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Treatment results of breast cancer patients with locoregional recurrence after mastectomy

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Purpose: To analyze the results of locoregional and systemic therapy in the breast cancer patients with locoregional recurrence (LRR) after mastectomy.

Materials and Methods: Seventy-one patients who received radiotherapy for isolated LRR after mastectomy between January 1999 and December 2009 were retrospectively reviewed. Among the 71 patients, 59 (83.1%) underwent wide excision and radiotherapy and 12 (16.9%) received radiotherapy alone. Adjuvant hormonal therapy was given to 45 patients (63.4%). Oncologic outcomes including locoregional recurrence-free survival, disease-free survival (DFS), and overall survival (OS) and prognostic factors were analyzed.

Results: Median follow-up time was 49.2 months. Of the 71 patients, 5 (7%) experienced second isolated LRR, and 40 (56%) underwent distant metastasis (DM). The median DFS was 35.6 months, and the 3- and 5-year DFS were 49.1% and 28.6%, respectively. The median OS was 86.7 months, and the 5-year OS was 62.3%. Patients who received hormone therapy together showed better 5-year DFS and OS than the patients treated with locoregional therapy only (31.6% vs. 22.1%, p = 0.036; 66.5% vs. 55.2%, p = 0.022). In multivariate analysis, higher N stage at recurrence was a significant prognostic factor for DFS and OS. Disease free interval (≤30 months vs. >30 months) from mastectomy to LRR was also significant for OS. The patients who received hormone therapy showed superior DFS and showed trend to better OS.

Conclusion: DM was a major pattern of failure after the treatment of LRR after mastectomy. The role of systemic treatment for LRR after mastectomy should be investigated at prospective trials.

Keywords: Breast cancer, Locoregional recurrence, Mastectomy

Introduction

In the breast cancer patients who received mastectomy but no adjuvant radiotherapy, locoregional recurrence (LRR) rate ranges from 5% to 40% within 10 years depending on the risk factors [1-4]. Isolated LRR may be a subclinical disseminated disease and may develop to the distant metastasis [5]. However, several studies have demonstrated that some of the patients can belong to the favorable subgroup and show long-term survival after salvage treatment [6-9]. Various treatment

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strategies including locoregional therapy (wide excision and/or radiotherapy) and/or systemic therapy (hormone therapy and/or chemotherapy) can be considered depending on the site of recur, operability, hormone receptor status, and other factors. Although many studies have analyzed the various treatment outcomes for isolated LRR and have tried to evaluate the prognostic factors, optimal treatment for isolated LRR and its prognostic factors are not clearly defined yet.

In this study, we analyzed the results of locoregional and systemic therapy in the breast cancer patients with isolated LRR after mastectomy. Furthermore, we investigated the prognostic factors for locoregional recurrence-free survival (LRRFS), disease-free survival (DFS), and overall survival (OS).

Materials and Methods

1. Patients

We retrospectively reviewed 71 patients who received radiotherapy for isolated LRR after mastectomy between January 1999 and December 2009. All patients did not receive adjuvant radiotherapy after mastectomy for several reasons–low risk of recurrence (T0-2, N0-1), 57; patient's refusal, 4; recurrence immediately after adjuvant chemotherapy, 1; wound problem, 1; unknown, 8.

We defined isolated LRR as the histologically confirmed recurrence within the ipsilateral chest wall, axillary, supra- or infraclavicular, and internal mammary region without simultaneous distant metastasis. The pathologic stage of initial tumor and recurrent stage were determined according to the American Joint Committee on Cancer (AJCC, 7th edition) TNM stage classification.

2. Treatments

Among the 71 patients, 59 (83.1%) underwent wide excision before radiotherapy and 12 (16.9%) received radiotherapy alone. Hormone therapy and/or chemotherapy were given to the patients depending on physician's judgment based on hormone receptor status. Estrogen receptor (ER), progesterone receptor (PR), and human epidermal growth factor receptor 2 (HER2) statuses were examined by immunohistochemistry. If HER2 status was equivocal in the immunohistochemistry, in situ hybridization was added. When the result of hormone receptor and HER2 status showed discordance between initial mastectomy specimen and recurred specimen, we selected latest result in the analysis.

3. Radiotherapy and evaluation

Radiotherapy was performed with 4 to 15 MV X-rays and/or 6 to 16 MeV electron from a linear accelerator (Clinac 4/100, 1800, 2100CD, or 21EX; Varian Medical Systems, Palo Alto, CA, USA) to the involved field with or without elective field. Chest wall, axillary, supra- or infraclavicular, and/or internal mammary region containing the recurrent tumor were defined as involved field. Elective field included uninvolved chest wall, axillary, supra- or infraclavicular, and/or internal mammary region and treated by two-field standard tangential technique, thee-field technique, or reverse hockey stick technique depending on the extent of treatment. Patients were typically treated to a dose of about 4,500 to 5,080 cGy in 25 to 28 fractions with 5 fractions per week with a local boost of 540 to 2,540 cGy in 3 to 13 fractions to tumor bed or gross tumor. In the patients who received definitive radiotherapy without wide excision, we performed response evaluation 1 to 6 months after the radiotherapy according to the Response Evaluation Criteria in Solid Tumors criteria [10].

4. Statistical analysis

LRRFS was calculated from the date of diagnosis of the isolated LRR to the date of diagnosis of second LRR. We defined second LRR as any recurrence within the ipsilateral chest wall, axillary, supra- or infraclavicular, and/or internal mammary region after the locoregional treatment for the isolated LRR. DFS was calculated from the date of diagnosis of the isolated LRR to the second LRR, distant metastasis, or death of any cause. OS was calculated from the date of diagnosis of the isolated LRR to the date of death of any cause. LRRFS, DFS, and OS rates were estimated using the Kaplan-Meier method. Univariate and Cox regression analysis were used to describe the association of independent variables with LRRFS, DFS, and OS. The variables those were analyzed included tumor size, nodal status, receptor status, interval from mastectomy to isolated LRR, site of recurrence, wide excision, radiotherapy field, radiotherapy dose, and hormone therapy. All statistical tests were two-sided and performed at the 5% level of significance by using SPSS ver. 18.0 (SPSS Inc., Chicago, IL, USA).

Results

1. Patient characteristics

The median age was 43 years (range, 29 to 71 years). The interval from mastectomy to isolated LRR ranged from 4

to 129 months (median, 30 months). Most common site of recurrence was chest wall (46 patients, 64.8%), followed by axillary lymph node (5 patients, 7.0%), supra- or infraclavicular lymph node (4 patients, 5.6%), internal mammary lymph node (2 patients, 2.8%) and multiple sites (14 patients, 19.7%) (Table 1). Among the chest wall recurrence, AJCC 7th stage rT1, rT2, rT3, and rT4 was 50.7%, 12.7%, 1.4%, and 18.3%, respectively. In patients with nodal recurrence, AJCC 7th stage rN1, rN2, and rN3 was 14.1%, 4.2%, and 16.9%, respectively. ER and/or PR were positive in 54 patients (76.1%), and negative in 16 patients (22.5%). Among the 63 patients who were able to check the HER2 status, 19 patients were HER2 positive, and 44 patients were HER2 negative (Table 1).

2. Treatment variation and response

Most patients (59 of 71, 83.1%) received radiotherapy after wide excision and 12 patients (16.9%) received definitive radiotherapy without excision. Sixty-three patients (88.7%) received elective field radiotherapy, involving ipsilateral chest wall and regional lymphatics as well as the tumor bed. Median total radiation dose was 59.4 Gy (range, 37.5 to 70.4 Gy) in 1.8 to 2.5 Gy per fraction. Hormone therapy was given to 45 patients (63.4%) and chemotherapy was given to 6 patients (8.4%) (Table 1). Among the 12 patients who received definitive radiotherapy without wide excision, 9 patients achieved complete (8 patients) or partial (1 patient) response and 3 patients showed stable disease status.

3. Failure patterns and survival rates

The median follow-up time was 49.2 months (range, 13.7 to 149.7 months). At the time of the analysis, 5 (7%) experienced second LRR, and 40 (56%) developed distant metastasis (Fig. 1). Among the 40 patients with distant metastasis, 14 patients experienced metastases to multiple sites and 26 patients experienced single site metastasis. The most common site of distant metastasis was lung (34.6%), followed by bone (30.8%), liver (15.4%), non-regional lymph node (11.5%), brain (3.8%), and malignant pericardial effusion (3.8%). Among the 5 patients who experienced second LRR, one patient was treated with involved field radiotherapy after wide excision, two patients were treated with elective field radiotherapy after wide excision, and two patients received elective field radiotherapy alone. All patients who had second LRR were treated with a dose of 50.4 to 70.4 Gy per 28 to 38 fractions in involved field and 45 Gy per 25 fractions in elective field. The interval from the isolated LRR to the second LRR was 6.4 to

Table 1. Patient characteristics

Characteristic	No. (%)
Baseline	
Initial T stage (AJCC 7th ed.)	
T1 / T2 / T3 / T4	25 (35.2) / 39 (54.9) / 3 (4.2) / 4 (5.6)
Initial N stage (AJCC 7th ed.)	
N1 / N2 / N3	33 (46.5) / 7 (9.9) / 6 (8.5)
Hormone receptor status	
ER (+) and/or PR (+)	54 (76.1)
ER (–) and PR (–)	16 (22.5)
Not checked	1 (1.4)
HER2 status	
(+)	19 (26.8)
(–)	44 (62.0)
Not checked	8 (11.3)
Site of recurrence	
Chest wall	46 (64.8)
Axillary lymph node	5 (7.0)
Supra/infraclavicular	4 (5.6)
Internal mammary	2 (2.8)
Multiple site[a]	14 (19.7)
Treatment	
Surgery for chest wall lesion (n = 59)	
None	10 (16.9)
Wide excision only	46 (78.0)
Wide excision + reconstruction[b]	3 (5.1)
Surgery for nodal lesion (n = 25)	
None	7 (28.0)
Recurrent node excision	7 (28.0)
Lymph node dissection[c]	11 (44.0)
Radiotherapy field	
Involved field	8 (11.3)
Elective field	63 (88.7)
Radiotherapy dose (Gy)	
Median (range)[d]	59.4 (37.5–70.4)
Systemic therapy	
Hormone therapy[e]	44 (62.0)
Chemotherapy[f]	5 (7.0)
Both	1 (1.4)
None	21 (29.6)

AJCC, American Joint Committee on Cancer; ER, estrogen receptor; PR, progesterone receptor; HER2, human epidermal growth factor receptor 2.
[a]Recurrence in chest wall and lymph node (n = 13) and multiple site recurrence in lymph node (n = 1). [b]By Goretex patch (n = 2) and by musculocutaneous flap (n = 1). [c]Axillary (n = 5), supraclavicular (n = 3), axillar and supraclavicular (n = 1), and internal mammary (n = 2). [d]1.8–2.5 Gy/fraction, ≥50 Gy except 1 patient of 37.5 Gy, ≥45 Gy to the area of elective irradiation, boost of 5.4–25.4 Gy to the area of recurrent tumor. [e]Letrozol (n = 20), tamoxifen (n = 7), lorelin (n = 5), zoladex (n = 4), arimidex (n = 3), aromasin (n = 1), megesterol (n = 1), and multiple (n = 4). [f]Anthracycline based.

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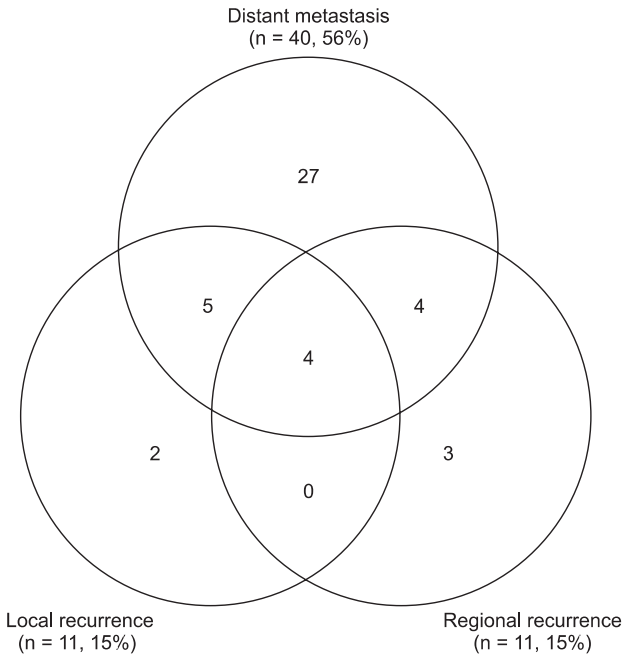

Fig. 1. Patterns of failure after the treatment of isolated locoregional recurrence.

41.8 months (mean, 25.1 months).

The median LRRFS was not reached, and the 3- and 5-year LRRFS were 79.6% and 69.6%, respectively (Fig. 2A). The median DFS was 35.6 months, and the 3- and 5-year DFS were 49.1% and 28.6%, respectively (Fig. 2B). The median OS was 86.7 months, and the 3- and 5-year OS were 82.3% and 62.3%, respectively (Fig. 2C).

4. Prognostic factors

On univariate analysis, initial N stage and site of recurrence were significant for LRRFS, DFS, and OS. Hormone receptor status, rN stage, wide excision and hormone therapy were significant for DFS and OS, and interval from mastectomy to isolated LRR was significant for OS. The patients treated with locoregional therapy and hormone therapy together showed better 5-year DFS and OS than patients treated with locoregional therapy only (31.6% vs. 22.1%, p = 0.036; 66.5% vs. 55.2%, p = 0.022). Tumor size, radiotherapy field, radiotherapy dose were not significant for LRRFS, DFS, and OS (Table 2).

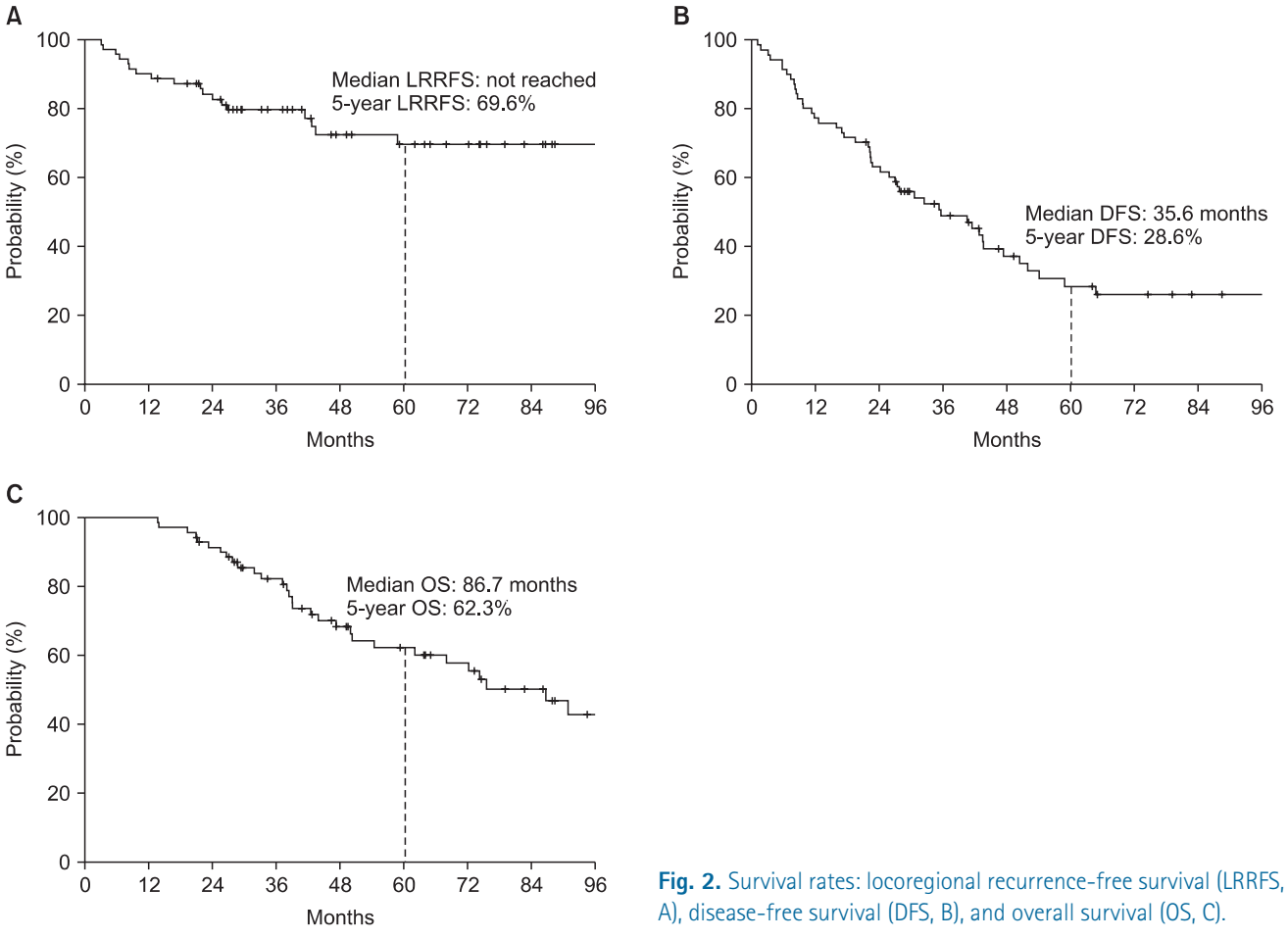

Fig. 2. Survival rates: locoregional recurrence-free survival (LRRFS, A), disease-free survival (DFS, B), and overall survival (OS, C).

Table 2. Prognostic factors for survival by univariate analysis

Factor	5-yr LRRFS (%)	p-value	5-yr DFS (%)	p-value	5-yr OS (%)	p-value
Age (yr)		0.569		0.672		0.777
<40	65.5		21.3		69.0	
≥40	76.0		33.4		58.1	
Initial T stage (AJCC 7th ed.)		0.820		0.537		0.548
T1-2	69.4		29.5		65.3	
T3-4	71.4		21.4		38.1	
Initial N stage (AJCC 7th ed.)		0.026*		0.041*		0.023*
N0-1	74.3		33.0		69.1	
N2-3	48.5		10.3		35.9	
Hormone receptor status		0.393		0.039*		0.005*
ER (+) and/or PR (+)	69.9		30.3		66.9	
ER (–) and PR (–)	67.5		14.3		43.9	
HER2 status		0.089		0.377		0.778
(+)	67.2		27.8		70.4	
(–)	72.1		30.7		65.3	
Disease-free interval (mo)		0.823		0.105		0.008*
≤30	70.6		23.1		47.8	
>30	69.3		34.0		77.5	
Site of recurrence		0.039*		0.003*		0.040*
Chest wall	78.5		37.9		69.2	
Lymph node, multiple	44.0		7.3		47.2	
T stage at recur (AJCC 7th ed.)		0.953		0.627		0.692
rT1-2	69.4		27.7		61.0	
rT3-4	68.9		31.1		66.0	
N stage at recur (AJCC 7th ed.)		0.296		<0.001*		<0.001*
rN0-1	73.1		36.2		73.8	
rN2-3	50.9		0.0		23.8	
Wide excision		0.122		0.005*		0.013*
(+)	74.6		33.3		69.7	
(–)	42.9		8.3		33.3	
Hormone therapy for ILRR		0.159		0.036*		0.022*
(+)	69.8		31.6		66.5	
(–)	64.5		22.1		55.2	
Radiotherapy field		0.412		0.603		0.663
Involved field	87.5		50.0		75.0	
Elective field	67.2		25.7		60.6	
Radiotherapy dose (Gy)		0.302		0.371		0.410
<50.4	83.6		54.9		65.3	
≥50.4	65.0		23.0		61.1	

*$p < 0.05$.
LRRFS, locoregional recurrence-free survival; DFS, disease-free survival; OS, overall survival; AJCC, American Joint Committee on Cancer; ER, estrogen receptor; PR, progesterone receptor; HER2, human epidermal growth factor receptor 2; ILRR, isolated loco-regional recurrence.

In multivariate analysis, the patients with regional recurrence or recurrence in multiple sites showed trend to lower LRRFS than patients with chest wall recurrence (hazard ratio [HR] = 2.712, p = 0.066). The higher N stage at recurrence was a significant prognostic factor for DFS (HR = 4.792, p < 0.001) and OS (HR = 6.471, p < 0.001). The absence of hormone therapy was also significant for DFS (HR = 2.472, p = 0.008) and showed trend to inferior OS (HR = 2.006, p = 0.082). Long disease-free interval (>30 months) from mastectomy to LRR was also significant for OS (HR = 0.333, p = 0.010), but not

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Table 3. Prognostic factors for survival determined by multivariate analysis

Factor	LRRFS		DFS		OS	
	HR (95% CI)	p-value	HR (95% CI)	p-value	HR (95% CI)	p-value
Initial N stage (AJCC 7th ed.)		0.212		0.279		0.479
N0-1	1		1		1	
N2-3	2.132 (0.938–7.845)		1.579 (0.691–3.610)		1.518 (0.478–4.816)	
Disease-free interval (mo)		0.315		0.497		0.010*
≤30	1		1		1	
>30	1.784 (0.577–5.513)		0.790 (0.400–1.561)		0.333 (0.144–0.768)	
Site of recurrence		0.066		0.357		0.339
Chest wall	1		1		1	
Lymph node or multiple	2.712 (0.938–7.845)		1.541 (0.614–3.867)		0.369 (0.048–2.848)	
N stage at recur (AJCC 7th ed.)		0.247		<0.001*		<0.001*
rN0-1	1		1		1	
rN2-3	0.387 (0.077–1.935)		4.792 (2.214–10.371)		6.471 (2.773–15.100)	
Hormone therapy		0.365		0.008*		0.082
(+)	1		1		1	
(–)	1.742 (0.524–5.789)		2.472 (1.273–4.802)		2.006 (0.915–4.395)	

*$p < 0.05$.
LRRFS, locoregional recurrence-free survival; DFS, disease-free survival; OS, overall survival; HR, hazard ratio; CI, confidence interval; AJCC, American Joint Committee on Cancer.

significant for DFS (HR = 0.790, p = 0.497) (Table 3).

Discussion and Conclusion

1. Survival rates of our institution

In this study, 5-year OS and DFS after isolated LRR were 62.3% and 28.6%, respectively. The OS was similar to the previous studies. Kuo et al. [7] reviewed 115 patients who were treated for isolated LRR between 1992 and 2003, and reported a 5-year OS rate of 63% and a DFS rate of 54%. In the reports which reviewed patients treated before 1990s, 5-year OS rates ranged from 20% to 50% [11-14]. The superior OS rates of the patients treated after 1990s might due to the improvement of surgery and radiotherapy technique and the use of hormone therapy. The DFS in present study was so poor when comparing with the result of Kuo et al. [7], even though the OS rate was comparable with the result of Kuo et al. [7]. Two possible explanations may account these results. First, in the present study, the patients were treated between 1999 and 2009 and could receive more thorough evaluation to detect the distant metastasis by computed tomography and/or positron emission tomography. Second, most patients in present study who experienced distant metastasis and/or second LRR received aggressive salvage therapy which consisted of chemotherapy, hormone therapy, with or without local therapy such as surgery or radiotherapy. Among the 40 patients who experienced distant metastasis, 36 patients received chemotherapy and 23 patients received hormone therapy. There were only 3 patients who received no salvage therapy. All of the 5 patients with second isolated LRR received chemotherapy, and 3 of them received surgery and 1 of them received radiotherapy. Although there has been no randomized trial which prove the definite benefit of systemic therapy in patients with distant metastasis, aggressive salvage treatment might have made the improvement of the survival.

2. Prognostic factors

Although isolated LRR after mastectomy may be a subclinical disseminated disease and may develop to the distant metastasis, several studies have demonstrated that some of the patients can belong to the favorable subgroup and show long-term survival. To evaluate the prognostic factors for this favorable subgroup, several studies have performed univariate and multivariate analysis. In this study, initial N stage, site of recurrence, hormone receptor status, rN stage, wide excision, and hormone therapy were significant prognostic factors for DFS and OS. Initial N stage and site of recurrence were also significant for LRRFS. In the aspect of OS, the interval from mastectomy to isolated LRR (>30 months vs. ≤30 months) also showed significant difference.

The number of positive lymph nodes at initial diagnosis was a significant prognostic factor for DFS and/or OS in other

studies [7,11-13,15,16]. Various categorization of lymph node status was used. Kuo et al. [7] divided patients into lymph node positive group and negative group, and lymph node negative group showed better DFS and OS in multivariate analysis. In the study of Schmoor et al. [15], lymph node status were divided into four groups (number of positive lymph node 0 vs. 1–3 vs. 4–9 vs. >9), and showed better DFS and OS in the group of the smaller number of positive lymph node. Deutsch [11], categorized initial lymph node status combined with initial adjuvant systemic therapy (node negative vs. node positive; no systemic therapy vs. node positive; systemic treatment vs. node unknown). As a result, patients with negative or unknown nodal status, or positive nodes but no adjuvant systemic therapy showed higher OS than patients with positive nodes and adjuvant systemic therapy. Lymph node status at initial diagnosis seems to continuously affect the prognosis after the LRR, and so it might improve the overall prognosis to give proper adjuvant treatment after the mastectomy according to the risk factors (e.g., adjuvant radiotherapy after mastectomy in the patients who had three or more positive lymph nodes).

Several studies showed that patients with disease-free interval at least two years had better DFS as well as OS compared with the patients with shorter disease-free interval [5,7,9,12,15,17-19]. In the study of Schmoor et al. [15], they defined different time-dependent covariates for the disease-free interval (≤1, 1–2, 2–5, or >5 years) and showed that the patients with the short disease-free interval had poor prognosis for DFS and OS than the patients with the long disease-free interval.

In the study of Kuo et al. [7], the patients with chest wall recurrence showed marginally better DFS than the patient with axillar recurrence or the patients with supra- or infraclavicular region or multiple sites recurrence (5-year DFS 61% vs. 52% vs. 26%, p = 0.080). In the aspect of OS, the patients with chest wall recurrence showed superior outcome than the patients with recurrence in other sites, but the difference was not significant. However, Kuo et al. [7] reported that most patients with supra- or infraclavicular or multiple sites recurrence received radiotherapy alone without wide excision, whereas most patients with chest wall or axillar recurrence received wide excision and radiotherapy. The prognostic impact of the site of recurrence might be confused by the association with the possibility of wide excision or other factors. In present study, the site of recurrence might be confused by the association with other prognostic factors such as rN stage, wide excision, and systemic therapy. However, it was not able to put all of the prognostic factors simultaneously in the multivariate analysis because of the relatively small number of patients compared to the large number of prognostic factors.

In several studies, the patients who underwent elective field radiotherapy showed better locoregional control than the patients treated with involved field radiotherapy [7,20]. Halverson et al. [20] reported that supraclavicular failure rate was lower in the patients who received elective field radiotherapy than in the patients with involved field radiotherapy. In the study of Kuo et al. [7], elective field radiotherapy and wide excision showed better locoregional control than involved field radiotherapy and wide excision or radiotherapy alone. However, in present study, most patients (88.7%) received elective field radiotherapy and it was not able to demonstrate the role of elective radiotherapy compared with involved field radiotherapy.

In the present study, we performed insufficient multivariate analysis which included initial N stage, disease-free interval, site of recurrence, N stage at recurrence and hormone therapy. Higher N stage at recurrence was a significant prognostic factor for OS and DFS, and the use of hormone therapy was significant for DFS. Long interval (>30 months) from mastectomy to LRR was also significant for OS, but not significant for DFS. The patients with chest wall recurrence showed trend to better LRRFS.

3. Failure patterns and systemic treatment

Even though 5 (7%) patients experienced second isolated LRR in this study, the major pattern of failure was distant metastasis (40 of 71, 56%). Especially, DFS was lower in the patients with higher N stage at recurrence and no hormone therapy. Although some patients have shown good local control and long-term survival after the treatment of isolated LRR, most patients eventually develop the distant metastasis. It seems to be important to know who will experience distant metastasis and whether the systemic therapy (chemotherapy or hormone therapy) will be effective to these patients. Haffty et al. [21] analyzed the prognosis of the patients with isolated chest wall recurrence after mastectomy, and reported lower distant metastasis-free survival and OS in the patients with progesterone receptor negative and shorter disease-free interval, and lower LRRFS in the patients with HER2 (+). Waeber et al. [22] reported the long term follow up result of phase III randomized trial comparing adjuvant tamoxifen with observation. Although this study was performed in patients with 'good-risk' characteristics which were defined as positive

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estrogen receptor, long disease-free interval (>12 months), ≤3 tumor nodules, each ≤3 cm in diameter, tamoxifen group showed significant improvement in DFS but no advantage in OS. Haylock et al. [23] evaluated the impact of chemotherapy in the combination with the locoregional therapy by control cohort method. The patients who combined chemotherapy showed better distant recurrence-free survival and OS than the patients who received locoregional therapy only (5-year distant recurrence-free survival 75.4% vs. 60.7%, p = 0.33; 5-year OS 81.9% vs. 74.3%, p = 0.24). In the 2012 San Antonio Breast Cancer Symposium, Aebi et al. [24] reported the results of CALOR trial which showed superior DFS and OS in the patients who added chemotherapy than the patients who didn't received chemotherapy, and chemotherapy was particularly effective in the ER negative patients. Although several studies including our study have tried to evaluate the prognostic impact of the systemic treatment, the patient characteristics were very heterogeneous and the number of patients was small number to perform the proper analysis. To determine the effect of systemic therapy in the patients with isolated LRR after mastectomy, well controlled randomized prospective study is needed.

Several limitations are present as followings: 1) the number of patients was small compared to the number of prognostic factors, and it was difficult to put all of the prognostic factors together in the multivariate analysis. 2) Patients' characteristics and the treatment were heterogeneous due to the nature of retrospective study. 3) A Herceptin, another recent option of systemic therapy, was not used in the patients of this study as a salvage treatment for the isolated LRR. It seems to be necessary to analyze more recent patients.

In this study, the patients with isolated LRR after mastectomy could obtain good locoregional control by the radiotherapy with or without wide excision. Distant metastasis seems to be a major pattern of failure after the treatment of loco-regional recurrence after mastectomy. The patients with higher N stage at recurrence showed inferior DFS and OS, and the patients who received hormone therapy showed better DFS. The role of systemic chemotherapy as well as locoregional and hormonal treatment should be verified at prospective trials in the patients with higher N stage at the time of recurrence.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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