

**Aim of the study:** Despite the increase in studies concerning oncoplastic reduction mammoplasty (ORM), data showing long-term aesthetic and patient satisfaction for ORM in patients with macromastia remain limited. Therefore, this study evaluated the long-term results of tumorectomy and concomitant bilateral ORM for early-stage breast cancer patients with macromastia in terms of cosmesis, patient satisfaction, and functional outcomes.

**Material and methods:** Retrospective data of patients with macromastia undergoing ORM for breast cancer between 1996 and 2011 were examined and evaluated regarding the aesthetic results, patient satisfaction, and functional outcomes.

**Results:** The median age of the 82 patients was 50 years. The median follow-up was 120 months (range: 28–212 months). The median breast volume was 1402 cm<sup>3</sup>, and the median weight of the excised breast material was 679 g. A good or excellent evaluation of the cosmetic outcome was as follows: self-evaluation: 84.1% at the early-stage, 80.3% at the later stage; panel evaluation: 75.4% at the late-stage. Median patient satisfaction rates were 9.1% for early-stage disease and 8.8% for late-stage disease. Reduced mobility and intertrigo improved by three-fold during the post-operative period.

**Conclusions:** ORM for early-stage breast cancer in women with macromastia results in good cosmesis in both the early-stage and long-term, and is quite acceptable for use in patients. Patients reacted favorably to the prospect of having their breast cancer and macromastia treated in a single session, and positive results continued over the long-term.

**Key words:** breast cancer, macromastia, oncoplastic reduction mammoplasty, cosmesis, satisfaction.

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# Oncoplastic reduction mammoplasty for breast cancer in women with macromastia: long term aesthetic, functional and satisfaction outcomes

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## Introduction

Breast-conserving surgery (BCS), the standard treatment for early-stage breast cancer, generates certain cosmetic and functional problems. These include a large breast size and problems associated with radiotherapy (RT), cosmesis, and patient satisfaction. The frequency of macromastia in breast cancer patients undergoing BCS is reported to be 40% [1]. In Losken's meta-analysis, the satisfaction rate of post-BCS is reported to be 83% [2]. Some problems have been reported with RT dose homogeneity in post-BCS patients with large breasts [3], and aesthetic concerns in post-BCS patients have reached 30% [4]. Indeed, post-operative RT problems, aesthetic concerns, and overall patient satisfaction rate are considered relative contraindications for the choice of BCS in breast cancer cases with macromastia.

Bilateral oncoplastic reduction mammoplasty (ORM) combines the techniques of tumorectomy and bilateral breast reduction. With this method, the tumor can be excised with wider margins, and the effectiveness of RT on a reduced breast is increased [5]. The aesthetic concerns that occur with BCS are reduced to 7% with the ORM procedure [6]. In addition, with ORM, a significant amount of breast parenchyma is removed from both the ipsilateral and contralateral breasts. It is believed that in ancient times, Amazon women had their right breasts removed to facilitate their social functions [7]. Currently, because screening programs and adjuvant therapies indicate that breast cancer patients have a longer life expectancy, breast aesthetics and quality of life have become more critical. Macromastia can cause dysfunctional problems such as back, neck, and shoulder pain, recurrent intertrigo, and a decline in physical activity, all of which diminish the quality of life [8]. Bilateral reduction mammoplasty improves the quality of life [9]. It has been shown that concomitant ORM leads to greater patient satisfaction and a better quality of life than when it is performed in later stages [10]. Recently, despite the increase in ORM studies, we have been unable to find data showing long-term aesthetic, functional, and patient satisfaction for ORM in patients with macromastia, although this is by far the more common procedure. Therefore, the primary endpoint of this study was to evaluate the aesthetic results and satisfaction rates for a 10-year period in patients with early-stage breast cancer and macromastia. The secondary endpoint was to assess the functional outcomes in that group.

## Material and methods

A retrospective review of the medical records of consecutive patients with breast cancer and macromastia undergoing concomitant ORM between January 1996 and May 2011 at Tepecik Training and Research Gen-

eral Hospital was performed. Both the files and data recorded on the hospital's Probel system were examined. According to the 2010 AJCC-UICC (American Joint Cancer Committee- Union Internationale Centre-le-Cancer) breast cancer staging system, stages I and II were included in the present study. Patients with *in situ*, stage III breast cancer or a breast volume < 1000 cm<sup>3</sup> were not included. Eighty patients who underwent ORM withdrew from observation and were removed from the study. All of the cases were first discussed and planned in multidisciplinary weekly meetings. After the risks and benefits of the technique had been discussed at length with the patient group, the procedure was performed on those providing authorization. Informed written consent was obtained for both the surgical procedure and for inclusion in the current study.

Macromastia was defined as a breast volume > 1000 cm<sup>3</sup>. Eighty-two consecutive patients were admitted to the study. The cases were examined for demographics, macromastia, operative and oncologic outcomes, complication factors, adjuvant therapy, cosmetic outcomes, and patient satisfaction. The oncological outcomes of this study are the subject of another study.

#### Patient evaluation and operative techniques

Based on the unit protocol, routine pre-operative oncological screening was performed in all of the patients diagnosed with breast cancer. The breast volume of all of the patients was measured using a Grousman-Roudner Device (GRD) [11]. Breast asymmetry was accepted as a disparity in breast volume greater than 10%. During the pre-operative evaluation, we determined the tumor quadrant to be excised, choice of nipple areola complex (NAC) flap, access to the axilla, choice of skin incision, and estimated volume of the breast tissue to be removed. Similar decisions were made for the contralateral breast. Tumors were to be excised by oncological principals macroscopically using a minimum margin of 1.5 cm. Intraoperative margin control was achieved using frozen sections and specimen mammography, and any re-excision was performed immediately. The only skin removed, comprised biopsy incision scars and the skin covering tumors close to the surface. Nipple resection was performed in tumors closer than 2 cm to the nipple. Similar procedures were simultaneously performed on the contralateral breast for symmetry. The ipsilateral breast was left 10% larger to allow for shrinkage during RT. At least two members of the five-strong surgical team were present at each operation. For axillary surgery before ORM, intraoperative sentinel lymph node biopsy was applied in fifty cases.

In most cases, the Wise pattern incision [12] was chosen for its ease of axillary access, flap alternatives, and ease of breast reconstruction. We preferred the vertical incision in cases of macromastia < 1300 cm<sup>3</sup> to minimize the incision. Our choice of NAC-carrying pedicle was based on forming a pedicle in the breast section furthest from the tumor. A free nipple graft was used in cases where the NAC distance was greater than 35 cm. In cases of nipple involvement, we performed central resection, followed by a Grisotti flap procedure. Next, axillary surgery was per-

formed. Complications were considered to be either early (< 2 months) or late (> 2 months).

Standard RT was applied 3 weeks post-operatively with 50 Gy to the whole breast and a boost to the tumor bed of 10 Gy. Thirty two patients had radiotherapy by using cobalt and others by linear accelerator. Twenty-four cases were administered chemotherapy (CT). CT and hormone therapy (HT) were applied in 25 cases, and HT alone was used in 35 cases. In addition, 16 c-erb-B2 cases were treated with trastuzumab.

In the post-operative period, patients were seen by surgeons and/or medical oncologists for physical and radiological follow-up. All of the patient data were recorded.

#### Cosmetic outcomes and patient satisfaction

Esthetic and satisfaction assessment were done in survivals and who accepted to take photographs and who only underwent to oncoplastic reduction. For the purposes of this study, self-evaluation by patients of cosmetic outcomes and satisfaction were considered early-stage at < 6 months post-operatively and late-stage at > 2 years post-operatively. The cosmetic outcome was rated on a scale of 1–4 (4 – excellent, 3 – good, 2 – moderate, 1 – poor). Early-stage aesthetic evaluation was completed by a member of the surgical team and by the patient herself. Late-stage evaluation was carried out by the patient, and by a panel comprising two team surgeons, one plastic surgeon, one surgery nurse, and a non-medical layperson. Anonymized photographs taken from the front, right, and left at 45-degree angles were used in the panel evaluations. The shape and size of the breast, state of the skin and scar, symmetry, and NAC location were all scored on a scale of 1–4. These points were computed to form the panel aesthetic score (20–16 – excellent; 15–11 – good; 10–6 – moderate; 5–1 – poor). The Likert scale (1–10) was used for patient self-evaluation of early-stage and late-stage aesthetic and functional outcomes, as well as overall satisfaction.

#### Macromastia

Functional result assessment of macromastia was done for survivals and who accepted to measure the volume of the breast. For this purpose the measurement of breast volumes and symptoms related to macromastia were obtained during the pre-operative period and patients' last control.

#### Statistics

Data were analyzed using SPSS version 15 (SPSS Inc., Chicago, IL, USA). Chi-squared analysis was performed for the comparison of the cosmetic results and symptoms of patients with macromastia (pre-operative and last evaluation). Evaluation of early and late satisfaction, as well as cosmetic evaluation, was accomplished using repeated-measures tests. The effect sizes were calculated for each evaluated group. Effect sizes up to 0.2 were considered small; effect sizes of approximately 0.5 were considered moderate; effect sizes of approximately 0.8 were considered large. The patient and treatment groups were compared using the log-rank test. Multivariate analyses

**Table 1.** Evaluation of the cosmesis and satisfaction

Evaluation	Early, n (%)	Late, n (%)	P-value/ effect size
Number of patients	82	61	–
Cosmetic evaluation by the surgeon			
Excellent	26 (31.7)	–	–
Good	38 (46.3)	–	–
Moderate	14 (17.1)	–	–
Poor	4 (4.9)	–	–
Cosmetic evaluation by the patient			
Excellent (4)	26 (31.7)	18 (29.5)	–
Good (3)	43 (52.4)	31 (50.8)	–
Moderate (2)	12 (14.6)	8 (13.1)	–
Poor (1)	1 (1.2)	4 (6.6)	–
Patient score (mean ± SD)	3.15 ± 0.67	3.0 ± 0.80	0.08/0.88
Cosmetic evaluation by the panel			
Excellent	–	15 (24.6)	–
Good	–	31 (50.8)	–
Moderate	–	12 (19.7)	–
Poor	–	3 (4.9)	–
Patients' satisfaction			
9–10	65 (79.3)	46 (75.4)	–
7–8	13 (15.9)	7 (11.5)	–
5–6	3 (3.7)	6 (9.8)	–
3–4	1 (1.2)	2 (3.3)	–
1–2	0	0	–
Satisfaction score (mean ± SD)	9.1 ± 1.37	8.8 ± 1.59	0.03/0.11

were performed using Cox proportional hazard models to test the differences between groups. In the analyses, *p*-values less than 0.05 indicated statistical significance.

## Results

### Patient data

The median follow-up was 121 months (range: 28–212 months). The median age was 49 years (range: 31–70). The median body mass index (BMI) was 28.9 (range: 22–43). At the time of diagnosis, 65 patients (79.3%) were post-menopausal. The median length of post-operative hospital stay was 3.4 days (range: 2–13 days), and the tumor was on the right side in 42 patients (53.6%).

### Operative findings

The mean length of operation was 124 ± 25 min (range: 80–190 min). Quadrantectomy followed by oncoplastic reduction was performed in the first 27 cases. In the subsequent 55 cases, the tumor area was excised en bloc. For the skin incision, the Wise pattern was implemented in 60 cases, and a vertical incision was implemented in 22 cases. Most of the tumors were located in the upper outer quadrant (*n* = 25). For reconstruction, 48 inferior, 17 superior medial, 7 superior, 4 free nipple, 4 superior lat-

eral, and 3 Grisotti flaps were employed. Similar techniques were used concomitantly for the contralateral breast.

### Histopathological evaluation and oncology

The median tumor size was 26 mm (range: 4–47 mm). The number of patients in stages 1 and 2 were 36 and 46, respectively. Patients with ductal and lobular carcinoma were 75 and 7, respectively. The number of patients who were receptor-positive was 56. In 16 patients, Her2 b was positive. Positive margins were found in three cases (3.7%) and a close margin was found in one case. Re-excision was performed for these cases. During the follow-up, local excision was performed in three cases of breast recurrence and one case of axillar recurrence. One patient underwent a mastectomy and transverse rectus abdominis myocutaneous (TRAM) reconstruction due to tumor recurrence in the breast.

### Complications

Ten (12.2%) cases showed early complications: suture-line dehiscence (*n* = 4), seroma (*n* = 3), wound site infection (*n* = 2) and areola necrosis (*n* = 1). Adjuvant treatment was postponed by 10–20 days (after 3 weeks post-operatively) in the four (4.9%) cases of incision opening and areola necrosis. Late complications were observed in 12 (14.6%) cases: skin problems (color, scarring), fat necrosis and fibrosis (re-excision was performed), impaired breast shape (dog ear correction), breast hypertrophy (treated with re-reduction), and chronic mastalgia.

### Cosmesis and patient satisfaction

The final cosmetic and patient satisfaction evaluation was based on 61 patients, because 14 patients died, 6 patients refused to be photographed, and 1 patient underwent the TRAM flap procedure. Table 1 shows the details. There was a decrease in self-evaluation scores for cosmetic outcomes (*p* = 0.08; effect size: 0.11), and a smaller decrease in patient satisfaction with the ORM procedure (*p* = 0.03; effect size: 0.11) over the long-term.

### Macromastia

The median weight of breast tissue removed was 678 g (range: 330–1300 g), with 671 g (range: 350–1180 g) from the right tissue and 685 g (range: 330–1300 g) from the left tissue. Because 4 patients died and 3 patients refused breast volume measurement, the final breast volume evaluation was based on a total of 65 patients. Table 2 summarizes the data for macromastia and its symptoms. Reduced mobility and intertrigo improved by three-fold during the post-operative period.

### Discussion

The main finding of this original study is that the choice of concomitant ORM BCS led to improved aesthetic and functional outcomes for women with early-stage breast cancer and macromastia according to the long-term results. This procedure was viewed favorably by a large proportion of the patient cohort.

## Aesthetics and satisfaction

Cosmetically favorable results have been achieved with this combination of breast procedures. Cordosa *et al.* [13] suggested that cosmetic evaluation after BCS should be performed before RT, and then in the 1<sup>st</sup>, 5<sup>th</sup>, and 10<sup>th</sup> years post-operatively. The inclusion of subjective evaluations, such as patient self-evaluation and panel evaluation, is also recommended. In breast cancer patients with macromastia treated with ORM, a cosmetic evaluation of good or excellent, using invalidated methods, was between 57% and 93% (Table 3). In a systematic review, which was recommended to be performed after at least 2 years post-operatively, the rate of OMC was 84–89% [19]. The median rate reported in Losken's meta-analysis for women undergoing BCS was 80% [2]. Hernanz [20] reported that ORM significantly improved the quality of life in cancer patients with macromastia. Grey [21] mentioned that RT causes greater retraction in heavy women with large-sized breasts, and that there is a drop in the 5-year aesthetic results. In our study, in both early-stage and late-stage patient cosmesis evaluations, good or excellent results were achieved in almost four-fifths of the cases. Similar to the results reported in the literature, the results of the present study decreased over time. The most important factor in cosmesis is breast symmetry. Despite pre-operative asymmetry and post-operative RT, our study established that late-stage disease was associated with improved symmetry using the objective criteria of breast volume measurement. In addition, during intraoperative breast volume calibration, leaving approximately 10% more tissue on the side that would receive RT helped to reduce asymmetry. One benefit of using ORM with these patients is that such adjustments can easily be made.

Our study showed that, in this group of patients undergoing ORM, a very high patient satisfaction rate was achieved in both the short-term and long-term. Invalidated methods were mostly used for measuring patient satisfaction. Newman and Munhoz [14, 16] published satisfaction rates of 93% and 86% for very satisfied and satisfied patients, respectively. However, these studies did not include data for long-term satisfaction. Patient satisfaction may be affected by post-operative complications, breast asymmetry, and the passing of time. We believe that, despite the long follow-up time and complications, our good satisfaction rates are due to the improvement in macromastia symptoms and breast symmetry. It is likely that this patient satisfaction level was not based entirely on cosmetic results, but rather, reflects general satisfac-

**Table 2.** Characteristics of the patients with macromastia

Characteristics	Pre-operative	Final evaluation	P-value
Number of the patients (n)	82	65	
Median BMI	28.9 (22–36)	32.1 (24–41)	–
Median Breast volume (cm <sup>3</sup> )			
Right breast	1380 (100–1900)	890 (650–960)	–
Left breast	1420 (1050–200)	875 (67–940)	–
Median distance of NAC (cm)			
Right	28.2 (25–36)	26.2 (23–30)	–
Left	28.9 (24–36)	26.1 (24–29)	–
Asymmetry (%)	14 (17.1)	6 (9.2)	0.04
Symptoms (%)			
Backache	68 (83)	26 (40)	0.02
Shoulder pain	64 (78)	26 (40)	0.03
Neck pain	55 (67)	20 (31)	0.03
Limitation of movement	51 (62)	12 (19)	0.04
Mastalgia	38 (46)	20 (31)	0.02
Intertrigo	31 (38)	8 (12)	0.01

BMI – body mass index; NAC – nipple areola complex

tion with the whole procedure. The high level of patient satisfaction was preserved over a long period of time. The cause may be that patients were grateful to be freed from the difficulties associated with macromastia.

## Macromastia

In our study, we observed that ORM significantly decreased macromastia problems. For women with macromastia, quality of life and functional problems are as important as cosmetic anxiety. Chadbourne [8] noted that macromastia problems were resolved by reduction mammoplasty in more than half of the cases. The effective role of breast reduction in resolving macromastia symptoms, particularly those related to pain, is well documented [22]. In our study, we noted improvement in more than half of the macromastia symptoms in two-thirds of our cases; in particular, reduced mobility and intertrigo improved. In breast cancer patients with macromastia, two important problems can be addressed in one session with a synergistic effect. This is the most attractive aspect of the procedure, because ORM surgery allows for the ease of wide

**Table 3.** The studies on ORM in patients with macromastia

	n	Follow up (month)	Stage T/mm	Specimen, g	Complication (%)	Cosmesis (%)
Newman <i>et al.</i> [14]	28	24	15	766	35.7	86
Chang <i>et al.</i> [15]	37	–	I, II	653	16.2	70
Munhoz <i>et al.</i> [16]	74	22	–	610	32.4	93
Kronowitz <i>et al.</i> [17]	41	36	–	626	34.1	57
Currie <i>et al.</i> [18]	20	34	I, II	370	25	0
This study	82	120	I, II	679	26.6	84

excision of the tumor, while providing a solution to the patient's chronic problem. Furthermore, concomitant reconstructive surgery is reportedly 62% cheaper than two stand-alone surgeries [23].

### Limitations

This study had some limitations. We may have influenced our patients in favor of ORM, and the aesthetic evaluations were done with invalidated methods. The effect of adjuvant treatment methods changed by the time on the aesthetic results was snoozed at in present study.

In conclusion, oncoplastic reduction mammoplasty for early-stage breast cancer in women with macromastia produces good cosmesis in both the short-term and long-term that are quite acceptable to the patients. The patients reacted favorably to the prospect of having their breast cancer and macromastia treated in a single session, and the positive results continued over the long-term. This technique widely diminishes the macromastia symptoms. We recommend further prospective, randomized trials for long-term and validated aesthetic results of ORM.

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*The authors declare no conflict of interest.*

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