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ORIGINAL ARTICLE

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Prognostic factors for breast cancer patients with T1-2 tumor and 1-3 positive axillary nodes treated using total mastectomy without radiotherapy

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Abstract

Prospective randomized trials have demonstrated that postmastectomy radiotherapy (PMRT) improves not only locoregional recurrence-free survival, but also overall survival for node-positive breast cancer patients. Subset analyses in previous trials have shown that improvement of overall survival with PMRT is not always demonstrated for patients with 1-3 positive nodes. Indications for PMRT are still marginal for patients with pathological invasion 5 cm in diameter and 1-3 positive nodes. The aim of this study was to clarify poor prognostic factors for breast cancer patients with pathological invasion size 5 cm and 1-3 positive nodes. Participants comprised 428 breast cancer patients with T1-2 tumor and 1-3 positive axillary nodes (pT1-2 N1) treated using total mastectomy without radiotherapy. Correlations between clinicopathological characteristics and 10-year Kaplan-Meier estimates of locoregional recurrence-free survival, disease-free survival, and overall survival were retrospectively analyzed. Median follow-up was 98 months. Locoregional recurrence was observed in 20 patients (4.7%), and distant recurrence was observed in 70 patients (16.4%). Disease-free survival rate was 80.8%, and overall survival rate within the study period was 90%. Multivariate analysis demonstrated that favorable prognostic factors for locoregional recurrence-free survival were the presence of chemotherapy and positive hormone receptor status, and for disease-free survival were presence of chemotherapy, pT1 tumor, and single positive node. Physicians may consider these favorable prognostic factors in decision to eliminate PMRT from patients with the borderline indications.

KEYWORDS
breast cancer, postmastectomy radiotherapy, prognostic factor, pT1-2N1

1 | INTRODUCTION

Locoregional therapy for breast cancer has progressed along with systemic therapies. Appropriate locoregional therapy minimizes not only locoregional failure, but also disease-free survival (DFS) and overall survival (OS). Indications for postmastectomy radiation therapy (PMRT) have recently been expanded. Danish Breast Cancer Cooperative Group (DBCG) trials 82b[1] and 82c[2] demonstrated that addition of PMRT with adjuvant chemotherapy reduced locoregional recurrence and prolonged overall survival for pre- and postmenopausal breast cancer patients with 1-3 positive nodes, as well as for patients with 4 or more positive nodes. The National Comprehensive Cancer Network guidelines were updated in 2009 to

indicate that clinicians should "strongly consider" PMRT for patients with tumors 5 cm in diameter and 1-3 positive lymph nodes,[3] whereas the 2001 American Society of Clinical Oncology guidelines did not recommend PMRT for the same patients.[4] The latest meta-analysis from the Early Breast Cancer Trialists' Collaborative Group (EBCTCG) also demonstrated that PMRT reduced the 10-year locoregional recurrence rate from 20.3% to 3.8%, and the 10-year breast cancer mortality rate from 50.2% to 42.3%.[5] The EBCTCG meta-analysis was based on 22 trials started between 1964 and 1986, and the latest chemotherapies and molecularly targeted therapies have reduced locoregional recurrence and breast cancer mortality rates beyond the levels reflected in the data included in that meta-analysis.

In addition, immediate breast reconstruction has become more common in the last decade.[6] Breast reconstruction significantly improves quality of life and reduces the psychosocial issues associated with mastectomy.[7] PMRT appears associated with an increased risk of reconstruction-related complications, such as implant removal[8] and fat necrosis of autologous tissue reconstructions.[8]

Despite robust evidence and recommendations, only about 30% of patients in the "strongly consider" cohort in the United States have actually received PMRT.[9] This may indicate that physicians do not consider PMRT as necessary for all T1-2N1 breast cancer patients.

The aim of the present study was to clarify the subgroup of T1-2N1 breast cancer patients with poor prognoses for whom PMRT should be recommended.

2 | MATERIALS AND METHODS

Eligible patients were women with invasive carcinoma of the breast who were treated with total mastectomy and axilla surgery, but without PMRT. Inclusion criteria for patients treated with surgery first were 1-3 positive axillary lymph nodes and primary tumor measuring 5 cm in diameter, and classification of disease as pathologically T1-2N1 (pT1-2N1). All patients received adjuvant or neoadjuvant systemic therapy with chemotherapy endocrine therapy, or both. In cases where the patient was treated with systemic therapy first, inclusion criteria were cT1-2N0-1 at the time treatment was started and residual tumor observed at both the primary site and 1-3 axillary lymph nodes, and classification as ypT1-2ypN1. Patients with contralateral breast cancer were excluded from this study.

Background characteristics reviewed included menopausal status, histological type, primary tumor size, histological grade, lymphovascular invasion, hormone receptor status, HER2 status, number of positive nodes, and use of chemotherapy. These characteristics were used to assess the risks of locoregional recurrence-free survival, disease-free survival, and overall survival. Positive estrogen receptor status was defined as positive immunohistochemical staining of at least 10% of cells. Her2 positivity was defined as a 3+ immunohistochemical result or a 2+ immunohistochemical result confirmed by fluorescence in situ hybridization. Primary tumor size was defined as the pathological invasion size for patients who underwent surgery first and as the clinical tumor size diagnosed from multiple radiological findings for patients who received neoadjuvant therapy first. In cases with neoadjuvant chemotherapy, positivity for estrogen receptor and HER2 status was defined if one of the tests showed positive results in a core biopsy specimen before neoadjuvant treatment or in a surgical specimen. Locoregional recurrence-free survival (LRFS) was defined as the time from the start of treatment to the time of first recurrence in the ipsilateral chest wall or in axillary, supraclavicular, or internal mammary nodes without evidence of distant disease for 1 month. DFS was defined as the time from start of treatment to the time of recurrence at a locoregional or distant site, such as bone, liver, lung, or central nervous system. OS was defined as the time from start of treatment to time of death. Physical examination was performed once every 3-6 months until 5 years after surgery, and every 6-12 months thereafter for all patients. Annual mammography of the contralateral breast and laboratory blood tests every 6-12 months were also performed for all patients. Examinations other than physical checkup, mammography, and laboratory tests were performed in cases with suspected abnormality. Locoregional recurrence was diagnosed from physical examination, ultrasonography, computed tomography (CT), or positron emission tomography (PET)-CT. The suspected lesion was confirmed as locoregional recurrence by histopathological examination. Distant metastases were diagnosed by ultrasonography, CT, PET-CT, or ^{99m}Tc bone scan. Pathological proof of distant metastases was obtained where possible.

All data were analyzed using SPSS statistical software (version 20.0; IBM, Armonk, NY). The chi-squared and Fisher's exact probability tests were used to analyze differences between qualitative data. Locoregional recurrence-free survival, disease-free survival, and overall survival curves were plotted according to the Kaplan-Meier method and compared using the log-rank test. Cox proportional hazard model was used to identify significant prognostic factors. Variables showing values of $P < 0.05$ in univariate analyses were included in multivariate analyses. Values of $P < 0.05$ were considered statistically significant.

3 | RESULTS

A total of 428 patients were included in this study, and median duration of follow-up was 98 months. Clinicopathological findings of eligible patients are shown in Table 1. At the time treatment started, 162 patients (38%) were premenopausal. All 6 clinically T3 (cT3) patients were treated by surgery preceding chemotherapy and diagnosed with pT2 from the resected specimen. All except 6 patients underwent axillary lymph node dissection, and those 6 patients had undergone sentinel lymph node biopsy without axillary lymph node dissection, because intraoperative diagnosis of sentinel nodes suggested no metastasis, but final pathology of sentinel nodes revealed micrometastasis. The median number of dissected lymph nodes was 16 (range, 5-45), excluding 6 patients without axillary dissection. Four of the 6 without axillary dissection underwent excision of 3

TABLE 1 Patient characteristics

Characteristics	Total dataset (%)	Number of patients	
		Systemic therapy-first cohort	Surgery-first cohort
Menopausal status			
Premenopausal	162 (38%)	19	143
Postmenopausal	266 (62%)	39	227
Clinical tumor size (pre-treatment)			
cT1	117 (27%)	3	114
cT2	305 (72%)	54	251
cT3	6 (1%)	1	5
Clinical nodal status (pre-treatment)			
cN0	374 (87%)	49	325
cN1	54 (13%)	9	45
Chemotherapy			
No	142 (33%)	8	134
Yes	286 (67%)	50	236
Histological type			
Invasive ductal	392 (92%)	51	34
Others	36 (8%)	7	29
Tumor size (pathological)			
pT1	212 (49%)	26	186
pT2	216 (51%)	32	184
Positive lymph nodes			
1	221 (52%)	27	194
2	130 (30%)	22	108
3	77 (18%)	9	68
Histological grades			
HG1	27 (6%)	6	21
HG2	202 (47%)	32	170
HG3	199 (47%)	20	179
Lymphatic invasion			
Negative	116 (27%)	17	99
Positive	312 (73%)	41	271
Hormone receptor			
Negative	112 (26%)	17	95
Positive	316 (74%)	41	275
HER2 status			
Negative	348 (81%)	52	296
Positive	50 (12%)	5	45
Unknown	30 (7%)	1	29
Subtype			
Luminal (HER2-)	274 (64%)	38	236
Luminal (HER2+)	19 (4%)	2	17
HER2+ (hormone receptor (–))	31 (7%)	3	28
Triple-negative	74 (17%)	14	60

sentinel nodes, and the remaining 2 patients underwent excision of 4 sentinel nodes. More than half of the eligible patients had one positive node, and 312 patients (73%) were diagnosed with positive lymphatic invasion. Hormone receptor-positive status was seen in 316 patients, and HER2 overexpression was observed in 50 patients. The systemic therapy-first cohort consisted of 43 neoadjuvant chemotherapy and 15 neoadjuvant endocrine therapy. There was no patient who was administered both chemotherapy and endocrine therapy in the neoadjuvant setting. Seven out of the 15 patients who undergo neoadjuvant endocrine therapy received chemotherapy after surgery. Adjuvant or neoadjuvant chemotherapy was administered in 286 patients (67%), and all of them were administered both 4 cycles of doxorubicin with cyclophosphamide (AC 60/600 mg/m^2) and 12 doses of weekly paclitaxel (80 mg/m^2). Chemotherapy was not given to elderly patients (>70 years old), patients with liminal A-like disease (strong ER+ and PgR+, and HER2 negative), or patients who refused to receive chemotherapy. Among the 50 patients with HER2 overexpression, 11 patients were administered trastuzumab for one year as adjuvant treatment and no patient was administered trastuzumab in neoadjuvant setting. There was no patient who was administered pertuzumab as adjuvant treatment.

Figures 1–3 show Kaplan-Meier estimates of locoregional recurrence-free survival (Figure 1), disease-free survival (Figure 2), and overall survival (Figure 3) for the 428 eligible patients. Ninety breast cancer events occurred during follow-up, comprising 20 locoregional recurrences and 70 distant recurrences. The 20 locoregional recurrences comprised 10 chest wall recurrences, 11 recurrences in regional lymph nodes (supraclavicular nodes, n = 6; axillary nodes, n = 3; supraclavicular plus axillary nodes, n = 1; and internal mammary nodes, n = 1) (one case with both locoregional and regional lymph node recurrences). Among the 20 locoregional recurrences, 8 cases

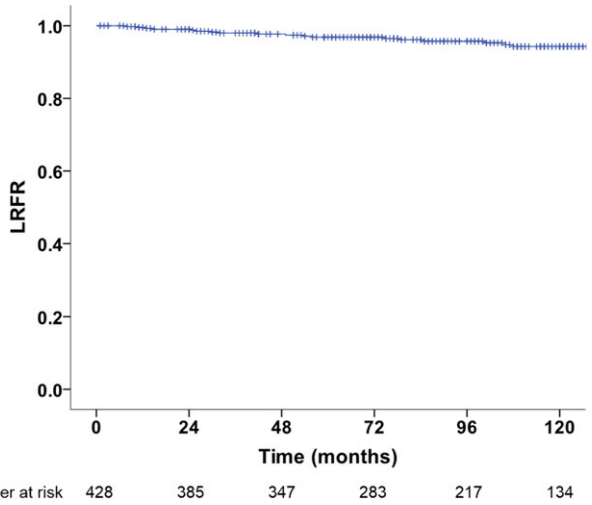

FIGURE 1 Kaplan-Meier estimates of locoregional recurrence-free survival (LRFS) after total mastectomy with axillary lymph node dissection for pT1-2N1 breast cancer patients [Color figure can be viewed at wileyonlinelibrary.com]

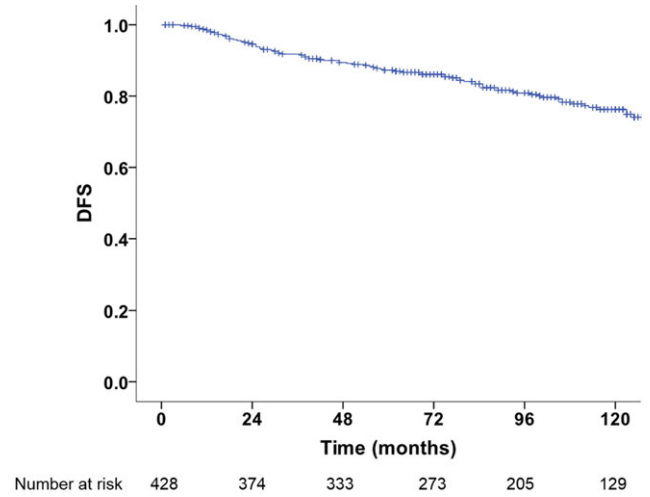

FIGURE 2 Kaplan-Meier estimates of disease-free survival (DFS) after total mastectomy with axillary lymph node dissection for pT1-2N1 breast cancer patients [Color figure can be viewed at wileyonlinelibrary.com]

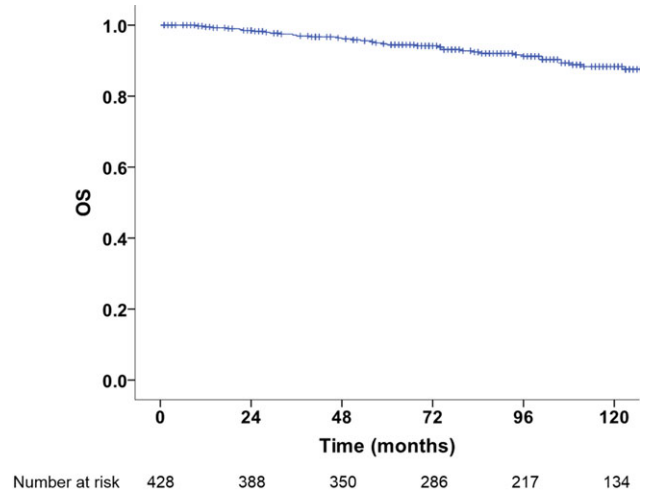

FIGURE 3 Kaplan-Meier estimates of overall survival (OS) after total mastectomy with axillary lymph node dissection for pT1-2N1 breast cancer patients [Color figure can be viewed at wileyonlinelibrary.com]

occurred with concurrent distant metastasis. A total of 43 fatal events occurred, consisting of 35 breast cancer deaths and 8 deaths from other causes. Ten-year locoregional recurrence-free rate, any disease-free survival rate and overall survival rate were 94.2%, 76.3%, and 88.3%, respectively.

From Tables 2–4 show the 10-year LRFS, DFS, and OS for each subgroup, including menopausal status (pre vs post), chemotherapy (done vs none), histological type (invasive ductal vs other), pathological tumor size (pT1 vs pT2), number of positive nodes (1 vs 2 or 3), histological grade (HG1 or 2 vs HG3), lymphovascular invasion (positive vs negative), hormone receptor status (positive vs negative),

TABLE 2 Univariate analysis for total dataset

Characteristics	10-year LRFS (%)	*P*	10-year DFS (%)	*P*	10-year OS (%)	*P*
Menopausal status						
Premenopausal	97.1	0.3	80.5	0.09	90.1	0.2
Postmenopausal	92.3		73.4		87.0	
Chemotherapy						
No	88.9	0.004	71.3	0.06	88.0	0.7
Yes	96.3		78.5		88.6	
Histological type						
Invasive ductal	92.8	0.6	76.1	0.4	87.6	0.2
Others	97.1		75.0		96.4	
Tumor size (pathological)						
pT1	95.7	0.2	81.4	0.006	91.1	0.07
pT2	92.8		71.3		85.5	
No. of positive lymph nodes						
1	97.1	0.047	81.8	0.006	91.5	0.052
2 or 3	91.0		70.1		84.7	
Histological grade						
HG1, 2	94.4	1	79.3	0.08	91.0	0.009
HG3	94.0		72.6		84.9	
Lymphovascular invasion						
Negative	99.1	0.047	83.8	0.02	93.2	0.09
Positive	92.7		73.4		86.6	
Hormone receptor						
Negative	93.0	0.09	73.6	0.09	85.5	0.2
Positive	94.8		77.2		89.3	
HER2 status						
Negative	94.0	0.4	76.1	0.7	87.6	0.8
Positive	93.0		76.6		92.2	
Unknown	100.0		79.4		91.8	
Subtype						
Luminal (HER2−)	96.0	0.3	80.7	0.2	90.5	0.3
Luminal (HER2+)	94.7		84.2		100.0	
HER2+	93.5		77.4		90.3	
Triple-negative	91.9		73.0		85.1	

DFS, disease-free survival; HG, histological grade; LRFS, locoregional recurrence-free survival; OS, overall survival.

HER2 (positive vs negative), and tumor subtypes (luminal (HER2-negative), luminal (HER2-positive), HER2-positive (hormone receptor negative), and triple-negative), for each of the total dataset (Table 2), systemic therapy-first cohort (Table 3), and surgery-first cohort (Table 4). Univariate analyses of the total dataset demonstrated that implementation of chemotherapy, single positive node, and negative lymphovascular invasion (ly-) represented significant favorable

TABLE 3 Univariate analysis for systemic therapy-first cohort

Characteristics	10-year LRFS (%)	*P*	10-year DFS (%)	*P*	10-year OS (%)	*P*
Menopausal status						
Premenopausal	94.7	0.2	84.2	0.02	94.7	0.048
Postmenopausal	84.6		56.0		74.4	
Chemotherapy						
No	83.4	0.4	64.8	0.4	80.9	0.9
Yes	90.0		72.9		89.2	
Histological type						
Invasive ductal	88.2	0.7	64.7	0.9	78.4	0.3
Others	85.7		71.4		100.0	
Tumor size (pathological)						
pT1	92.3	0.5	65.4	0.4	80.8	0.9
pT2	84.4		65.6		81.2	
No. of positive lymph nodes						
1	96.3	0.1	74.1	0.3	85.2	0.5
2 or 3	80.6		58.1		77.4	
Histological grade						
HG1, 2	92.1	0.1	73.7	0.03	89.5	0.02
HG3	80.0		50.0		65.0	
Lymphovascular invasion						
Negative	100.0	0.1	82.4	0.4	88.2	0.5
Positive	82.9		58.5		78.0	
Hormone receptor						
Negative	70.6	0.002	52.9	0.03	70.6	0.009
Positive	95.1		70.7		85.4	
HER2 status						
Negative	88.5	0.8	69.2	0.09	82.7	0.8
Positive	80.0		20.0		60.0	
Unknown	100.0		100.0		100.0	
Subtype						
Luminal (HER2−)	94.7	0.03	71.1	0.001	84.2	0.001
Luminal (HER2+)	100.0		50.0		100.0	
HER2+	66.7		0.0		33.3	
Triple-negative	71.4		64.3		78.6	

DFS, disease-free survival; HG, histological grade; LRFS, locoregional recurrence-free survival; OS, overall survival.

TABLE 4 Univariate analysis for surgery-first cohort

Characteristics	10-year LRFS (%)	*P*	10-year DFS (%)	*P*	10-year OS (%)	*P*
Menopausal status						
Premenopausal	96.5	0.8	81.8	0.6	90.9	0.8
Postmenopausal	96.5		81.5		91.6	
Chemotherapy						
No	94.2	0.04	82.7	0.4	94.2	0.7
Yes	97.4		81.2		90.2	
Histological type						
Invasive ductal	96.2	0.3	80.9	0.3	90.9	0.3
Others	100.0		89.7		96.6	
Tumor size (pathological)						
pT1	97.3	0.4	88.2	0.002	94.6	0.03
pT2	95.7		75.0		88.0	
No. of positive lymph nodes						
1	97.4	0.3	86.1	0.02	93.8	0.08
2 or 3	95.5		76.7		88.6	
Histological grade						
HG1, 2	95.8	0.5	83.8	0.2	94.2	0.046
HG3	97.2		79.3		88.3	
Lymphovascular invasion						
Negative	99.0	0.2	90.9	0.03	97.0	0.07
Positive	95.6		78.2		89.3	
Hormone receptor						
Negative	96.8	0.9	80.0	0.4	90.5	0.6
Positive	96.4		82.2		91.6	
HER2 status						
Negative	96.3	0.5	80.7	0.9	90.5	0.4
Positive	95.6		86.7		97.8	
Unknown	100.0		82.8		89.7	
Subtype						
Luminal (HER2−)	96.2	0.7	82.2	0.6	91.5	0.4
Luminal (HER2+)	94.1		88.2		100.0	
HER2+	96.4		85.7		96.4	
Triple-negative	96.7		75.0		86.7	

DFS, disease-free survival; HG, histological grade; LRFS, locoregional recurrence-free survival; OS, overall survival.

prognostic factors for LRFS. Pathological tumor diameter 2 cm or less (pT1), single positive node, and ly- were favorable factors for DFS. Histological grade 1 or 2 (HG1, 2) was the only favorable prognostic factor identified for OS.

In the systemic therapy-first cohort, hormone receptor status correlated strongly with LRFS, DFS, and OS. Menopausal status and histological grade were also significant prognostic factors for DFS and OS, but not for LRFS. Significant differences in prognostic results among breast cancer subtypes were observed. In the surgery-first cohort, implementation of chemotherapy was the only significant factor for LRFS. Pathological tumor size, number of positive nodes, and lymphovascular invasion were identified as prognostic factors for DFS. Pathological tumor size and histological grades were identified as significant factors for OS.

Multivariate analysis performed for the total dataset demonstrated that implementation of chemotherapy and positive hormone receptor status were significant favorable prognostic factors for LRFS, pT1, single positive node, and implementation of chemotherapy correlated

TABLE 5 Multivariate analysis of prognostic factors for total dataset

	10-year LRFS		10-year DFS		10-year OS	
Characteristics	**HR (95%CI)**	***P***	**HR (95%CI)**	***P***	**HR (95%CI)**	***P***
Menopausal status						
Premenopausal	1	0.49	1	0.17	1	0.23
Postmenopausal	1.41 (0.53-3.80)		1.37 (0.87-2.17)		1.50 (0.78-2.89)	
Chemotherapy						
No	1	0.005	1	0.025	1	0.54
Yes	0.27 (0.11-0.68)		0.59 (0.37-0.94)		0.80 (0.40-1.61)	
Tumor size (pathological)						
pT1	1	0.61	1	0.035	1	0.22
pT2	1.29 (0.50-3.34)		1.61 (1.04-2.52)		1.49 (0.79-2.83)	
Positive lymph nodes						
1	1	0.11	1	0.023	1	0.12
2, 3	2.24 (0.84-5.95)		1.66 (1.07-2.57)		1.65 (0.88-3.08)	
Histological grade						
HG1, 2	1	0.57	1	0.26	1	0.051
HG3	1.32 (0.51-3.40)		1.29 (0.83-2.02)		1.93 (1.00-3.76)	
Lymphovascular invasion						
Negative	1	0.08	1	0.068	1	0.22
Positive	6.21 (0.80-47.6)		1.80 (0.96-3.37)		1.83 (0.70-4.78)	
Hormone receptor						
Positive	1	0.044	1	0.16	1	0.49
Negative	2.68 (1.03-7.01)		1.42 (0.87-2.30)		1.27 (0.65-2.51)	

DFS, disease-free survival; HG, histological grade; LRFS, locoregional recurrence-free survival; OS, overall survival.

with favorable DFS, and HG1, 2 was not significant, but tended to correlate with favorable OS (Table 5).

4 | DISCUSSION

This study examined prognostic factors for patients who had undergone total mastectomy, and the disease was classified as pT1-2N1 (1-3 positive nodes). Our results demonstrated that positive hormone receptor status correlated with favorable LRFS, and pT1 and single positive node correlated with favorable DFS. The implementation of adjuvant or neoadjuvant chemotherapy was significantly correlated with both favorable LRFS and DFS. No significant prognostic factor for OS was identified, possibly because systemic chemo- and endocrine therapy for metastatic breast cancer affects OS.

Several limitations to this study need to be considered. At first, our study population included patients treated with systemic therapy before surgery. Node-positive disease after systemic therapy was different from node-positive disease before systemic therapy, and the prognoses should be unlike. We analyzed the prognostic factors separately in each cohorts, while multivariate analysis was made only the total dataset because of small number of events. The diameter of metastases in lymph nodes and extranodal infiltration was not always recorded during the study period. CT or ultrasonography to identify locoregional or distant metastasis was not performed annually, and some patients terminated follow-up due to personal reasons. Such factors may have affected the study end points and results of analyses.

Over the last decade, molecular characterization studies have extensively investigated breast cancer treatment. Sorlie et al demonstrated that breast cancers can be classified into intrinsic subtypes, luminal, ERBB2-positive, basal, and normal breast-like.[10] Several subsequent studies have indicated that intrinsic subtypes correlate with patient prognosis, and the basal and HER2 subtypes have shown significantly lower OS and relapse-free survival compared to luminal subtypes.[11,12] However, Moo et al[13] demonstrated that molecular subtypes did not correlate with locoregional recurrence in mastectomy patients with T1-2N1 breast cancer. In our study, univariate analyses showed hormone receptor status was strongly associated with all of LRFS, DFS, and OS in the systemic therapy-first cohort, and multivariate analysis demonstrated hormone receptor status was associated with LRFS in the total dataset. In addition, significant differences in prognostic results among breast cancer subtypes were observed in the systemic therapy-first cohort but not in the surgery-first cohort. Modern systemic therapy, taxanes, or anti-HER2 therapy increased the pathological complete remission (pCR) rate and have improved the prognosis for patients with HER2 overexpression and the triple-negative subtype. However, prognoses for patients who could not accomplish pCR from preoperative systemic therapy appeared still poor in HER2+ or triple-negative subtype.

The indications for PMRT among pT1-2N1 breast cancer patients treated by mastectomy remain under discussion. An EBCTCG meta-analysis demonstrated that PMRT for patients with 1-3 positive nodes reduced the 10-year breast cancer recurrence rate by 11.5% and the 10-year breast cancer mortality rate by 5.6%.[5] The absolute risk reduction by PMRT depends on the baseline risk of the study population. Modern systemic therapies have reduced the baseline risk of breast cancer recurrence, so the effects of PMRT on patient prognoses may be reduced compared to previous decades. McBride et al showed that the 5-year locoregional recurrence rate fell from 9.5% in the early era to 2.8% in the late era, with no clear effect of PMRT on breast cancer patients with 1-3 positive nodes as demonstrated on retrospective analysis.[14] Our institute previously reported that PMRT has limited value in establishing locoregional control.[15] In the present study, locoregional relapse was observed in 20 cases (4.7%) during the median follow-up period of 8.2 years and was similar to that in McBride's late era, and less than half the locoregional recurrence rate reported in the meta-analysis.[5] Our study demonstrated that chemotherapy significantly reduced locoregional recurrence and improved disease-free survival even if patients with residual positive nodes after systemic therapy included in the multivariate analysis.

Radiotherapy is associated with several adverse events, including lymph edema of the arm,[16] skin dryness, radiation pneumonitis, cardiac dysfunction, secondary skin cancer, and angiosarcoma.[17] Another problem is that PMRT can lead to an increased frequency of complications in the reconstructed breast such as capsule contracture, surgical-site infection, and skin necrosis are more likely.[18] Given the unclear balance of risks and benefits, whether PMRT is warranted for pT1-2N1 breast cancer patients remains contentious, and the latest guidelines support this contention.[19] The guidelines stated that panelists agreed that clinicians making such recommendations for individual patients should consider factors which may decrease the risk of locoregional failure, attenuate the benefit of reduced breast cancer-specific mortality, and/or increase the risk of complications resulting from PMRT.[19] These factors included patient age, lack of concomitant complications, smaller tumor size, absence of lymphovascular invasion, single positive node, and/or small size of nodal metastases, low tumor grade, and strong hormonal sensitivity, and these factors were supported by our results. The ongoing NSABP B-51 trial is assessing omission of PMRT in patients who present with histologically positive axillary nodes but convert to histologically negative axillary nodes following neoadjuvant chemotherapy. Patients who have residual positive nodes after neoadjuvant chemotherapy are ineligible for this study because of necessity of PMRT, but our results showed that physicians may be able to eliminate PMRT from luminal-like breast cancer patients with ypT1-2 and single residual positive node.

5 | CONCLUSION

Our study demonstrated that the presence of adjuvant or neoadjuvant chemotherapy, positive hormone receptor status, pathological T1 tumor, and single positive node were favorable prognostic factors for pT1-2N1 breast cancer patients after total mastectomy with axillary lymph node dissection. The relevance of these factors was supported by previous evidence and the latest guidelines. The indications for PMRT among pT1-2N1 breast cancer patients treated by mastectomy remain under discussion. Physicians may eliminate PMRT from patients with the borderline indications on the basis of how many favorable factors the patients have. The ongoing BIG 2.04 MRC/EORTC SUPREMO trial will provide insights into these issues.

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