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Review

# Oncologic outcomes of volume replacement technique after partial mastectomy for breast cancer: A single center analysis

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ABSTRACT

*Background and objectives:* Volume replacement technique is a good option for Asian women with small to moderate-sized breasts undergoing partial mastectomy for breast cancer. We analyzed the oncologic outcomes of this procedure in a single center.
*Methods:* Seventy-two patients with breast cancer underwent partial mastectomy with volume replacement technique in this prospective study. Volume replacement techniques were tailored individually according to the volume of excised breast and tumor location. The mean duration of follow-up was 40.9 months. We analyzed association between various clinicopathologic factors and locoregional recurrence, distant metastasis and assessed cosmetic outcomes.
*Results:* The incidences of locoregional recurrence and distant metastasis were 2.8% and 5.6%, respectively. According to multivariate analysis, history of contralateral breast cancer ($P < 0.001$) and fat necrosis ($P = 0.002$) significantly associated with incidence of locoregional recurrence and pathologic tumor size ($P = 0.037$) and stage ($P = 0.048$) significantly influenced the incidence of distant metastasis.
*Conclusion:* From an oncologic perspective, volume replacement procedures after partial mastectomy are an appropriate form of surgical management of breast cancer.



**Contents**



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**Synopsis for table of contents**

Previous studies have shown that volume replacement technique after partial mastectomy in patients with small to moderate-sized breasts who have breast cancer is effective and has good cosmetic outcomes. The authors analyzed the oncologic results of volume replacement technique after partial mastectomy and evaluated associations between various clinicopathologic factors and locoregional recurrence and distant metastasis. According to multivariate analysis, history of contralateral breast cancer ($P < 0.001$) and fat necrosis ($P = 0.002$) significantly influenced the incidence of locoregional recurrence and pathologic tumor size ($P = 0.037$) and stage ($P = 0.048$) significantly influenced the incidence of distant metastasis.

## Introduction

The term “oncoplastic breast surgery” includes all plastic and reconstructive surgery performed after wide resection of breast cancer. The aims of breast reconstruction after partial mastectomy are to safely provide a good cosmetic outcomes and increasing breast-conserving cases which would require a mastectomy [1,2].

Oncoplastic techniques can be categorized as volume displacement or volume replacement techniques [3–5]. Volume displacement techniques use breast tissue and parenchyma to reshape the breast, whereas volume replacement techniques are external autologous tissue flaps [1]. With volume replacement technique, post-irradiation breast deformity can be minimized and the flaps can be individually customized. Various adjacent tissue flaps can be used, including lateral thoracodorsal (LTD) flap; intercostal artery perforator (ICAP) flap; thoracodorsal artery perforator (TDAP) flap; thoraco-epigastric (TE) flap; and distant tissue flap: deep inferior epigastric perforators (DIEP) flap; latissimus dorsi (LD) myocutaneous flap; transversus rectus abdominis myocutaneous (TRAM) flap [6–8].

Numerous oncoplastic methods had been introduced and developed with good cosmetic results. However, most studies have reported the oncologic outcomes of only specific flaps and this would be insufficient to represent the oncologic result of volume replacement techniques [9–11]. The authors here report the oncologic outcomes of various volume replacement techniques and analyzed affected factors to locoregional recurrence or distant metastasis.

## Materials and methods

In this prospective study, from 2007 to 2012 oncoplastic volume replacement surgical procedures were performed in Kyungpook National University Medical Center and 72 eligible patients with breast cancer and their oncologic outcomes analyzed.

The treatment strategy for each patient with breast cancer was decided in multidisciplinary team discussions, the team being composed of a breast and plastic surgeon, oncologist, radiologist, pathologist, radiation oncologist, and rehabilitation physician. Because partial mastectomies would have been insufficient for them, neoadjuvant chemotherapy was recommended in six patients who had >3 cm diameter breast tumors. However, only four of them underwent neoadjuvant chemotherapy. Immediate volume replacement oncoplastic surgery was performed after partial mastectomy (Fig. 1).

In all cases, the breast tumors were removed with more than 5 mm of safe margin and the surgical margins evaluated pathologically for the presence of tumor cells and no inked tumor cell was defined as a negative resection margin. We performed frozen biopsy to evaluate the resection margin status. And either sentinel node biopsy or axillary lymph node dissection was performed according to axillary lymph node status. Volume replacement techniques were individualized according to the excised breast volume and tumor location [2]. These techniques included use of LTD, ICAP, TDAP, TE, LD, extended LD and inferior chest wall flaps.

After surgery, the adjuvant radiotherapy, chemotherapy or hormone treatment was added postoperatively if considered necessary. The adjuvant radiotherapy was delivered to the ipsilateral breast with radiation dose of 50.4 Gy in 28 fractions, and then dose of 10 Gy in 5 fractions was added to the tumor bed. When the closest resection margin is less than 0.1 cm, the patient was received additional radiation with 14 Gy in 7 fractions.

The associations of various clinicopathologic factors with locoregional recurrence and distant metastasis were analyzed. The clinical variables assessed included age, body mass index, history of contralateral breast cancer (metachronous bilateral breast cancer), neoadjuvant or adjuvant treatment, type of flap used in breast reconstruction, operative time, duration of hospital stay, and postoperative complications. The disease characteristics assessed included tumor location and type, size and pathologic stage, amount of breast tissue removed, and hormone receptor status.

All patients were followed up after completing adjuvant treatments biannually for the first 2 years and annually for a further 3 years. Locoregional recurrence or distant metastasis was evaluated with blood tests, tumor markers, mammography, breast ultrasonography, chest X-rays, bone scans and positron emission tomography/computed tomography.

### *Statistical analysis*

All statistical analysis was carried out using SPSS ver. 12.0 (SPSS, Chicago, IL, USA). Categorical variables were analyzed using the $X^2$ test in univariate analysis and oncologic outcomes were assessed by multivariate analysis using logistic regression to identify factors affecting locoregional recurrence or distant metastasis of breast cancer. *P*-values < 0.05 were considered statistically significant.

## Results

The mean duration of follow-up was 40.9 months (SD, ± 18.68 months) and mean disease-free interval 3 9.7 months (SD, ±18.36 months). During follow-up, two patients (2.8%) developed locoregional recurrence and four (5.6%) distant metastases. Distant metastases were detected in bone (n = 3) and lung (n = 2); one patient had both bone and lung metastases (Table 1). However, no patients died during follow-up.

The mean age of the patients was 46.9 years (SD, ±7.11 years) and mean body mass index 23.3 kg/m$^2$ (SD, ±3.03 kg/m$^2$). Neoadjuvant chemotherapy and adjuvant chemotherapy were administered to four (5.6%) and 49 patients (68.1%), respectively. In addition, 68 patients (94.4%) underwent postoperative adjuvant irradiation. Four patients refused adjuvant radiotherapy and three patients had severe uncontrolled diabetes. However, there was no case that should be delayed because of these complications.

The mean operative time was 414.9 min (SD, ±108.9 min) and mean hospital stay 11.2 days (SD, ±3.43 days). During follow-up, breast mammography and ultrasonography showed fat necrosis in nine cases (12.5%); all resolved with conservative management. And other clinical characteristics of patients with breast cancer