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Original article

The impact of immediate breast reconstruction on post-mastectomy lymphedema in patients undergoing modified radical mastectomy

Kyeong-Tae Lee [1], Goo-Hyun Mun [1], So-Young Lim, Jai-Kyong Pyon, Kap-Sung Oh, Sa-Ik Bang*

Department of Plastic Surgery, Samsung Medical Center, Sungkyunkwan University School of Medicine, Ilwon-dong 50, Kangnam-ku, Seoul 135-710, Republic of Korea

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ABSTRACT

The aim of this study was to assess the impact of immediate breast reconstruction (IBR) with autologous tissue on the development of post-mastectomy lymphedema in patients undergoing modified radical mastectomy (MRM). A retrospective chart review was performed for early-stage breast cancer patients who underwent MRM between January 2001 and December 2009. Patients were categorized into two groups based on whether or not they underwent IBR. The incidence of lymphedema was assessed and compared. A total of 712 patients underwent MRM, which included 117 patients undergoing IRB. There were no significant differences between two groups except for a lower body mass index in the reconstruction group. Comparing the incidence of lymphedema using multivariate logistic regression analysis, the reconstruction group had a significantly lower incidence of lymphedema (p-value = 0.023). Breast cancer patients who underwent MRM with IBR had a significantly lower incidence of lymphedema than those in the non-reconstruction group.

Introduction

Although the use of breast conserving surgery or total mastectomy and sentinel lymph node biopsy has recently increased, especially for the treatment of noninvasive breast cancer, modified radical mastectomy including axillary lymph node dissection remains one of the most frequently performed operations for the treatment of early-stage breast cancer patients.[1] Quite a few patients with invasive early-stage breast cancer undergo modified radical mastectomy, including patients who have a large tumor and cannot achieve an adequate safety margin to undergo breast conserving surgery or those suspected to be node-positive clinically. The advantages of modified radical mastectomy include not only local control of cancer and reduction of the risk of cancer recurrence but also retention of the chest muscles, which prevents disfigurement and allows patients the option of breast reconstruction.

However, total mastectomy with axillary lymph node dissection can have several sequelae including post-mastectomy lymphedema, one of the most dreadful complications in breast cancer patients. Lymphedema is the pathologic accumulation of protein-rich fluid in the interstitial space, which can lead to inflammation, pain, and disability.[2] The most common type of secondary lymphedema occurs following mastectomy and/or radiotherapy, with a reported prevalence ranging from 4 to 62.5%.[3–7] Lymphedema in patients with breast cancer can result in cosmetic problems, functional limitations, and psychological distress, all of which can decrease quality of life. Post-mastectomy lymphedema can be a particularly important issue for patients undergoing modified radical mastectomy, who are known to have a higher rate of lymphedema development than patients who undergo sentinel lymph node biopsy.[8–11] However, there is no definitive way to prevent or cure lymphedema, and little is known about its pathophysiology.

Immediate breast reconstruction is considered a cardinal adjuvant treatment, especially for women with early-stage breast cancer, as it can prevent disfiguration of the chest wall, increase self-esteem, and improve quality of life.[12,13] It can also provide financial benefits.[14] In addition, several studies have shown that immediate breast reconstruction does not affect the biological behavior of breast cancer, promote cancer recurrence, or interfere with adjuvant chemotherapy.[15–17]

Although several previous studies have examined the association between breast reconstruction and the development of lymphedema, most reports concern the impact of delayed breast reconstruction[3,18] and little is known about the relationship between immediate breast reconstruction and the occurrence of post-mastectomy lymphedema. The aims of this study were to

* Corresponding author. Department of Plastic and Reconstructive Surgery, Samsung Medical Center, College of Medicine, Sungkyunkwan University, 50 Ilwon-dong, Seoul, Republic of Korea. Tel.: +82 2 3410 2235; fax: +82 2 3410 0036.
E-mail addresses: sibang55@samsung.com, skymaker26@gmail.com (S.-I. Bang).
[1] These authors are first co-authors, and equally contributed to this article.

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assess and compare the prevalence of post-mastectomy lymphedema in two groups of patients categorized based on whether or not they had undergone immediate breast reconstruction and to determine the impact of immediate breast reconstruction using autologous tissue on the development of lymphedema.

Methods

A retrospective chart review was performed for breast cancer patients who underwent modified radical mastectomy with or without immediate breast reconstruction using autologous tissue between January 2001 and December 2009. In our institution, the modified radical mastectomies were performed for the patients having axillary lymph nodes which were suspicious to have tumor infiltrations either clinically or in radiologic findings. The patients with large tumors, advanced disease or the pregnant patients were also included the indication of modified radical mastectomy. When performing the axillary procedure in the operations, the patients having lymph nodes which were enlarged or seems to be infiltrated by tumor underwent axillary lymph node dissection based on the operator's decisions.

Of theses, patients with advanced stage breast cancer (TNM stage III and IV) were not included in this study due to the low proportion eligible to undergo immediate breast reconstruction after mastectomy. Patients with noninvasive breast cancer, including ductal carcinoma in situ, were usually treated with breast conserving surgery or total mastectomy and sentinel lymph node biopsy according to our institutional protocol and were also not included. Additionally, patients with a medical history of prior breast cancer, previous procedures in the axillary region, or pre-existing lymphedema were excluded. In breast reconstruction group, only the patients who underwent reconstruction using autologous tissue were included and those who underwent reconstruction using tissue expander or implant combined methods were excluded.

The patients were categorized into two groups based on whether or not they underwent immediate breast reconstruction with autologous tissue. A majority of the non-reconstruction group consisted of patients who refused the immediate reconstruction procedure because of its higher cost or fears about the longer operation time and complexity of the procedure. In addition, patients who were preoperatively expected to have an advanced cancer stage often underwent delayed reconstruction according to the oncologic surgeon's preference and thus were not included in the immediate breast reconstruction group.

During regular follow-ups for postoperative cancer surveillance, patients with any signs or symptoms of lymphedema were referred to the rehabilitation doctors and underwent a medical examination. Lymphedema was diagnosed by the rehabilitation doctors based on both subjective assessment of symptoms and objective measurement of volume change in the affected arm by volumetry (Perometer, Nam Buk Surgical, Korea). The severity of the lymphedema was also assessed clinically by the rehabilitation doctors using Campisi staging system.

We reviewed electronic medical records to gather preoperative patient demographic data. Other potential factors that might have influenced the development of post-mastectomy lymphedema were also reviewed, including tumor size, cancer stage, number of excised lymph nodes, and adjuvant chemotherapy or radiotherapy. The present study was approved by the institutional review board of our institution.

All statistical analyses were performed using the Statistical Package for the Social Sciences version 18.0 (SPSS Inc., Chicago, IL, USA). Variables were compared between the groups using the Pearson chi-square test and Fisher's exact test to examine associations between categorical variables, and the Mann–Whitney test was used for continuous variables.

Results

A total of 776 patients underwent modified radical mastectomy for early-stage breast cancer during the study period, including 178 patients who underwent immediate breast reconstruction. Of these, after excluding 61 patients who performed the breast reconstruction using tissue expander and 3 patients with loss of follow-up visits, 712 patients were enrolled in this study including 246 patients (34.6%) in stage I, 292 (41.0%) in stage IIa, and 174 (24.4%) in stage IIb. The mean follow-up duration was 53 months. The median age at the time of operation was 46 (range, 27–68) years, and the median body mass index was 23.4 kg/m^2. Regarding tumor size, 353 patients (49.6%) were T1 stage (tumor size $<$ 2 cm), 342 patients (48.0%) were T2 stage (2–5 cm), and 17 patients (2.4%) were T3 stage ($>$5 cm). In axillary lymph node staging, 448 patients (62.9%) had no metastatic lymph nodes (N0 stage) and 264 patients (37.1%) were N1 stage. The mean number of axillary lymph nodes excised during operation was 16.3. Adjuvant chemotherapy and adjuvant radiotherapy was administered in 589 patients (82.7%) and 113 patients (15.9%), respectively (Table 1). Among the 712 enrolled patients, 117 underwent immediate breast reconstruction using autologous tissue following modified radical mastectomy, including 86 pedicled extended latissimus dorsi myocutaneous (ELD) flaps, 14 pedicled transverse rectus abdominis (TRAM) flaps, and 17 free deep inferior epigastric artery perforator (DIEP) flaps.

There were no statistically significant differences in patient demographic data, tumor staging, and adjuvant treatment, except body mass index at operation. The reconstruction group had

Table 1
Data of patient demographics and cancer staging.[a]

Variable	No reconstruction $N = 595$ (83.6%)	Immediate reconstruction $N = 117$ (16.4%)	p-value
Age at operation	46	45	0.133
Body mass index at operation	23.3	21.9	<0.01
T stage			0.127
1	285 (47.9%)	68 (58.1%)	
2	295 (49.6%)	47 (40.2%)	
3	15 (2.5%)	2 (1.7%)	
N stage			0.122
0	367 (61.7%)	81 (69.2%)	
1	228 (38.3%)	36 (30.8%)	
Removed lymph node	16	15	0.415
Adjuvant Chemotherapy			0.069
Yes	499 (83.9%)	90 (76.9%)	
No	96 (16.1%)	27 (23.1%)	
Adjuvant radiotherapy			0.501
Yes	92 (15.5%)	21 (17.9%)	
No	503 (84.5%)	96 (82.1%)	
Post-mastectomy lymphedema	110 (18.5%)	11 (9.4%)	0.017
Campisi Staging of lymphedema			0.556
Stage 1	76 (69.1%)	6 (54.5%)	
Stage 2	33 (30.0%)	5 (45.5%)	
Stage 3	1 (0.9%)	0 (0.0%)	
Volume difference[b]	9.2%	12.4%	0.140

[a] Values are median for continuous variables and number (percentage) for categorical variables. The p-value for continuous variables was obtained by using Mann–Whitney test and p-value for categorical variables was obtained by using chi-square tests.

[b] The value of volume difference was obtained by comparing the volume of affected arm with that of contralateral arm which was normal.