Published in final edited form as:

Ann Surg Oncol. 2017 March ; 24(3): 652–659. doi:10.1245/s10434-016-5605-5.

Outcomes of Sentinel Lymph Node-Positive Breast Cancer Patients Treated with Mastectomy without Axillary Therapy

Elizabeth FitzSullivan, MD¹, Roland L. Bassett², Henry M. Kuerer, MD¹, Elizabeth A. Mittendorf, MD¹, Min Yi, MD¹, Kelly K. Hunt, MD¹, Gildy V. Babiera, MD¹, Abigail S. Caudle, MD¹, Dalliah M. Black, MD¹, Isabelle Bedrosian, MD¹, Chantal Reyna, MD¹, Mediget Teshome, MD¹, Funda Meric-Bernstam, MD¹, and Rosa Hwang, MD¹

¹Department of Breast Surgical Oncology, The University of Texas MD Anderson Cancer Center, Houston, TX

²Department of Biostatistics, The University of Texas MD Anderson Cancer Center, Houston, TX

Abstract

Purpose—Early-stage breast cancer patients with minimal axillary disease identified by sentinel lymph node dissection (SLND) have low regional recurrence rates when treated with breast-conserving surgery and radiation therapy (XRT) and many avoid a completion axillary lymph node dissection (CLND). As the incidence of total mastectomy (TM) has increased, it has become important to characterize which TM patients with a positive SLN may not benefit from further axillary treatment.

Methods—An institutional database was utilized to identify patients treated with a TM for invasive breast cancer and who had a positive SLN from 1994–2010. Clinicopathologic factors were analyzed. Regional recurrence rate, recurrence-free survival (RFS), and overall survival (OS) were determined.

Results—A total of 525 patients with invasive breast cancer and a positive SLN were treated with TM, including 58 patients who did not have CLND or XRT and 12 patients who did not have CLND but did receive XRT. Median follow-up was 66 months. The incidence of regional recurrence was not significantly different for patients who received no further axillary treatment compared to those who underwent CLND without XRT or those treated with XRT without CLND (10-year rate: 3.8% vs. 1.6% and 0%, respectively). RFS and OS were not significantly different among patients who received no further axillary treatment compared to those who underwent CLND, XRT, or both.

Conclusions—In select patients with early-stage breast cancer treated with mastectomy with a positive SLN, CLND may be avoided without adversely affecting recurrence or survival.

Traditionally, completion axillary lymph node dissection (CLND) has been the standard of care for breast cancer patients with lymph node-positive disease identified by sentinel lymph

Correspondence to: Rosa Hwang, MD, Department of Breast Surgical Oncology, The University of Texas MD Anderson Cancer Center, 1400 Pressler Street, Unit 1484, Houston, TX 77030. rhwang@mdanderson.org.

Presented in part at the 2013 American Society of Clinical Oncology Breast Cancer Symposium in San Francisco, California.

The authors indicate no potential conflict of interest.

node dissection (SLND) for axillary staging and local regional control. Because axillary node dissection has significant morbidities, including but not limited to impaired range of motion, significant pain, and lymphedema compared with SLND, omitting CLND has been considered.^{1,2} Several studies have demonstrated that in early-stage breast cancer with limited axillary disease it is safe to omit CLND without affecting the risk of regional recurrence or survival, particularly in those undergoing breast conservation therapy.^{3–7} The American College of Surgeons Oncology Group (ACOSOG) Z0011 trial showed there was no significant difference in locoregional recurrence risk by omitting completion axillary lymph node dissection (CLND) in patients with early stage breast cancer and minimal axillary disease.³ However, women were eligible for the Z0011 trial only if they were undergoing breast conservation, and it has been speculated that the use of adjuvant radiation contributed to the low rates of regional recurrence in this population. In a subset analysis of 605 women from the Z0011 trial, Jagsi et al. reported most women (>50%) in the SLN alone arm had high tangents and nearly 20% had a third field added to the radiation treatment plan.⁸ For those patients who do not meet criteria for the Z0011 trial, the precise role of CLND has not been well defined.

The purpose of this study was to determine if omitting further axillary treatment, including either CLND or adjuvant radiation therapy (XRT), in select patients undergoing total mastectomy (TM) for early-stage clinically node-negative breast cancer identified as node positive by SLND adversely affected the regional recurrence risk or survival.

PATIENTS AND METHODS

Following approval from the Institutional Review Board of The University of Texas MD Anderson Cancer Center (MDACC), a prospective database maintained by the Department of Breast Surgical Oncology was queried to identify patients from 1994 through 2010 who were treated with a TM for clinically node negative invasive breast cancer and had a positive SLN. CLND was defined as removal of ten or more lymph nodes. A positive SLN was defined according to the guidelines outlined by the AJCC Cancer Staging Manual, 7th edition, N1mi, or larger.⁹ Demographic, diagnostic, clinical, pathologic, treatment, and follow-up variables were analyzed with respect to the patients' axillary treatment. Four treatment groups were analyzed: No CLND and No XRT, CLND and No XRT, CLND and XRT, No CLND and XRT.

The cumulative incidence of regional recurrence was defined as time from the date of diagnosis to the development of regional recurrence with death considered as a competing risk. Patients who remained alive without recurrence were censored at the time of last follow-up. Recurrence-free survival (RFS) was defined as time from date of diagnosis to the development of distant metastasis or death, with censoring at the last follow-up for patients who remained alive without distant metastasis. Overall survival (OS) was defined as time from date of diagnosis to death with censoring at the last follow-up. The predicted probability of additional non-SLN involvement was determined using the MD Anderson Cancer Center nomogram to predict additional positive non-SLN (NSLN).¹⁰ Patients treated with neoadjuvant therapy were excluded from the analysis of regional recurrence, RFS, and OS.

Statistical Analyses

Fisher's exact test was used to compare categorical patient characteristics between CLND and no CLND patients, and the Wilcoxon rank-sum test was used to compare continuous patient characteristics between these two groups. The distribution of OS and RFS were estimated using the Kaplan-Meier method. Distributions were compared with the log-rank test. The cumulative incidence of regional recurrence was estimated in a competing risks model with the competing risk of death before recurrence. The method of Fine and Gray was used to compare distributions. All reported p values are two-sided, and $p < 0.05$ was considered statistically significant. Analyses were performed using R version 3.1.0.

RESULTS

Patient Characteristics

A total of 642 patients were identified as having a TM for invasive breast cancer with a positive SLN with sufficient data for analysis. Of these patients, 96 did not undergo CLND. The median follow-up was 66 months. Demographic and pathologic characteristics for these patients are summarized in Table 1. Patients who did not undergo CLND tended to be slightly older with a smaller primary tumor and were less likely to have lymphovascular invasion. Patients not treated with a CLND also had a lower axillary tumor burden with fewer positive SLN, smaller maximum size of the SLN metastasis, and no extranodal extension. Using the MDACC nomogram, which incorporates many of these clinicopathologic variables, the predicted probability of additional non-SLN involvement was significantly lower for patients who did not receive a CLND compared with those who did: 10% vs. 23% ($p < 0.0001$). Approximately 18% of the patients in the study were treated with neoadjuvant chemotherapy and were excluded from further analysis.

Of the remaining 525 patients, 70 patients omitted CLND and 58 (82.9%) did not receive CLND or adjuvant radiation therapy (Table 2). Patients who did not undergo CLND or XRT tended to have a smaller primary tumor ($p = 0.02$), lower pathologic T stage ($p = 0.003$) and a lower rate of close or positive margins ($p = 0.01$) compared with patients who did not undergo CLND but did receive XRT. In regards to nodal disease, they had a lower N stage ($p = 0.00004$) and a smaller maximum size of nodal metastasis ($p = 0.02$) and tended to have a lower predicted probability of additional non-SLN involvement using the MDACC nomogram, although this was not statistically significantly different ($p = 0.18$).

Regional Recurrence

The incidence of regional recurrence was not statistically different among the four groups of patients ($p = 0.45$; Fig. 1). The 10-year rate of regional recurrence among patients who received no further axillary treatment was 3.8%, among patients treated with CLND without XRT was 1.6% and among patients treated with XRT and CLND was 1.8%. There were no regional recurrences at 10 years among patients who did not undergo CLND but did receive XRT.

Characteristics of Patients without CLND with a Regional Recurrence

Two of the 70 patients who did not receive a CLND developed a regional recurrence (Table 3). Neither of these patients received XRT. The first patient was 58 years old with a 3.5-cm, Her2-positive cancer with lymphovascular invasion and a <1-mm metastasis in the only SLN removed. Five additional non-SLN did not show evidence of carcinoma. The nomogram score for this patient was 4%. CLND and XRT were not recommended by her physicians. She developed an axillary recurrence at 21 months without evidence of distant disease. She did not receive chemotherapy or trastuzumab, because this was not standard of care at the time of her diagnosis. She is alive without evidence of disease at 11 years after diagnosis. The second patient was 34 years old with a multifocal cancer and a 0.3-mm metastasis in a SLN. The nomogram score for this patient was 7%. She completed adjuvant chemotherapy and was not recommended to receive adjuvant radiation treatment. She was taking adjuvant tamoxifen when she developed a supraclavicular recurrence and bony metastasis at 44 months and died from breast cancer.

Recurrence-Free and Overall Survival

Recurrence-free survival was not significantly different among the four groups of patients ($p = 0.22$; Fig. 2). The 10-year recurrence free survival among patients who received no further axillary treatment was 84.9%, among patients treated with CLND without XRT was 82.2%, among patients treated with XRT without CLND was 82.5% and among patients treated with XRT and CLND was 72.8%.

Similarly, there was no significant difference in OS among the four groups of patients ($p = 0.111$; Fig. 3). The 10-year OS among patients who received no further axillary treatment was 87.9%, among patients treated with CLND without XRT was 86.0%, among patients treated with XRT without CLND was 81.8% and among patients treated with XRT and CLND was 67.6%.

DISCUSSION

Over the past few decades, less invasive strategies for axillary staging have been developed to enable more individualized treatment for breast cancer patients. As a result, the role of CLND has been evolving. Although the omission of CLND in node positive disease has gained acceptance in patients undergoing BCT, the question remains whether the results of ACOSOG Z0011 can be extended to other patient populations, including those undergoing total mastectomy.

A few previous studies have suggested that CLND may be omitted in node-positive mastectomy patients with a low tumor burden.^{11,12} Snow et. al. demonstrated there was no significant difference in recurrence and overall survival rates in patients undergoing mastectomy without CLND in node positive patients, although patients who were younger, had larger primary tumors, and more nodal disease were more likely to proceed with CLND.¹³ In addition, a study from Memorial Sloan Kettering Cancer Center (MSKCC) of 210 patients with breast cancer treated with mastectomy without CLND despite a positive SLND reported a low 4-year regional recurrence rate of 1.2% and 4-year disease-free survival of

94.8%.¹² Most of these patients had stage I-IIA estrogen receptor-positive, progesterone receptor-positive, Her2-negative disease with minimal nodal disease. However, 5% of these patients were treated with postmastectomy radiation and these patients were not analyzed or described separately. The International Breast Cancer Study Group Trial 23-01 randomized patients with micrometastatic disease in the lymph nodes to CLND or no CLND.¹² The study included 86 patients treated with mastectomy and subgroup analysis of these patients showed that no CLND was not inferior to CLND with a hazard ratio of 0.52 (0.09–3.10). It is unclear how many of these patients were treated with postmastectomy radiation. These studies suggest that CLND may be omitted in some node-positive patients undergoing TM.

Our study, which has the largest reported cohort with recurrence and survival rates, shows that in select patients treated with mastectomy for early stage breast cancer with a positive SLN, omission of CLND appears to be appropriate with excellent long-term outcomes both in terms of regional recurrence and survival. Recognizing that these treatment groups are inherently different in regards to patient/tumor characteristics, this information can be exploited to identify which characteristics should guide therapeutic decisions, such as CLND or XRT. We found that patients who safely avoided CLND were slightly older, had smaller tumors, fewer positive SLN, and smaller size SLN metastases, with no evidence of lymphovascular invasion or extranodal extension. These findings are similar to those of Yao et al. who showed that patients treated with a mastectomy with a positive SLN were less likely to undergo CLND if they were aged 50 years or older, had only one positive lymph node and only micrometastasis, tumors <1 cm in size, and no LVI.¹⁴ The excellent long-term outcomes of these patients as seen in our study support previous studies, particularly the MSKCC study, which found no significant difference in regional recurrence or disease-free survival among mastectomy patients with a positive SLN treated with CLND versus those not treated with a CLND. However, the MSKCC study included those patients with N0(i+) disease, whereas our study included only patients with lymph node-positive disease as defined by AJCC, N1mi or greater. In addition, our study has the longest median time of follow-up than previously reported studies, which is a strength of this study and allows for a more accurate portrayal of recurrence and overall survival rates. The availability of multidisciplinary conferences and ease of communication between disciplines may allow for a more informed clinical decision and selective application to omit further axillary treatment. Using the web-based MD Anderson Cancer Center nomogram, we identified a significant correlation between higher nomogram score and higher axillary tumor burden. This may warrant further evaluation to determine if the nomogram score can guide selection of patients where CLND may be safely omitted.

Our study, in combination with previous studies, provides further evidence that axillary treatment, either CLND or XRT, may be safely omitted in select mastectomy patients with low predicted risk of additional nodal disease. To our knowledge, this is the only study that specifically compares the recurrence rate and recurrence-free survival among patients with a positive SLN after mastectomy with no axillary treatment compared with patients treated with CLND without radiation or CLND and radiation. Our study demonstrated that in select patients with a positive SLN, it is safe to omit both CLND and XRT. Those patients who did develop a recurrence after omission of both CLND and XRT had significant risk factors for

recurrence including young age, presence of lymphovascular invasion, or HER2-positive disease not treated with HER2-targeted therapy.

As this is a single institutional study, there is an inherent selection bias despite the numerous practitioners involved. Although our series includes the largest number of patients published to date, a more definitive answer regarding the need for additional axillary treatment for these patients would be provided by a prospective trial, perhaps incorporating the MDACC nomogram or other prediction tool to guide treatment.

As previously mentioned, approximately 18% of our patients received neoadjuvant chemotherapy and were excluded from the analysis regarding recurrence, RFS, and OS. There has been little investigation into whether it is safe to omit further axillary treatment among some of these patients. Investigations are ongoing evaluating the need for further axillary surgery for clinically node-positive patients who undergo SLN dissection after neoadjuvant chemotherapy. The Alliance A11202 trial will randomize patients with persistent SLN involvement to either CLND and XRT or XRT without CLND.¹⁵ The NSABP B-51/RTOG 1304 trial will randomize patients who convert to a negative SLN to either radiotherapy or no therapy to the axilla.¹⁶

As the trend towards minimizing invasive procedures continues, additional studies are warranted to better characterize which patients can safely omit further axillary treatment. These studies should include nomograms or other tools that predict recurrence to guide decisions regarding that therapies can be omitted safely. Based on our results in combination with previous studies, in select patients with early-stage breast cancer treated with mastectomy with a positive SLN, CLND may be avoided without adversely affecting recurrence or survival. These may include patients with older age, small primary tumor, and low nodal burden.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

The University of Texas MD Anderson Cancer Center is supported in part by the National Institutes of Health through Cancer Center Support Grant CA016672.

References

1. Peintinger F, Reitsamer R, Stranzl H, Ralph G. Comparison of quality of life and arm complaints after axillary lymph node dissection vs sentinel lymph node biopsy in breast cancer patients. *Br J Cancer*. 2003; 89(4):648–52. [PubMed: 12915872]
2. Blanchard DK, Donohue JH, Reynolds C, Grant CS. Relapse and morbidity in patients undergoing sentinel lymph node biopsy alone or with axillary dissection for breast cancer. *Arch Surg*. 2003; 138(5):482–7. discussion 487–8. [PubMed: 12742949]
3. Giuliano AE, McCall L, Beitsch P, et al. Locoregional recurrence after sentinel lymph node dissection with or without axillary dissection in patients with sentinel lymph node metastases: the American College of Surgeons Oncology Group Z0011 randomized trial. *Ann Surg*. 2010; 252(3):426–32. discussion 432–3. [PubMed: 20739842]

4. Baruch AC, Wang H, Staerckel GA, Evans DB, Hwang RF, Krishnamurthy S. Immunocytochemical study of the expression of mesothelin in fine-needle aspiration biopsy specimens of pancreatic adenocarcinoma. *Diagn Cytopathol.* 2007; 35(3):143–7. [PubMed: 17304533]
5. Cyr A, Gao F, Gillanders WE, Aft RL, Eberlein TJ, Margenthaler JA. Disease recurrence in sentinel node-positive breast cancer patients forgoing axillary lymph node dissection. *Ann Surg Oncol.* 2012; 19(10):3185–91. [PubMed: 22890591]
6. Bilimoria KY, Bentrem DJ, Hansen NM, et al. Comparison of sentinel lymph node biopsy alone and completion axillary lymph node dissection for node-positive breast cancer. *J Clin Oncol.* 2009; 27(18):2946–53. [PubMed: 19364968]
7. Naik AM, Fey J, Gemignani M, et al. The risk of axillary relapse after sentinel lymph node biopsy for breast cancer is comparable with that of axillary lymph node dissection: a follow-up study of 4008 procedures. *Ann Surg.* 2004; 240(3):462–8. discussion 468–71. [PubMed: 15319717]
8. Jagsi R, Chadha M, Moni J, et al. Radiation field design in the ACOSOG Z0011 (Alliance) Trial. *J Clin Oncol.* 2014; 32(32):3600–6. [PubMed: 25135994]
9. Edge SB, Compton CC. The American Joint Committee on Cancer: the 7th edition of the AJCC cancer staging manual and the future of TNM. *Ann Surg Oncol.* 2010; 17(6):1471–4. [PubMed: 20180029]
10. Mittendorf EA, Hunt KK, Boughey JC, et al. Incorporation of sentinel lymph node metastasis size into a nomogram predicting nonsentinel lymph node involvement in breast cancer patients with a positive sentinel lymph node. *Ann Surg.* 2012; 255(1):109–15. [PubMed: 22167004]
11. Galimberti V, Cole BF, Zurrada S, et al. Axillary dissection versus no axillary dissection in patients with sentinel-node micrometastases (IBCSG 23-01): a phase 3 randomised controlled trial. *Lancet Oncol.* 2013; 14(4):297–305. [PubMed: 23491275]
12. Milgrom S, Cody H, Tan L, et al. Characteristics and outcomes of sentinel node-positive breast cancer patients after total mastectomy without axillary-specific treatment. *Ann Surg Oncol.* 2012; 19(12):3762–70. [PubMed: 22576064]
13. Snow R, Reyna C, Johns C, et al. Outcomes with and without axillary node dissection for node-positive lumpectomy and mastectomy patients. *Am J Surg.* 2015
14. Yao K, Liederbach E, Pesce C, Wang CH, Winchester DJ. Impact of the American College of Surgeons Oncology Group Z0011 Randomized Trial on the number of axillary nodes removed for patients with early-stage breast cancer. *J Am Coll Surg.* 2015; 221(1):71–81. [PubMed: 25899731]
15. Boughey JC, Suman VJ, Mittendorf EA, et al. Sentinel lymph node surgery after neoadjuvant chemotherapy in patients with node-positive breast cancer: the ACOSOG Z1071 (Alliance) clinical trial. *JAMA.* 2013; 310(14):1455–61. [PubMed: 24101169]
16. Garg AK, Buchholz TA. Influence of neoadjuvant chemotherapy on radiotherapy for breast cancer. *Ann Surg Oncol.* 2015; 22(5):1434–40. [PubMed: 25727554]

Figure 1.
Cumulative Incidence of Regional Recurrence for TM SLN+ by CLND/XRT

Figure 2.
Recurrence-Free Survival for TM SLN+ by CLND/XRT

Figure 3.
Overall Survival for TM SLN+ by CLND/XRT

Table 1

Clinicopathologic characteristics of patients with a positive SLN treated with mastectomy by CLND or no CLND (N = 642)

Characteristic		No CLND (N = 96)	CLND (N = 546)	P value
Age, yr; median (range)		57 (29–89)	53 (28–91)	0.03
Tumor size, cm; median (range)		2.0 (0.1–10.5)	2.3 (0.1–15.0)	0.002
Pathologic T stage				
T1		59 (61%)	225 (41%)	0.002
T2		29 (30%)	227 (42%)	
T3–4		8 (8%)	92 (17%)	
Histology				
IDC		74 (77%)	359 (66%)	0.15
ILC		9 (9%)	90 (16%)	
Mixed		11 (11%)	72 (13%)	
Other		2 (2%)	25 (5%)	
Lymphovascular invasion ^a	Present	26 (27%)	227 (42%)	0.007
Multifocality/multicentricity ^a				
Present		24 (25%)	198 (36%)	0.04
Nuclear grade				
1		13 (14%)	63 (12%)	0.62
2		46 (48%)	289 (53%)	
3		37 (39%)	194 (36%)	
Estrogen receptor ^a	Positive	79 (82%)	485 (88%)	0.09
Progesterone receptor ^a	Positive	64 (67%)	391 (72%)	0.33
Her2 ^a	Amplified	12 (13%)	72 (13%)	1.00
Triple-negative ^a		9 (9%)	36 (7%)	0.28
No. of SLN removed; median (range)		3 (1–8)	3 (1–14)	0.13
No. of positive SLN; median (range)		1 (1–4)	1 (1–9)	<0.0001
SLN metastasis size (mm) ^a ; median (range)		1.2 (0.01–10.5)	4.0 (0.2–40.0)	<0.0001
Pathologic N stage				
N1mi		69 (72%)	125 (23%)	<0.0001
N1		27 (28%)	316 (58%)	
N2		0	76 (14%)	
N3		0	29 (5%)	
Extranodal extension ^a	Present	4 (4%)	127 (24%)	<0.0001
Predicted probability of Positive non-SLN ^{10, a} ; median (range)		10% (1–77%)	23% (0–99%)	<0.0001
Neoadjuvant chemotherapy	Yes	26 (27%)	91 (17%)	0.02
Adjuvant chemotherapy ^a	Yes	52 (54%)	388 (71%)	<0.0001
Adjuvant XRT		26 (27%)	254 (47%)	0.003
Yes				

Characteristic		No CLND (N = 96)	CLND (N = 546)	P value
Adjuvant endocrine treatment ^a	Yes	71 (74%)	444 (82%)	0.07

^aNot available for all patients

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 2

Clinicopathologic characteristics of patients with a positive SLN treated with mastectomy without CLND by XRT or no XRT (N = 70)

Characteristic		No XRT (N=58)	XRT (N=12)	P-Value
Age, yr; median (range)		59 (34–89)	63 (29–79)	0.96
Tumor size, cm; median (range)		1.7 (0.2–5.0)	3.3 (0.7–10.0)	0.02
Pathologic T stage	T1	41 (71%)	5 (42%)	0.003
	T2	17 (29%)	4 (33%)	
	T3	0	3 (25%)	
Histology	IDC	46 (79%)	10 (83%)	0.89
	ILC	7 (12%)	1 (8%)	
	Mixed	3 (5%)	1 (8%)	
	Other	2 (3%)	0	
Lymphovascular invasion	Present	17 (29%)	4 (33%)	0.74
Multifocality	Present	13 (22%)	4 (33%)	0.47
Nuclear grade	1	7 (12%)	1 (8%)	0.5
	2	29 (50%)	4 (33%)	
	3	22 (38%)	7 (58%)	
Estrogen receptor	Positive	47 (81%)	8 (67%)	0.27
Progesterone receptor	Positive	40 (69%)	5 (42%)	0.10
Her2 ^a	Amplified	9 (16%)	1 (9%)	1.00
Triple-negative ^a		4 (7%)	3 (27%)	0.08
No. of SLN removed: median (range)		3 (1–8)	3 (2–6)	0.39
No. of positive SLN: median (range)		1 (1–3)	1 (1–2)	0.12
SLN metastasis size (mm): median (range)		1.0 (0.01–9.0)	3.0 (0.4–9.0)	0.02
Pathologic N stage	N1mi	47 (81%)	3 (25%)	0.00004
	N1	11 (19%)	9 (75%)	
Extranodal extension	Present	3 (5%)	0 (0%)	1.00
Predicted probability of positive non-SLN ¹⁰ , ^a : median (range)		10% (1–77%)	16% (2–60%)	0.18
Final margin status	Negative	57 (98%)	9 (75%)	0.01
	Close/Positive	1 (2%)	3 (25%)	
Adjuvant chemotherapy	Yes	39 (67%)	9 (75%)	0.74
Adjuvant endocrine treatment ^a	Yes	42 (72%)	9 (75%)	1.00

^aNot available for all patients

Clinicopathologic characteristics of patients with a positive SLNB treated with mastectomy without axillary treatment who developed a regional recurrence

Table 3

Age	Histology/ Nuclear grade	Tumor(s) size (cm)	Tumor markers (ER/PR/Her2)	# SLN positive/ removed	Size SLN metastasis (mm)	Extradonal/ extension/ lymphovascular invasion	Chemotherapy	Radiation therapy	Hormonal therapy	Recurrence	Predicted Probability of Positive non- SLN ¹⁰
58	IDC/3	3.5	+/-/+	1/6	<1mm	-/+	Adjuvant	-	+	Axillary	4%
34	IDC/2	1.0, 0.7	+/+/-	1/3	0.3	-/-	Adjuvant	-	+	Supraclavicular	7%