Therapeutic reduction mammoplasty techniques in management of breast cancer in large-breasted females – a comparative study between inferior and superior pedicle reduction mammoplasty

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Background
Oncoplastic surgery for breast cancer in patients with macromastia is a new concept that has evolved to associate breast conserving surgery with techniques of breast reshaping. This study aims to compare the outcomes of therapeutic reduction mammoplasty in medium-sized to large-breasted females with breast cancer using superior pedicle versus the inferior pedicle mammoplasty for early stages of breast cancer.

Patients and methods
From January 2013 to January 2017, 50 females patients with medium-sized to large-sized breasts diagnosed with early breast cancer and suitable for breast conservation underwent reduction mammoplasty depending on either inferior pedicle (group 1) or superior pedicle (group 2). Patients with central breast cancer and inability to obtain free resection margin after excision were excluded from the study. Surgical outcomes, oncologic safety, and cosmetic result were assessed and compared between both techniques.

Results
There was no significant difference between the two groups regarding age and weight of the patients (median: 42 vs 40 years) ($P>0.05$). Most cases had a mass in the upper outer quadrant of the breast (60%). On follow-up, wound dehiscence occurred more frequent in the inferior pedicle group, which occurred in four (16%) cases, than in the superior pedicle group, which occurred in two (8%) cases. The cosmetic outcomes were assessed in inferior pedicle versus superior pedicle mammoplasty groups, showing excellent results in 15 (60%) cases versus 16 (64%) patients, respectively. In a median follow-up of 24 months, no cases showed local recurrence.

Conclusion
Therapeutic reduction mammoplasty using inferior and superior pedicles was shown to be oncologically safer than traditional conservative surgery with more satisfactory esthetic outcome. Moreover, the superior pedicle mammoplasty yields a lower morbidity with better cosmetic outcome than inferior pedicle mammoplasty in large-breasted women with breast cancer.

Keywords:
breast cancer, conservation surgery, oncoplastic techniques, reduction mammoplasty

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Introduction

The surgical treatment of cancer in large ptotic breast has many difficulties for surgeons performing traditional breast conservative surgery and for the radiation oncologist owing to the heterogeneous distribution of the radiation dose [1].

The challenge is to perform a resection wide enough to provide the most favorable oncologic control but not to remove so much breast tissue as to leave a deformed breast. Oncoplastic surgery consists of a new concept that associates conservative breast surgery with the techniques of breast reshaping. It provides a proper opportunity to improve the final cosmetic results and to expand the indications for conservative treatment without decreasing oncological safety [2].

Additionally, in some circumstances, oncoplastic techniques allow a more radical tumor excision, which potentially reduces margin involvement. The capacity to remove a wider margin may be important in certain groups of patients such as those with ductal carcinoma in situ and larger tumors that would usually be treated by a more radical surgery [3]. This adds to the oncologic safety of breast conserving treatment (BCT), because a larger volume of breast tissue can be excised as a wider negative margin can be achieved. It is especially indicated for large tumors when standard

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BCT has a high probability of leaving positive margins [4].

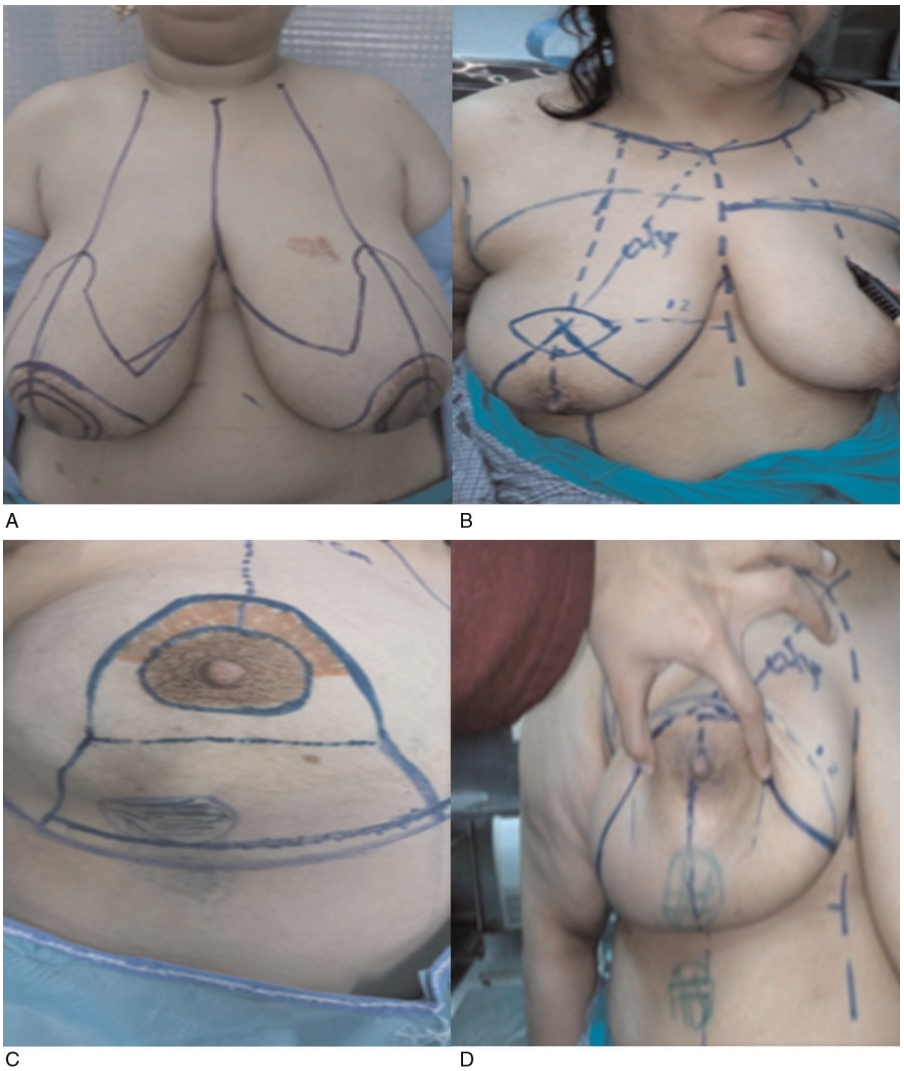
Surgeons should not only understand the distribution of cancer within the breast at planning for an optimum surgical resection but also should know the degree to which imaging can accurately predict the exact histological extent and orientation of disease. There are multiple oncoplastic techniques that can be used for the treatment of each tumor-specific site in relation to the size of the breast [5]. The most commonly used techniques in large-breasted women especially in the upper outer quadrant of the breast are inferior and superior pedicle reduction mammoplasty [6,7].

This study aims to compare the cosmetic outcome and oncologic safety in terms of conversion to mastectomy rate or necessity for repeated excision after therapeutic reduction mammoplasty in large-breasted women with breast cancer using superior pedicle with the inferior pedicle mammoplasty within 3 months after the completion of the radiotherapy course. We also aim to assess the local recurrence within this short-term follow-up.

Patients and methods

Between January 2013 and January 2017, 50 females patients with medium-sized to large-sized breasts with early breast cancer admitted to Ain Shams University Hospitals and suitable for breast conservation participated in this comparative study. Ethical Committee approval was given for the study and written informed consent was obtained from all participants. Patients were divided into two equal groups: group 1 (inferior pedicle group; 25 patients) and group 2 (superior pedicle group; 25 patients). The

Figure 1



(A) marking of the inferior pedicle. (B) Marking of the superior pedicle while the patient in upright position. (C, D) Marked site of the tumor in the lower central pole of the breast.

choice of the procedure depends on the location of the tumor. The inferior pedicle procedure was suitable for lesions in the upper pole of the breast, whereas the superior pedicle procedure was suitable for lesions in the lower pole of the breast. It should be noted that both techniques are suitable for lesions in the upper outer quadrant of the breast, which is considered the most common site of breast cancer.

Exclusion criteria were central breast lesions, multicentric carcinoma, and patient's choice of involvement in the study. Inability to obtain tumor-free safety margins after repeated excision, the patient was excluded from the study and the technique was converted to mastectomy. All included patients provided written informed consent for the therapeutic procedures, and only two of them accepted to perform the same contralateral reduction technique in the same session, one from each group.

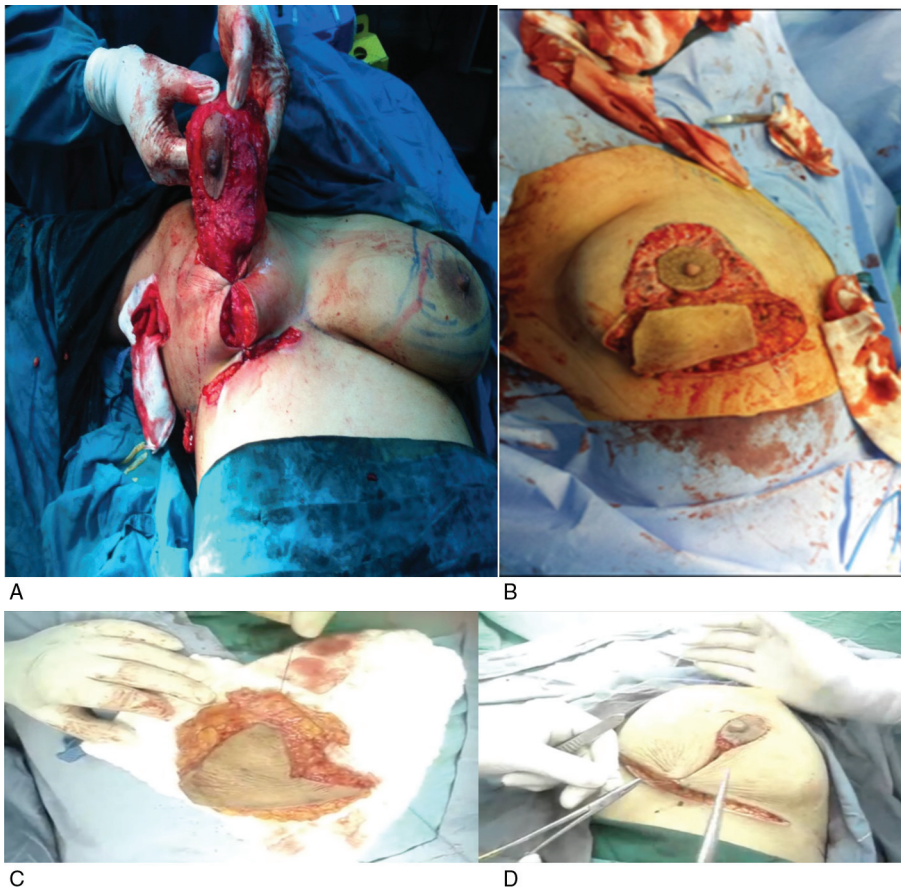
Surgical technique

Preoperative marking was performed according to the standard inverted T Wise pattern. The neo-nipple is marked in the breast meridian ~19–23 cm from the sternal notch. The tumor defect location is anticipated, and an inferior or superior pedicle is drawn out (~8–10 cm wide). The location of the pedicle can be adjusted to maximize width and blood flow depending on the tumor location and degree of breast ptosis. A similar pattern is drawn on the contralateral breast for symmetry, whenever indicated (Figs 1 and 2).

De-epithelialization of skin in the designed flap was done (Fig. 3). After tumor excision with a good safety margin (4–12 cm) (Figs 4–6), the specimen was marked with clips, weighed, and examined by frozen section to evaluate the safety margins. In our study, we started first with the diseased breast, and after assessment of adequate tumor-free safety margins, the same procedure in the contralateral breast was done to assure symmetry, whenever indicated.

During the hospital stay, patients were assessed for the onset of wound infection, dehiscence, nipple and areola necrosis, and hematoma formation.

Figure 2



(A) De-epithelialization of the inferior pedicle. (B) De-epithelialization of the superior pedicle and excision of the tumor with a good safety margin. (C) Specimen excised and margins are marked for frozen section examination. (D) Reshaping of the breast parenchyma and closure of the incisions.

Figure 3

Post-operative view after bilateral inferior pedicle reduction with excellent cosmetic outcome after 3 months.

Figure 4

Postoperative view after bilateral superior pedicle reduction with excellent cosmetic outcome after 3 months.

For 1 month postoperatively, the outpatient visits were done on a weekly basis, where assessment was made for presence of complications including wound infections and persistent seroma in the breast and axilla, and then the patients were followed up monthly till the next 3 months after completion of the radiotherapy course. All patients received radiotherapy and adjuvant chemotherapy according to stage and type of the tumor.

The cosmetic evaluation was performed 3 months after the completion of radiotherapy course and classified according to both surgeon and patient judgment as excellent, good, fair, and poor.

Figure 5

Postoperative result 1 week after superior pedicle reduction without contralateral symmetry.

Figure 6

Postoperative result 1 week after inferior pedicle reduction without contralateral symmetry.

The patients were followed up for 1 year every 3 months and every 6 months for the second year with at least 1 year of follow-up (12 months).

Statistical analysis was done by SPSS version 17 (SPSS Inc., IBM, Chicago, Illinois, USA). Mann–Whitney test was used for age and weight. The median and the range were used as descriptive analysis for the age and weight, whereas the percentage was used for the incidence of complications and assessment of cosmetic outcome.

Results

The age of the patients ranged from 34 to 60 (median: 41) years. There was no significant difference between the two groups regarding age and weight ($P>0.05$). The age of the patients in group 1 ranged from 36 to 60 years with a median of 42 years, whereas in group 2, the range was from 34 to 56 years, with a median of 40 years. The size of the tumor ranged from 1 to 5 cm. Most patients (60%) had breast cancer located in the upper outer quadrant of the breast. Most of the patients (43

patients) were diagnosed as having infiltrating ductal carcinoma. The weight of patients in the inferior pedicle group ranged between 60 and 90 kg, with a median of 80.90 kg, whereas in the superior pedicle group, weight of the patients ranged between 58 and 85 kg, with a median of 80.28 kg. (P=0.841). Patient and tumor characteristics are listed in Table 1.

Regarding inferior pedicle group, the size of the tumor ranged from 1 to 4 cm. Most patients were diagnosed as having infiltrating ductal carcinoma (22 patients, 88%). The weight of tissues removed ranged from 400 to 830 g. The tumor safety margins ranged from 2 to 7 cm. One patient had infiltrated margin at frozen section after an attempt of re-excision and mastectomy was made (conversion rate of 4%).

Table 1 Patient and tumor characteristics

	Group 1 (inferior pedicle)	Group 2 (superior pedicle)	Total
Patients			
Age	36–60 years Median: 42	34–56 years Median: 40	34–60 years Median: 41 $P>0.05$
Weight	60–90 kg Median: 80.9	58–85 kg Median: 80.2 P=0.841	
Tumor pathology			
DCIS	1	1	
Invasive ductal carcinoma	22	23	
Invasive lobular carcinoma	1	1	
Mucinous carcinoma	1	0	
Tumor stage			
T stage			
T1	7	5	12
T2	20	18	38
N stage			
N0	10	6	16
N1	19	15	34
Tumor grading			
G1	10	9	19
G2	15	8	23
G3	4	4	8
Tumor location			
Upper outer quadrant	16	14	30
Lower outer quadrant	5	6	11
Upper inner quadrant	1	0	1
Lower inner quadrant	3	5	8

DCIS, ductal carcinoma *in situ*.

In the superior pedicle group, the size of the tumor ranged from 1 to 5 cm. Most of the patients were diagnosed as having infiltrating ductal carcinoma (23 patients, 92%). There was no need for conversion to mastectomy or repeated excision. The weight of tissue removed ranged from 600 to 1100 g. The tumor-free safety margins ranged from 3 to 10 cm.

It should be noted that only two patients accepted to perform simultaneous breast reduction in the contralateral breast, one patient from each group.

Wound dehiscence was the commonest postoperative complication after inferior pedicle mammoplasty. It occurred in four (16%) patients, which was minor and affecting less than half of the longitudinal scar in three patients, and was managed conservatively. One patient had secondary infection with dehiscence affecting more than half of the longitudinal scar and was managed by secondary suturing after infection control.

On the contrary, wound dehiscence was less common after superior pedicle mammoplasty (two patients representing 8%), with one patient requiring secondary suturing.

Moreover, partial areolar necrosis and fat necrosis were equal in the two groups. In each group, one patient developed partial necrosis of the areola (two patients, 8%); these were small areas and were managed by debridement and secondary suturing.

Another two patients developed a small firm area along the suture line 9 and 12 months postoperatively after inferior pedicle and superior pedicle mammoplasty, respectively, and were investigated by sonogram and tru-cut biopsy, revealing traumatic fat necrosis that was surgically excised. The overall complications are listed in Table 2.

Table 2 Overall complication rate

	Inferior pedicle group [n (%)]	Superior pedicle group [n (%)]
Minor skin necrosis	1 (4)	1 (4)
Wound dehiscence	4 (16)	2 (8)
Infection	2 (8)	2 (8)
Fat necrosis	1 (4)	1 (4)
Partial areola necrosis	1 (4)	1 (4)
Total areola necrosis	0	0
Seroma	4 (16)	2 (8)

Seroma was noticed more frequent in the inferior pedicle group (four cases, 16%) than superior pedicle group (two cases, 8%).

Three months after completion of the radiotherapy course, the cosmetic outcome was evaluated. In the inferior pedicle group, 15 (60%) patients showed excellent results, seven (28%) women showed good results, two (8%) patients had satisfactory result, and one (4%) patient showed poor result.

On the contrary, assessment of the cosmetic outcome using the superior pedicle showed the following: 16 (64%) women showed excellent, eight (30%) women patients showed good results, and one (6%) patient rated the outcome as fair. There were better outcomes in the superior pedicle group than the inferior pedicle group. Regarding the two patients who accepted to perform simultaneous contralateral reduction (one patient from each group), the cosmetic outcome was rated as excellent, and the patients were greatly happy with the result. In both groups, no local recurrence or systemic metastasis was noticed during the follow-up period, which ranged from 12 to 36 (median 24) months (Fig. 5).

Discussion

Although simple lumpectomy in patients with macromastia may lead to good cosmetic results, breast reduction of both sides improves symptoms such as back and shoulder pain and may thus improve the quality of life. Moreover, the homogeneity of radiation dose distribution may be altered in large breasts. Chronic radiation-induced pain, fibrosis, and a poor cosmetic result after radiotherapy are frequent problems. Thus, breast reduction may improve adjuvant radiotherapy effects [8].

Appropriate surgical treatment of early breast cancer in a large-breasted woman who is a candidate for breast conservation therapy requires good knowledge of the basic mammoplastic techniques to deal with the various technical modifications needed for each individual case. Local control could be a determinant of survival in a percentage of affected women, and large free margins of resection are recommended by the pioneers of BCT [9,10].

Mastectomy is associated with an unacceptable asymmetry. If a large-breasted patient was to undergo complete mastectomy and decides not to undergo a reconstruction procedure, the contralateral breast could cause intolerable asymmetry and discomfort owing to the huge breast volume and weight [11].

Oncoplastic surgery has proven to be an oncologically safe procedure, with rates of local recurrence, metastasis, and death comparable to breast conservation surgery [12].

In this study, reduction therapeutic mammoplasty was used for the management of early breast cancer in large-breasted women, and we consider it to be a more conservative and less radical procedure.

In our study, the median age of the patients was 41 years, which is close to the study of Denewer *et al*. [6], who reported the median age of the patients to be 43 years, and comparable to the study by Antony *et al*. [13], who reported a median age of 30 years.

In our study, ~60% of tumors were found in upper outer quadrant, which is comparable to the study of Losken *et al*. [14] and Lee [15], who reported that one-half of breast cancers affect the upper outer quadrant alone.

Moreover, also our result is similar to Roshdy *et al*. [16], who reported ~60% of the tumors were found in the upper outer quadrant of the breast.

Ideally, each patient case should have the specific reduction technique individualized to their needs, but more than half the surgeons reported using only the inferior pedicle and inverted T skin pattern, so this is not always possible [17].

In our study, we divided our patients into two equal groups : group 1 (inferior pedicle group; 25 patients) and group 2 (superior pedicle group; 25 patients). The choice of the procedure depends on the location of the tumor. The inferior pedicle procedure was suitable for lesions in the upper pole of the breast, whereas the superior pedicle procedure was suitable for lesions in the lower pole of the breast.

In our study, conversion to mastectomy was required in one (4%) case of our 50 patients with cancer treated with total radical mastectomy (TRM) owing to positive margin in frozen section inspite of repeated attempt to obtain free margin, which can be compared positively with other study, where Fitoussi *et al*. [18] in 2010 found a positive marginal rate was 18.9%, which led to mastectomy in 9.4% of the patients, with 540 patients in their oncoplastic surgery-related study [18].

In the study of Giacalone *et al*. [19] in 2006, positive surgical margin and re-excision rates are found to be lower in the oncoplastic surgery group, with 42

oncoplastic surgeries and 57 breast conserving surgery (BCS) applied patients.

In our series of inferior pedicle, one patient had infiltrated margin at frozen section after two attempts of excision and mastectomy was performed (conversion rate of 4%). In superior pedicle mammoplasty, there was no conversion to mastectomy owing to the easy attainment of tumor-free safety margins in all cases, because of wider excision being possible in large breasts.

McCulley and MacMillan [20] in 2005 reported a series of 50 patients with breast cancer treated with therapeutic mammoplasty, in which four (8%) patients required reoperation owing to surgical margin involvement. In these series, three different oncoplastic techniques were used.

Clough *et al*. [2] in 2003 found surgical margin involvements in 11 (10.9%) of their 101 patients with breast cancer whom were treated with oncoplastic surgery.

Regarding complications, in the literature, the complication rate for oncoplastic breast reduction ranges between 17 and 24%. Common complications include skin necrosis, infection, and partial or complete nipple areolar complex necrosis, according to Munhoz and colleagues reports [21–23].

Caruso *et al*. [24], evaluated the outcomes in 61 cases treated using reduction mammoplasty and reported five cases of skin complications and one case of partial nipple necrosis.

However, Munhoz *et al*. [25], reported an immediate complication rate of 17.6%, comprising skin necrosis (8.1%), infection (2.7%), partial necrosis of the nipple–areola complex (2.7%), dehiscence (1.35%), and total necrosis of the nipple–areola complex (1.35%).

Skin necrosis and wound dehiscence are the most often reported complications after therapeutic reduction mammoplasty [26].

Our complication rate is comparable to these result as in our study we reported complications as follow: 10 (20%) cases developed seroma, six (12%) cases developed wound dehiscence, four (8%) cases developed wound infection, and two (4%) case developed partial areolar necrosis. These complications neither affected the general health of any patient nor caused a delay in adjuvant treatment. It should be noted that the inferior pedicle technique shows a higher percentage of complications compared with the superior pedicle technique as listed in Table 2.

Our reported rate of patient satisfaction as excellent ranges between 15/25 women (60%) and 16/25 women (64%) after inferior pedicle and superior pedicle mammoplasty, respectively. In two patients who accepted to perform simultaneous contralateral reduction (one patient from each group), the cosmetic outcome was rated as excellent, and the patients were greatly happy with their result.

In comparison with other reports, Chang *et al*. [27] in 2004 evaluated the degree of patient satisfaction and cosmetic results, and 20/37 (54%) women and 14/20 (70%) women reported excellent results. No local recurrence was observed in follow-up period, which ranged from 12 to 36 (median 24) months [28].

Caruso *et al*. [24] in 2008 reported one (1.6%) case of local recurrence with a follow-up period of 68 months, and Chang *et al*. [27] showed a zero recurrence rate.

Long-term outcomes in larger scale multi-institutional studies investigating oncoplastic reduction mammoplasty as a curative surgical treatment of breast cancer remain a major issue for its oncologic radicality procedure in Egyptian women regarding the risk of local recurrence.

Conclusion

Therapeutic reduction mammoplasty using inferior and superior pedicle mammoplasty for early breast cancer in large-breasted women is a surgically and oncologically safe procedure. The superior pedicle mammoplasty has less postoperative morbidity and more satisfactory cosmetic outcome with lower morbidity than inferior pedicle mammoplasty.

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Conflicts of interest

There are no conflicts of interest.

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