (TES), is based on the principle that stiffer (less elastic) tumors appear blue and are assigned higher scores (4,5), whereas softer (more elastic) tumors appear green and are assigned lower scores (0-3). Literature on SE suggests that TES may perform better than US alone in the characterization of small malignant masses (<1 cm). However, intrinsic tissue elasticity should not depend on tumor size or breast density, known factors limiting mammography. Moreover, an upper age limit for mammographic screening is not established and false positives are common. This study aimed to determine if patient age or tumor size affect the accuracy of SE.

Methods From January 2012 to May 2013, 221 breast tumors in 196 patients (age 14-91) were examined using SE and biopsied. Patient data was collected and images were assigned a TES. Average TES and patient data were analyzed and compared in different groups according to patient age (premenopausal: <50, postmenopausal: 50-74, elderly: >74), tumor type (benign vs malignant), and tumor size (small, < 1.0 cm; moderate, 1.0-2.0 cm; large, >2.0 cm).

Results The mean TES for benign tumors, 2.6 ± 1.1 (mean \pm SD), $n = 90$, was significantly less than that of malignant tumors, 3.1 ± 1.1 , $n = 71$, ($p = 0.002$). Likewise, mean TES of moderate sized benign tumors (2.7 ± 1.2 , $n = 41$) was significantly less than malignant tumors (3.3 ± 1.0 , $n = 31$), $p = 0.02$. While the data suggest that this remains true in the small (2.5 ± 1.1 , $n = 40$ vs 3.0 ± 1.1 , $n = 28$) and large (2.1 ± 0.4 , $n = 8$ vs 3.1 ± 1.4 , $n = 10$) size groups, no statistically significant difference was identified ($p = 0.08$). Tumors were then analyzed based upon type and patient age. The mean TES of benign tumors in premenopausal women, 2.1 ± 1.1 , $n = 60$, was not significantly different than in postmenopausal women, 2.5 ± 1.3 , $n = 28$, ($p = 0.68$). Likewise, there was no significant difference in the mean TES of malignant tumors in premenopausal, 3.0 ± 1.3 , $n = 24$, and postmenopausal, 3.2 ± 1.0 , $n = 38$, women ($p = 0.99$). Furthermore, the sensitivity of TES in identifying a benign tumor was similar in both premenopausal (81.7%) and postmenopausal (75.0%) women, $p = 0.91$. The sensitivity of TES in identifying a malignant tumor was also similar in both premenopausal (37.5%) and postmenopausal (42.1%) women, $p = 0.73$. Due to the small sample size of benign tumors in the elderly group ($n = 2$), reliable comparisons could not be made. The TES for the 2 benign tumors in elderly women were 2.0 and 3.0, while the mean for malignant tumors in elderly women was 3.3 ± 1.0 , $n = 9$.

Conclusion SE is an effective and accurate diagnostic tool for the differentiation of benign and malignant breast tumors of moderate size. A larger study group may demonstrate similar results in the small and large size tumors. SE is an effective and consistent diagnostic tool for benign and malignant tumors across all ages and it is not affected by menopause.

Nomograms to Predict Sentinel Lymph Node Metastasis in Breast Cancer Patients: a Validation Study

Liling Zhu, Qian Ouyang, Kai Chen, Fengxi Su

Breast Tumor Center, Sun Yat-sen Memorial Hospital, Guangzhou, Guangdong, China

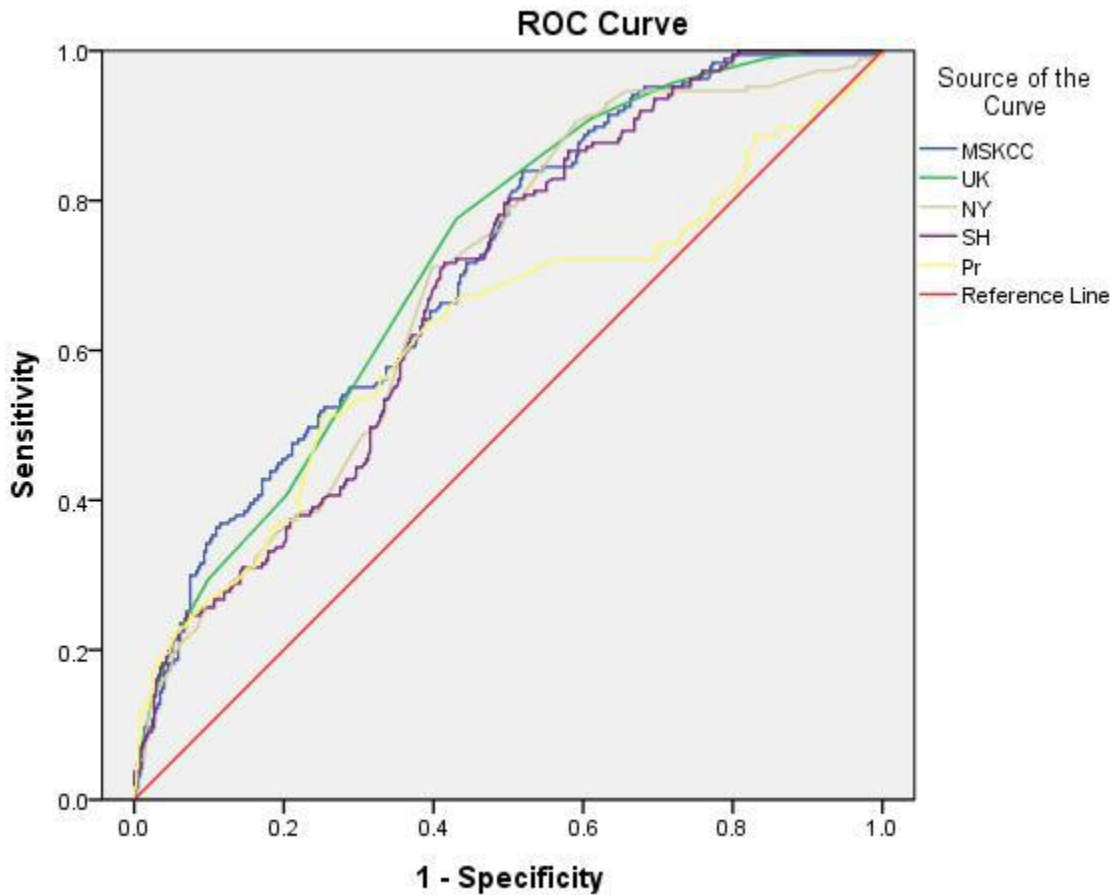
Objective Sentinel lymph node biopsy (SLNB) is a standard procedure for breast cancer patients with clinically negative axillae. Several nomograms have been developed to predict sentinel lymph node metastasis. In this study, we validated these nomograms and compared their performances.

Methods In total, 561 breast cancer patients were enrolled in the study. Univariate and multivariate analyses were employed to identify the risk factors for SLN metastasis. The MSKCC, UK, New York, Shanghai, and Paris models

were included and the ROC curves (with area under the curve [AUC] calculated) were used to assess their performance. Calibration plots were drawn and Hosmer-Lemeshow goodness-of-fit (H-L) test was used to evaluate the accuracy of these models. P value of H-L test >0.05 indicates that predictive probability is close to actual probability.

Results The median age of these patients was 49 (22-88) yr. Among them, 34.7% (233/671) had positive SLNs. Tumor size, lymph vascular invasion (LVI), and lateral quadrant tumors were significantly associated with SLN positivity in the univariate and multivariate analyses. The AUC values of the MSKCC, UK, New York, Shanghai, and Paris models were 0.71, 0.72, 0.69, 0.69, and 0.62, respectively. The P value of the H-L test was 0.06 in UK model, whereas all of the other models did not pass the H-L test ($P < 0.01$)

Conclusion The UK model and the MSKCC model performed well in our population. The UK model was the only one that passed the calibration plots and outperformed the other 4 models.



Diagonal segments are produced by ties.