

Treatment times in breast cancer patients receiving neoadjuvant versus adjuvant chemotherapy: Is efficiency a benefit of preoperative chemotherapy?

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Abstract

Background/Objective: Delays in the time to surgery, chemotherapy, and radiotherapy have each been shown to impair overall survival in breast cancer patients. Neoadjuvant and adjuvant chemotherapy confer equivalent survival, but it remains unknown which approach facilitates faster completion of treatment. If either setting were to result in a significant delay, it could have survival implications. In this study, we aimed to examine the time it takes patients to start and complete breast cancer treatment when undergoing neoadjuvant chemotherapy (NAC) versus adjuvant chemotherapy (AC).

Methods: Women ≥ 18 years old with non-recurrent, noninflammatory, clinical stage I-III breast cancer diagnosed from 2004-2015 whose treatment course included both surgery and chemotherapy were reviewed from the National Cancer Database (NCDB). Patients were divided into two groups: those undergoing NAC and those having AC. Comparisons between the two groups were performed using Student's t-test and chi-square test.

Results: There were 155,606 women who met inclusion criteria. Of these, 28,241 patients received NAC and 127,365 patients received AC. Patients undergoing NAC had higher clinical T stage (35.8% T3a vs 4.9% T3a) and higher clinical N stage (14.4% N2/3 vs 3.7% N2/3) compared to those having AC. Time to start treatment was longer in the NAC group (35.6 vs 33.4 days unadjusted, $p < 0.0001$; 36.1 vs 35.4 days adjusted, $p = 0.15$). Time to radiotherapy was longer in patients undergoing NAC (243.2 vs 208.7 days unadjusted, $p < 0.0001$; 240.8 vs 218.2 days adjusted, $p < 0.0001$), and time to endocrine therapy was also longer in patients undergoing NAC (305.4 vs 288.3 days unadjusted, $p < 0.0001$; 301.6 vs 275.7 days adjusted, $p < 0.0001$). Average length of stay was similar in both groups (NAC 1.61 ± 4.93 days compared to AC 1.28 ± 5.90 days, $p = 0.14$). In the NAC group versus AC group, rates of unplanned readmission (1.2% vs 1.7%, $p < 0.0001$), 30-day mortality (0.04% vs 0.01%, $p = 0.18$), and 90-day mortality (0.30% vs 0.08%, $p = 0.0002$) were similar. NAC was not an independent predictor of increased length of stay, but was associated with a lower risk of readmission (OR 0.5, 95% CI 0.44-0.59) and a higher risk of 30- and 90-day mortality (OR 2.74, 95% CI 1.18-6.36 and OR 3.5, 95% CI 2.66-4.52).

Conclusion: Although NAC and AC confer equivalent survival in prospective randomized trials, NAC is not more efficient in getting patients through treatment when compared to AC, and NAC patients do not start treatment more quickly after diagnosis. While times from biopsy to radiotherapy and endocrine therapy are significantly longer in the setting of NAC, these times are not due to longer hospital stays or readmissions. Although there are clear indications for administering NAC versus AC, rapidity of treatment should not be considered a benefit of giving chemotherapy preoperatively.

Introduction

- Results from NSABP B-18 and B-27 have demonstrated that there is no difference in overall survival in the setting of neoadjuvant chemotherapy versus adjuvant chemotherapy in the treatment of breast cancer.
- While we do have studies examining delays to surgery (Bleicher et al, 2016) and delays to adjuvant chemotherapy (Lohrich et al, 2008; Chavez-MacGregor et al, 2016), there is little data available regarding the time it takes patients to start and complete their breast cancer treatment when undergoing neoadjuvant versus adjuvant chemotherapy.
- Patients often want to start treatment as soon as possible, and also often inquire as to the total length of treatment that will be required. In certain cases, medical oncologists recommend neoadjuvant chemotherapy with the thought that this will start treatment sooner than if surgery is the first modality, and may get patients through their treatment course faster than if they proceed to surgery first, followed by adjuvant chemotherapy.

Methods

- Inclusion criteria: Women ≥ 18 years old with non-recurrent, noninflammatory, clinical stage I-III breast cancer diagnosed from 2004-2015 having both surgery and chemotherapy in the National Cancer Database (NCDB).
- Exclusions: Males, patients with recurrent disease, non-breast cancers or multiple tumors, patients treated with neoadjuvant hormone therapy and/or neoadjuvant radiotherapy.
- Patients were divided into two groups: those undergoing NAC and those having AC, and were then further stratified based on treatment sequence (see Table 2).
- Treatment times were measured from biopsy to: Date of first treatment, start of radiotherapy and start of endocrine therapy.
- Treatment times were adjusted for facility volume, age, race, education, insurance, income, urban/rural setting, facility distance, treated at more than one facility, Charlson comorbidity index, histology grade, clinical T stage, clinical N stage, AJCC clinical stage, pathologic T stage, pathologic N stage, and phenotype (ER/PR/HER2).
- Outcomes and predictors of longer treatment times were examined.
- Comparisons between NAC and AC were performed using Student's t-test and chi-square test.
- Propensity score-weighted logistic regression models were used.

Results

Table 1. Demographics

	NAC (n=28,241)		AC (n=127,365)		P-value
	n	%	n	%	
Age					
Median	57	20.2	57	45.1	<0.0001
Q1	42	14.8	42	32.8	
Q3	72	25.5	72	56.1	
Q4	87	30.8	87	67.8	
Q5	102	36.1	102	79.8	
Q6	117	41.4	117	91.4	
Q7	132	46.8	132	102.8	
Q8	147	52.1	147	114.8	
Q9	162	57.5	162	126.8	
Q10	177	62.8	177	138.8	
Q11	192	68.1	192	149.8	
Q12	207	73.5	207	161.8	
Q13	222	78.8	222	173.8	
Q14	237	84.1	237	185.8	
Q15	252	89.4	252	197.8	
Q16	267	94.7	267	209.8	
Q17	282	100.0	282	221.8	
Q18	297	105.3	297	233.8	
Q19	312	110.6	312	245.8	
Q20	327	115.9	327	257.8	
Q21	342	121.2	342	269.8	
Q22	357	126.5	357	281.8	
Q23	372	131.8	372	293.8	
Q24	387	137.1	387	305.8	
Q25	402	142.4	402	317.8	
Q26	417	147.7	417	329.8	
Q27	432	153.0	432	341.8	
Q28	447	158.3	447	353.8	
Q29	462	163.6	462	365.8	
Q30	477	168.9	477	377.8	
Q31	492	174.2	492	389.8	
Q32	507	179.5	507	401.8	
Q33	522	184.8	522	413.8	
Q34	537	190.1	537	425.8	
Q35	552	195.4	552	437.8	
Q36	567	200.7	567	449.8	
Q37	582	206.0	582	461.8	
Q38	597	211.3	597	473.8	
Q39	612	216.6	612	485.8	
Q40	627	221.9	627	497.8	
Q41	642	227.2	642	509.8	
Q42	657	232.5	657	521.8	
Q43	672	237.8	672	533.8	
Q44	687	243.1	687	545.8	
Q45	702	248.4	702	557.8	
Q46	717	253.7	717	569.8	
Q47	732	259.0	732	581.8	
Q48	747	264.3	747	593.8	
Q49	762	269.6	762	605.8	
Q50	777	274.9	777	617.8	
Q51	792	280.2	792	629.8	
Q52	807	285.5	807	641.8	
Q53	822	290.8	822	653.8	
Q54	837	296.1	837	665.8	
Q55	852	301.4	852	677.8	
Q56	867	306.7	867	689.8	
Q57	882	312.0	882	701.8	
Q58	897	317.3	897	713.8	
Q59	912	322.6	912	725.8	
Q60	927	327.9	927	737.8	
Q61	942	333.2	942	749.8	
Q62	957	338.5	957	761.8	
Q63	972	343.8	972	773.8	
Q64	987	349.1	987	785.8	
Q65	1002	354.4	1002	797.8	
Q66	1017	359.7	1017	809.8	
Q67	1032	365.0	1032	821.8	
Q68	1047	370.3	1047	833.8	
Q69	1062	375.6	1062	845.8	
Q70	1077	380.9	1077	857.8	
Q71	1092	386.2	1092	869.8	
Q72	1107	391.5	1107	881.8	
Q73	1122	396.8	1122	893.8	
Q74	1137	402.1	1137	905.8	
Q75	1152	407.4	1152	917.8	
Q76	1167	412.7	1167	929.8	
Q77	1182	418.0	1182	941.8	
Q78	1197	423.3	1197	953.8	
Q79	1212	428.6	1212	965.8	
Q80	1227	433.9	1227	977.8	
Q81	1242	439.2	1242	989.8	
Q82	1257	444.5	1257	1001.8	
Q83	1272	449.8	1272	1013.8	
Q84	1287	455.1	1287	1025.8	
Q85	1302	460.4	1302	1037.8	
Q86	1317	465.7	1317	1049.8	
Q87	1332	471.0	1332	1061.8	
Q88	1347	476.3	1347	1073.8	
Q89	1362	481.6	1362	1085.8	
Q90	1377	486.9	1377	1097.8	
Q91	1392	492.2	1392	1109.8	
Q92	1407	497.5	1407	1121.8	
Q93	1422	502.8	1422	1133.8	
Q94	1437	508.1	1437	1145.8	
Q95	1452	513.4	1452	1157.8	
Q96	1467	518.7	1467	1169.8	
Q97	1482	524.0	1482	1181.8	
Q98	1497	529.3	1497	1193.8	
Q99	1512	534.6	1512	1205.8	
Q100	1527	539.9	1527	1217.8	
Q101	1542	545.2	1542	1229.8	
Q102	1557	550.5	1557	1241.8	
Q103	1572	555.8	1572	1253.8	
Q104	1587	561.1	1587	1265.8	
Q105	1602	566.4	1602	1277.8	
Q106	1617	571.7	1617	1289.8	
Q107	1632	577.0	1632	1301.8	
Q108	1647	582.3	1647	1313.8	
Q109	1662	587.6	1662	1325.8	
Q110	1677	592.9	1677	1337.8	
Q111	1692	598.2	1692	1349.8	
Q112	1707	603.5	1707	1361.8	
Q113	1722	608.8	1722	1373.8	
Q114	1737	614.1	1737	1385.8	
Q115	1752	619.4	1752	1397.8	
Q116	1767	624.7	1767	1409.8	
Q117	1782	630.0	1782	1421.8	
Q118	1797	635.3	1797	1433.8	
Q119	1812	640.6	1812	1445.8	
Q120	1827	645.9	1827	1457.8	
Q121	1842	651.2	1842	1469.8	
Q122	1857	656.5	1857	1481.8	
Q123	1872	661.8	1872	1493.8	
Q124	1887	667.1	1887	1505.8	
Q125	1902	672.4	1902	1517.8	
Q126	1917	677.7	1917	1529.8	
Q127	1932	683.0	1932	1541.8	
Q128	1947	688.3	1947	1553.8	
Q129	1962	693.6	1962	1565.8	
Q130	1977	698.9	1977	1577.8	
Q131	1992	704.2	1992	1589.8	
Q132	2007	709.5	2007	1601.8	
Q133	2022	714.8	2022	1613.8	
Q134	2037	720.1	2037	1625.8	
Q135	2052	725.4	2052	1637.8	
Q136	2067	730.7	2067	1649.8	
Q137	2082	736.0	2082	1661.8	
Q138	2097	741.3	2097	1673.8	
Q139	2112	746.6	2112	1685.8	
Q140	2127	751.9	2127	1697.8	
Q141	2142	757.2	2142	1709.8	
Q142	2157	762.5	2157	1721.8	
Q143	2172	767.8	2172	1733.8	
Q144	2187	773.1	2187	1745.8	
Q145	2202	778.4	2202	1757.8	
Q146	2217	783.7	2217	1769.8	
Q147	2232	789.0	2232	1781.8	
Q148	2247	794.3	2247	1793.8	
Q149	2262	799.6	2262	1805.8	
Q150	2277	804.9	2277	1817.8	
Q151	2292	810.2	2292	1829.8	
Q152	2307	815.5	2307	1841.8	
Q153	2322	820.8	2322	1853.8	
Q154	2337	826.1	2337	1865.8	
Q155	2352	831.4	2352	1877.8	
Q156	2367	836.7	2367	1889.8	
Q157	2382	842.0	2382	1901.8	
Q158	2397	847.3	2397	1913.8	
Q159	241				