

Inferior pedicle mammoplasty vs round block technique for early-stage upper inner quadrant breast cancer

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Received: 20 June 2020

Accepted: 2 July 2020

Published: 24 December 2020

The Egyptian Journal of Surgery 2020, 39:1046–1059

Background

Breast-conserving treatment has become the standard treatment in early breast cancer; its goal is to provide a treatment as effective as mastectomy with the added benefit of a preserved breast. However, it is sometimes difficult to achieve good cosmetic results, particularly in patients with breast cancer located in the upper inner quadrant, for which the traditional conservative surgery results in a deformed breast.

Aim

The aim was to compare prospectively the oncoplastic outcome of lower pedicle mammoplasty and round block techniques for early-stage breast cancers in the upper inner quadrant.

Patients and methods

This is a prospective, randomized study on 20 female patients who were diagnosed in the upper inner quadrant to have early breast cancer and are candidates for oncoplastic breast surgery. The study was conducted at Ain Shams University Hospitals. Approval of the Ethics Committee and written informed consent from all participants were obtained. Patient selection was achieved through a number of inclusion and exclusion criteria.

Results

There is a significant difference between the two groups. Inferior pedicle mammoplasty needs longer operative time and postoperative hospital stay and drainage days with more intraoperative blood loss in comparison to the round block technique. As regards postoperative complications, inferior pedicle mammoplasty has more wound complications such as wound infection and dehiscence than the round block technique.

Conclusion

Early breast cancer patients with lesions in the upper inner quadrant are candidate for either inferior pedicle mammoplasty or round-block technique. Round-block technique is safer for them, as morbidity is lower, better cosmesis, no need for contralateral mastectomy, and fewer complications, so no delay in radiotherapy and inferior pedicle mammoplasty needs more surgeon experience.

Keywords:

doughnut mastopexy, inferior pedicle mammoplasty, oncoplastic breast surgery, upper inner quadrant breast cancer

Egyptian J Surgery 39:1046–1059
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1110-1121

Introduction

The breast is the true mirror of femininity, and it remains the core of womanhood in the mind of each one of us, with its role as nourisher and consoler. These roles evoke the idea that this delicate organ has importance and affection in women's minds [1].

Breast cancer is predicted to be the most common newly diagnosed cancer in women and accounts for 29% of all cancers in women [2].

In Egypt, the rate of breast cancer is higher than the worldwide records representing 32.04% of diagnosed cancers in women. More importantly, it has been reported that 49.7% of the Egyptian patients have regional spread at the time of diagnosis and 11.9% of them have distant metastasis [3].

When a woman is diagnosed with breast cancer many aspects of her physical, emotional, and sexual wholeness are threatened and she experiences a life-threatening issue by facing the mortality of the disease as well [4].

For more than 5000 years, breast cancer cases have been reported in medical writings. They appear with perhaps greater frequency in documents from the ancient world than any other form of cancer. This suggests breast cancer prevalence was important. The earliest suggestive written evidence of breast cancer

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comes from ancient Egypt and can be found in the Edwin Smith and Ebers Papyrus dating from 3000 to 2500 BC [5].

Radical mastectomy is a procedure that William S. Halsted invented and popularized as the surgical treatment for breast cancer. It removes the whole breast, the pectoral muscles, and the axillary lymph nodes, leaving a depression under the clavicle, prominent ribs and a markedly deformed patient, known as 'operation women most fear.' Subsequently, the modified radical mastectomy became popular, not because a prospective randomized trial proved its equality, but because the Women's Movement, frustrated with years of mutilation, pressed for change [6].

Since 1996, the approval of breast conservation surgery by the World Health Organization Research Committee for the Evaluation of Diagnostic Methods and Treatment of Breast Cancer has provided an alternative method of treatment for early breast cancer, in addition to radical mastectomy [7].

Breast-conserving surgery, defined as 'total removal of the breast lesion with consolidated margin of safe surrounding problem in a cosmetically appropriate manner (lumpectomy) normally accompanied by radiation therapy,' became the standard for low-grade breast cancer therapy. For all early diagnosed breast cancers, it is safe and recommended, because it has the same overall survival rates because of mastectomy. Several prospective and randomized studies and the number of clinical trials reveal this. In addition, it provides higher quality of life by reducing the effect of mastectomy-induced psychosocial change, body image, and sexual function [8].

It is expected that around 30% of all breast-conserving surgeries bring late aesthetic results that are considered unsatisfactory. The choice for preventive measures that have integrated techniques of plastic surgery into breast cancer surgery is changing this reality. Therefore, oncoplastic surgery is considered as tumor-specific immediate breast reconstruction in order to optimize surgical planning [9].

By the early 1990s, Audretsch suggested the integration of plastic surgery techniques with breast-conserving breast cancer treatment. This approach was conceptually referred to as 'oncoplastic surgery' which aims to provide safe oncological treatment through careful preoperative planning and the incorporation

of plastic surgical techniques for successful oncological tests with favorable cosmetic outcomes in cases with large breast volumes [10].

Therefore, oncoplastic surgery is considered as the 'third path' between surgical breast conservation and mastectomy [11].

Large defects in the upper inner quadrant of the breast will shift the nipple upward or medial in an unnatural manner. This is why oncoplastic surgery is of particular importance for the management of breast cancer in the upper inner quadrant, known as the no man's land [12].

If the tumor is in the upper inner quadrant of the breast and there is concern about creating unfavorable results from a cosmetic standpoint with lumpectomy alone, then inferior pedicle mammoplasty is preferable. Inferior pedicle oncoplastic procedure for upper inner tumors allows the surgeon to obtain large resection and breast negative margins is kept well from the aesthetic point of view. The inferior pedicle can reliably keep the nipple-areolar complex well perfused in a breast of almost any size and shape [13].

Aim

The aim of this study was to compare prospectively the oncoplastic results of inferior pedicle mammoplasty and round block as techniques for early breast cancers located at the upper inner quadrant.

Patients and methods

Type of study

This is a prospective, randomized study on 20 female patients who were diagnosed to have early breast cancer in the upper interior quadrant and are candidates for oncoplastic breast surgery.

Study settings

The study was conducted at Ain Shams University Hospitals. Approval of the Ethics Committee and written informed consent from all participants were obtained. Patient selection was achieved through a number of inclusion and exclusion criteria.

Inclusion criteria: female patients in the age range from 18 to 70 years. Primary breast malignancy stage I and II (Manchester) or T2 N1 M0 or less (TNM classification). Upper inner quadrant lesions. Imaging studies confirming pathoanatomic features corresponding to clinical symptoms. Histopathological diagnosis confirming clinical features and manifestations. Downgraded tumors by neoadjuvant therapy.

Exclusion criteria: male patients and female patients below the age of 18 years and over 70 years. Advanced primary breast cancer stage III, IV (Manchester) or T2 N1 M0 or more (TNM classification) with nipple and areola involvement including Paget's disease of the nipple and patients with multicentric lesions. Recurrent malignancy following conservative breast surgery. Inflammatory breast cancer with extensive skin involvement. Previous breast irradiation. Patient refusing conservative breast surgery.

Patients were subdivided by a sealed envelope method into two groups. Group I: this group is composed of 10 patients who underwent the round block technique with the removal of the mass with safety margin and followed up postoperatively to detect any complication, assess aesthetic outcome, and to detect recurrence. Group II: this group is composed of 10 patients who underwent inferior pedicle mammoplasty for removal of the mass with safety margin and followed up postoperatively to detect any complication, assess aesthetic outcome, and to detect recurrence. All patients in both groups included in our study were compared for the following:

Intraoperatively

Operative time, blood loss, and contralateral symmetrization.

Postoperatively

Drainage volume, drainage days, and hospital stay were assessed. Development of seroma and estimating the total seroma volume. Development of wound hematoma, wound infection. development of nipple areola complex (NAC) necrosis, wound dehiscence, cosmetic outcome, and local recurrence were assessed.

All patients included in the study were subjected to the following:

Clinical assessment

Detailed medical, surgical, menstrual, and family history. History of intake of oral contraceptive pills or hormonal replacement therapy with estrogen and progesterone. General examination including full breast and axillary examination.

Investigations

Routine laboratory investigations, bilateral sonomammography, and abdominal and pelvic ultrasound were done. Others are chest radiography and histopathological examination for the suspicious breast mass. MRI breast for patients with invasive lobular carcinoma.

Multidisciplinary team

Multidisciplinary team at the breast unit at General Surgery Department of Ain Shams University reviewed every single case independently. The multidisciplinary team (MDT) included: breast surgery consultant, pathology consultant, and radiology consultant. Discussion was made up upon every case including patient history, examination, and investigations.

Patient counseling and consent

After admission and completion of history and examination, each patient received a detailed explanation of her condition regarding the disease itself, the type of surgery, and expected postoperative adjuvant therapy. Operative details of both surgical techniques were explained for each patient using pictures of similar cases to help visualization of the outcome, risks, and benefits of the procedures. Possible complications were also clearly stated and explained individually for each procedure. Also, the need for postoperative radiation dose to the remaining tissue of the breast and the resultant effect of this dose on the skin and cosmetic outcome was explained. All patients were evaluated by our surgical team before surgery; full photography of the breast was taken from multiple views. A formal consent was written and explained to the patient. The consent was signed one day before surgery and any inquiries, concerns, or doubts were discussed with the patient and a first-degree relative (upon patient's request).

Medical photography

The need for medical photography was also discussed and explained. How will the photography be taken, and who is going to photograph her. Also, the reason of the photography was discussed, explained, and consented. Medical photographs were taken and kept in the patient's records as agreed upon. Pictures were taken to the patients along their follow-up visits to keep record and document progress.

Surgical techniques

- (1) Group I: round block technique with the removal of the mass with safety margin and axillary resection of the lymph nodes stage I and II.
- (2) Group II: reduction mammoplasty with the removal of the mass with safety margin and axillary resection of level I and II lymph nodes.

Operative technique

Round block technique (Fig. 1): it is also known as doughnut mastopexy or periareolar mastopexy. The procedure begins by making two periareolar

Figure 1



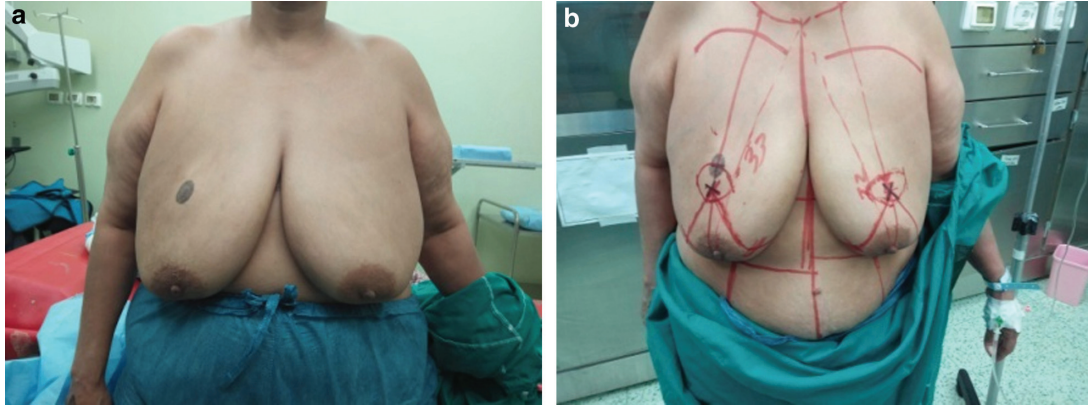
(a) Round block technique (wire localization). (b) Preoperative drawings. (c) De-epithelialization between outer and inner incision line. (d) Excision of the tumor. (e) Specimen orientation for frozen section assessment. (f) Closure of the glandular defect and purse string suturing. (g) Repositioning and suturing the NAC. (h) Early postoperative result. (i) Late postoperative result.

concentric incisions, accompanied by de-epithelialization of the skin that intervenes. In order to allow access to the tumour, the outer edge of the de-epithelialized skin is incised and the whole skin envelope can then be undermined. From its posterior glandular base, the NAC stays vascularized. There is a resection of the lesion from the subcutaneous tissue down to the pectoralis fascia, resulting in the development of an external and internal glandular flap. To remove the excision defect, the flaps are first mobilised away from the fascia pectoralis and pushed towards each other, then the two incisions are approximated, resulting in a periareolar scar. Axillary dissection starts from a separate transverse incision along the hair line; the incision is placed ~4–5 cm below the most superior aspect of the axilla. The incision is extended anteriorly to the lateral border of the pectoralis major muscle and posteriorly to the latissimus dorsi muscle. A plane of dissection was created along the inferior border of the axillary vein

and all fat, lymphatics, and blood vessels were dissected off the axillary vein sparing the thoracodorsal pedicle and long thoracic nerve. Closure with the drain end is fixed to the skin with nonabsorbable sutures.

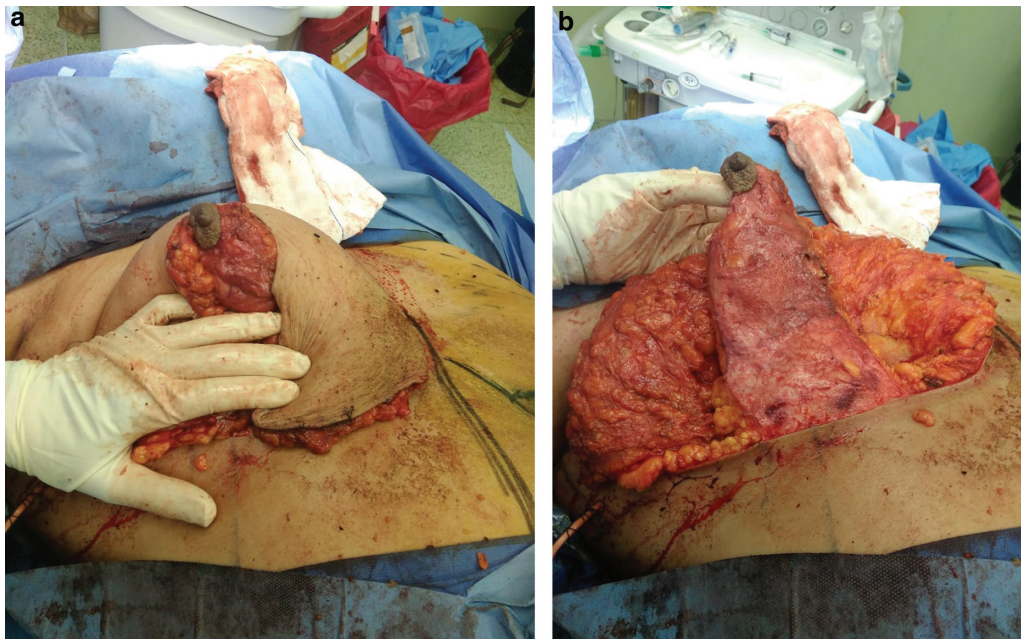
Inferior pedicle mammoplasty technique: with the patient in an upright standing position, sketches are done preoperatively (Fig. 2). A central midline is drawn to the umbilicus by the sternal notch. The tumour and the area of breast tissue intended for tumour resection are indicated on the skin. From the midclavicular point to the nipple, a vertical line is drawn, and this line continues across the nipple to the inframammal fold and to the thoracic wall. The new location of the nipple is identified at the level of the original inframammal fold, with this point projected anteriorly onto the midclavicular axis. An inverted V, with its top, is drawn at the future nipple spot. The two lines of the V are drawn connecting these points to the top of the V. From the end of both inverted V lines,

Figure 2



Marking skin for inferior pedicle flap design.

Figure 3



De-epithelization of inferior pedicled flap.

horizontal lines are drawn and attached to the inframammalian fold medium and laterally with a base width of 6 to 12 cm on the surface, the lower pedicle is delineated. It is labelled with a new areola. The skin is incised around the formed lines, deepithelializing the lower pedicle (Fig. 3). Skin flaps with a thickness of 1 to 2 cm are dissected down to the fascia pectoralis superiorly, medially and laterally. The tumor and the surrounding tissue are dissected from the pedicle below. The specimen is oriented and frozen section examinations are done for margin evaluation. The tumor bed is marked with clips. The lower pedicle is prepared 6–12 cm in width and 2–6 cm in thickness. This is superiorly moved to the defect and the layers of the flaps closed. Contralateral symmetrization is performed in

Figure 4



Postoperative contralateral summarization.

patients who have preoperatively acknowledged (Fig. 4). Axillary dissection is carried out as already discussed.

Patients were assessed intraoperatively for the following:

- (1) Operative time.
- (2) Blood loss.

Postoperatively the patients were assessed for:

Drainage volume, hematoma and flap congestion or ischemia	First postoperative day
Drainage volume and days, seroma, wound infection, skin/nipple sloughing, and flap necrosis	Within first week
Scar fibrosis/dimpling and flap necrosis	After 1 month
Sonomammography	Every 3 months
Aesthetic outcome by patient and surgeon satisfaction	Up to 1 year

The aesthetic outcome score was based on multiple items that made up a checklist to be evaluated by our team and the MDT of the breast for every single case. This checklist included the overall shape of the breast, the symmetry of both breasts, the site and direction of the nipple, the volume of the breast, and the skin incision shape.

Statistical methodology

Analysis of the data was done by an IBM computer using SPSS (the Statistical Program for Social Sciences) (Statistical analysis was done using IBM SPSS statistics for windows, Version 20.0. Armonk, NY: IBM Corp) as follows: description of quantitative variables as mean, SD, and range. Description of qualitative variables as number and percentage. Unpaired *t*-test was used to compare two groups as regards quantitative variables. Paired *t*-test was used to compare quantitative variable in the same group. *P* value more than 0.05 is considered insignificant, *P* less than 0.05 significant and *P* less than 0.01 is highly significant.

Results

Table 11

Discussion

Breast cancer is the most frequent carcinoma in women, diagnosed in 1.4 million women in the USA every year, and has been the most common cause for cancer mortality in women. Even with new

progress in screening, diagnostics, and surgery, there is still a lot left to be desired [14].

Surgical techniques involving breast cancer have recently evolved in three important areas: patient recovery, oncological safety, and optimal cosmetic outcome [15].

Four main factors influence the extent of breast deformity after breast conservation: tumor location, tumor to breast size ratio, use of radiotherapy, and surgical resection approach [16].

After partial mastectomy, the size and location of the defect are two of the main factors influencing postoperative cosmetic outcome. After oncoplastic breast surgery, the ratio of the excised breast volume is an important factor in determining the cosmetic result and patient satisfaction. Studies have indicated that 10–12% of breast volume excision indicates bad cosmesis. The location of the defect after partial mastectomy is also a significant influence on the cosmetic result. For example, surgery for upper inner quadrant cancers is associated with a poor cosmetic outcome even in small-scale cases [17].

In our study, we divided the study sample into two groups and we compared between round block technique (group I) and inferior pedicle mammoplasty (group II) in the treatment of early breast cancer in the upper interior quadrant.

In our study, there was no significant statistical difference between the two groups as regards the patients' age (Table 1) and patient comorbidities (Table 3), with the mean age of 47.4 years (30–62 years) and 43.07 years (30–64 years) in group I (round block technique) and group II (inferior pedicle mammoplasty), respectively. This was relatively lower than the mean age of the patients who participated in the study carried out by Rose *et al.* [18] which was 53 years. Moreover, the mean age was higher in some studies such as that carried out by Tenofsky *et al.* [19], which was 60.9 years. The mean age of the patients was 53.3 years in the round block group in the study carried out by Eichler *et al.* [20]. The mean age of the patients was 50 years in the reduction mammoplasty group in the study carried out by Emirolgu *et al.* [15].

Relatively younger age of the included patients increased cosmetic and aesthetic demands. This made patient satisfaction a more challenging goal.

Table 1 Age difference between the two groups

Age	Groups		t-test P value
	Round block technique	Inferior pedicle mammoplasty	
Range	30–62	30–64	0.155
Mean±SD	47.40±8.42	43.07±7.81	

Table 2 Family history in the two groups

Family history	Round block technique [n (%)]	Inferior pedicle mammoplasty [n (%)]	P value
Negative	8 (80)	9 (90)	0.543
Positive	2 (20)	1 (10)	

Table 3 Comorbidities in the two groups

Comorbidities	Round block technique [n (%)]	Inferior pedicle mammoplasty [n (%)]	P value
Negative	7 (70)	6 (60)	0.666
Positive	3 (30)	4 (40)	

Table 4 Tumor size in the two groups

Tumor size (mm)	Groups		t-test P value
	Round block technique	Inferior pedicle mammoplasty	
Range	8–29	10–32	0.733
Mean±SD	18.5±5.23	20.1±6.09	

Table 5 Distance of the tumor from the nipple in the two groups

Distance of the tumor from the nipple (cm)	Groups		t-test P value
	Round block technique	Inferior pedicle mammoplasty	
Range	1.5–10	1.5–11.5	0.539
Mean±SD	6.02±2.42	6.35±3.29	

In our study, there was positive first-degree family history in 20% of the patients in group I (round block) and positive second degree family history in 10% of the patients in group II (inferior pedicle mammoplasty) (Table 2). Unfortunately, BRCA gene test, which is related to significant positive family history, was not available in our hospitals during this study.

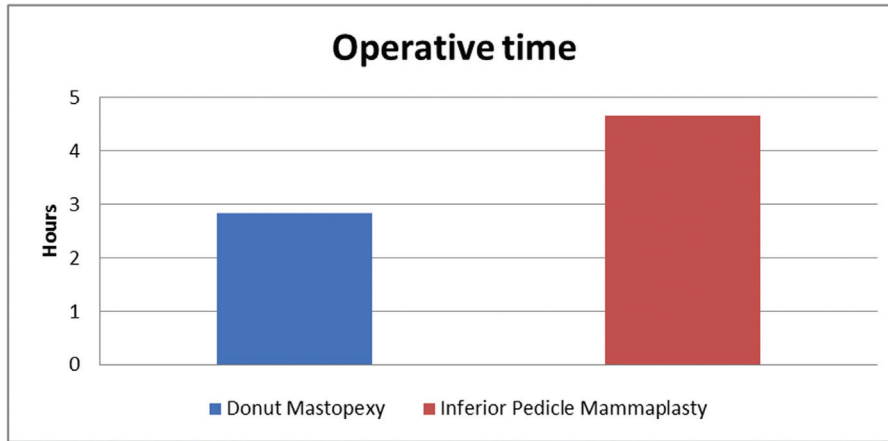
In our study, there was no significant statistical difference between the two groups as regards the tumor size and its distance from the nipple (Tables 4 and 5). In group I, it ranged from 1.5 to 10 cm with a mean distance of 6.02 cm and in group II it ranged from 1.5 to 11.5 cm with a mean distance of 6.35 cm. This was higher than those of patients included in the study carried out by Chen [21] (2–6 cm apart from the center of the nipple). Therefore, both techniques are available options for patients with distant lesions from the nipple–areola complex but these lesions add some technical difficulty of the round block technique.

There was significant statistical difference in both group as regards the operative time (Fig. 5, Table 6), intraoperative blood loss (Fig. 6, Table 7), hospital stay (Figs 7 and 8), postoperative drainage volume and days (Figs 9 and 10, Tables 9 and 10), postoperative complications (Figs 8–14, Tables 12–16), and cosmetic outcome (Fig. 15, Table 17) as regards patient and surgeon satisfaction. These are comparable to some studies as follows:

As regards the operative time and intraoperative blood loss, in our study, the operative time was longer and blood loss was more in group II (inferior pedicle mammoplasty) than group I (round block technique) with mean: 4.65 h and 100–300 ml (average: 203.33 ml) in group II vs mean: 2.83 h and 50–150 ml (average: 100 ml) in group I.

Ogawa [22] in his study of 18 patients reported a mean operative time of 3 h (range: 188–191 min) in the round block technique group.

Figure 5

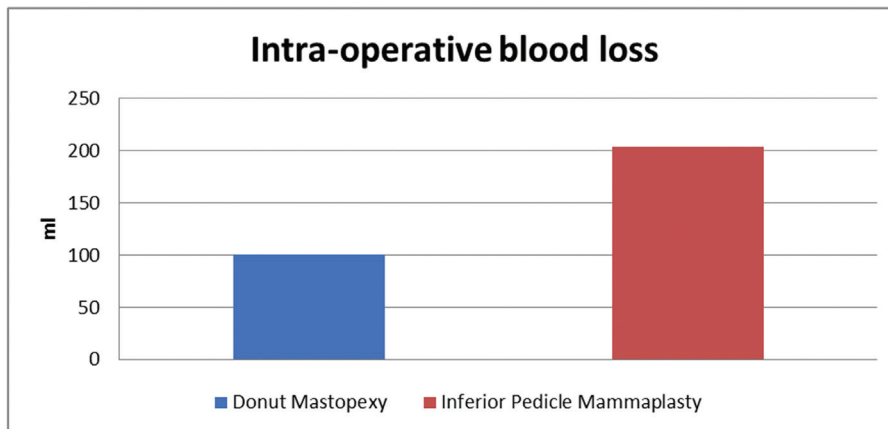


Operative time.

Table 6 Difference in the operative time in the two groups

Operative time (h)	Groups		t-test P value
	Round block technique	Inferior pedicle mammoplasty	
Range	2–3.5	4–5.5	<0.001
Mean±SD	2.83±0.49	4.65±0.60	

Figure 6



Intraoperative blood loss.

Table 7 Intraoperative blood loss in the two groups

Intraoperative blood loss (ml)	Groups		t-test P value
	Round block technique	Inferior pedicle mammoplasty	
Range	50–150	100–300	<0.001
Mean±SD	100.00±37.70	203.33±61.71	

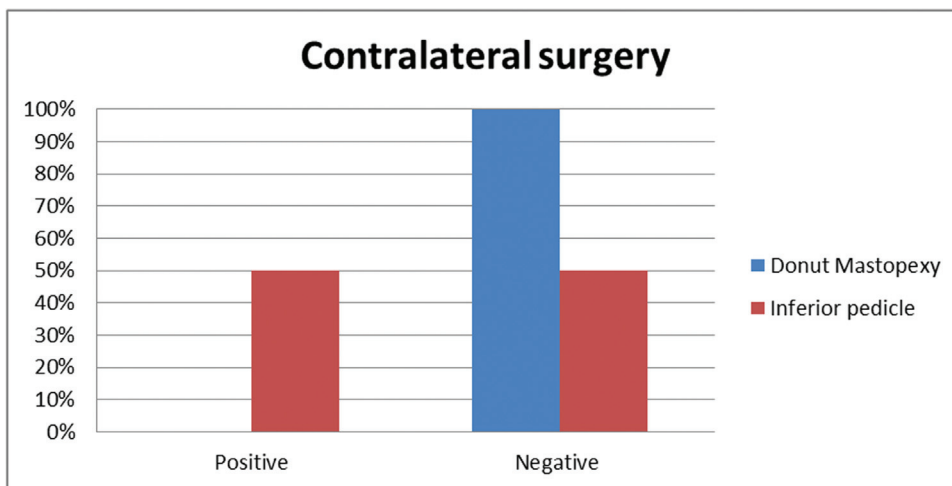
Emirolgu *et al.* [15] in their study of 82 patients reported that the average operative time in the reduction mammoplasty group was 2.5 h (range: 80–190 min).

In our study, we found that the mean hospital stay was 1.6 days (range: 1–2 days) in group I (round block

technique) vs 2.4 days (1–3 days) in group II (inferior pedicle mammoplasty).

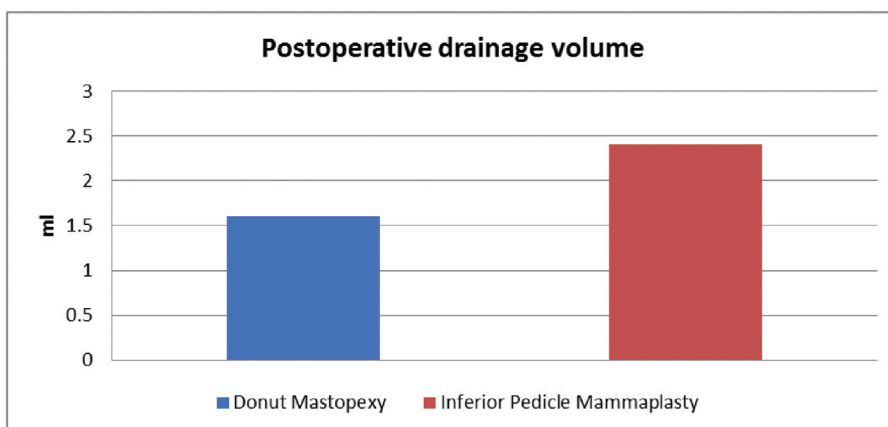
Regarding postoperative complications, Emirolgu *et al.* [15] in a total of 82 patients that underwent oncological reduction mammoplasty, the overall rate of complications was 12.2% (10/82). Four patients

Figure 7



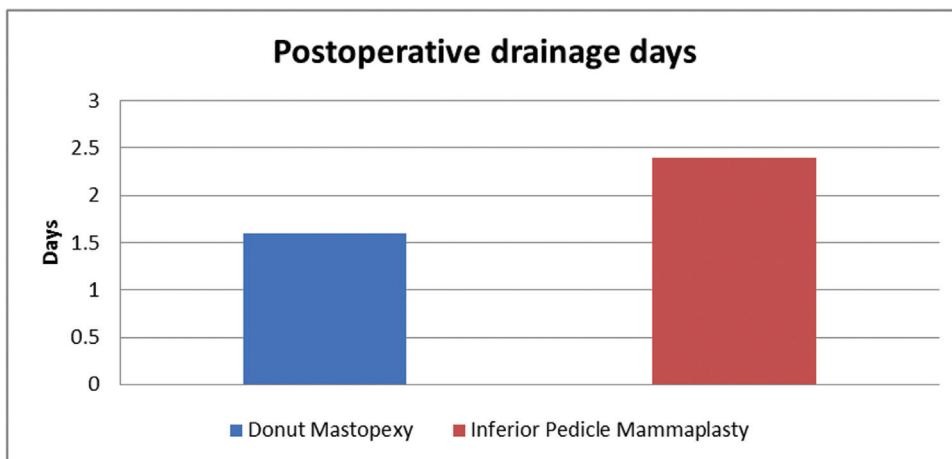
Hospital stay.

Figure 8



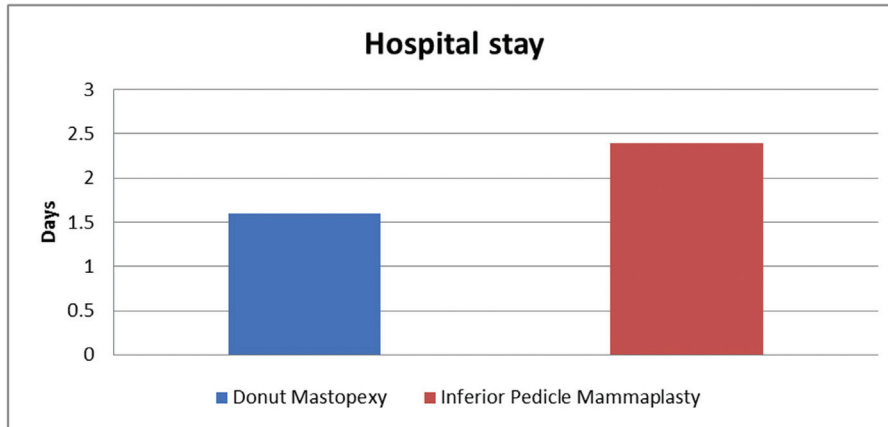
Postoperative seroma formation.

Figure 9



Postoperative drainage volume.

Figure 10



Postoperative drainage days.

Table 8 Contralateral surgery in the two groups

Contralateral surgery	Round block technique [n (%)]	Inferior pedicle mammoplasty [n (%)]	P value
Positive	0	5 (50)	0.004
Negative	10 (100)	5 (50)	

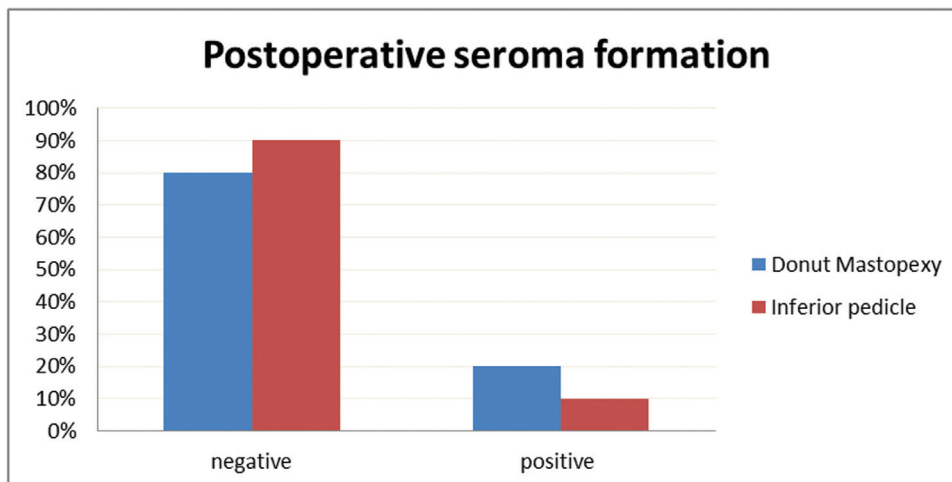
Table 9 Total drainage volume in the two groups

Postoperative drainage volume (ml)	Groups		t-test
	Round block technique	Inferior pedicle mammoplasty	P value
Range	50–150	150–300	<0.001
Mean±SD	93.66±35.93	226.76±56.72	

Table 10 Total drainage days in the two groups

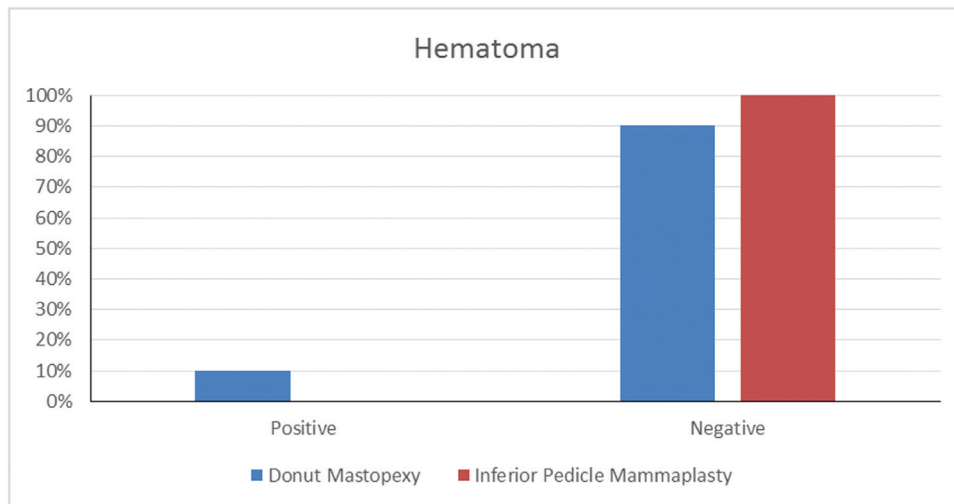
Postoperative drainage days	Groups		t-test
	Round block technique	Inferior pedicle mammoplasty	P value
Range	2–3	4–6	<0.001
Mean±SD	2.50±0.54	4.90±0.53	

Figure 11



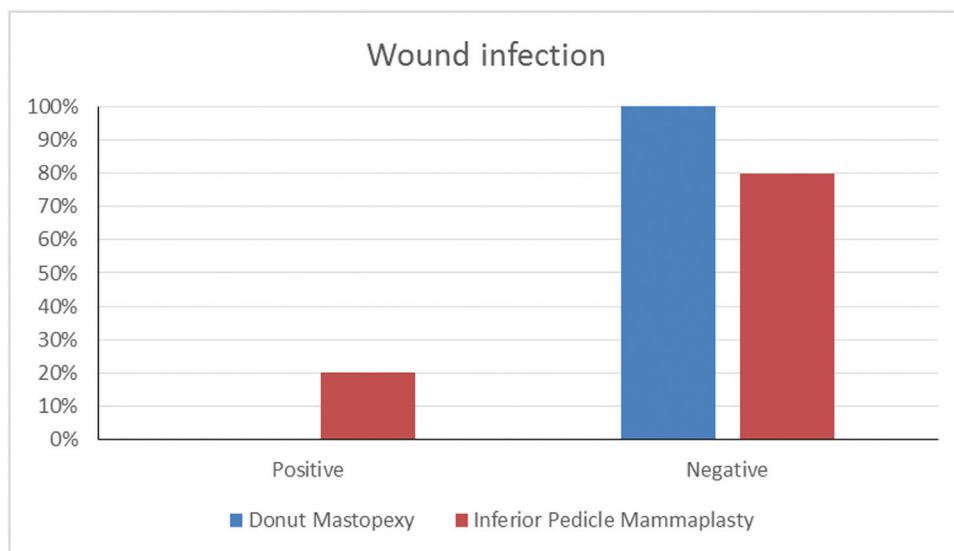
Hematoma.

Figure 12



Wound infection.

Figure 13



NAC necrosis.

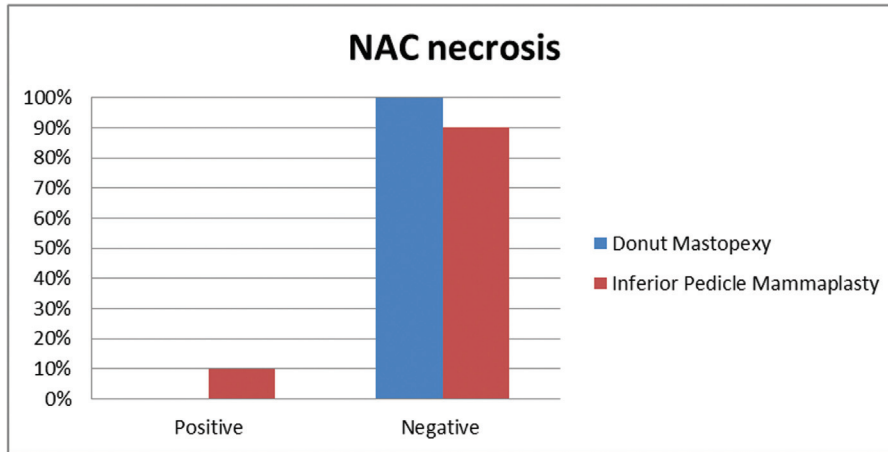
developed wound dehiscence, one patient developed areola necrosis, three patients developed seroma, and two patients developed wound site infection.

In the Ogawa [22] study in a total of 18 patients who underwent round block technique, four patients had blood flow insufficiency in part of the NAC.

In our study, patients have experienced some complications. In group I (the round block technique), one patient developed seroma and another one had hematoma. In group II (inferior pedicle mammoplasty), two patients developed

seroma, one had wound infection, two had wound dehiscence, and one had partial NAC necrosis. In our study, we reported the cosmetic outcome according to subjective patient satisfaction and subjective surgeon satisfaction to the final breast shape and it was 80% excellent and 20% good in group I (round block technique), while in group II (inferior pedicle mammoplasty) it was excellent in 20%, good in 30%, fair in 30%, and poor in 20%. The 50% in group II (inferior pedicle mammoplasty) that underwent contralateral breast surgery for symmetrization are those who were given excellent and good cosmetic result (Fig. 16, Table 8).

Figure 14



Wound dehiscence.

Table 11 Hospital stay in the two groups

Postoperative hospital stay (days)	Groups		t-test
	Round block technique	Inferior pedicle mammoplasty	P value
Range	1–2	1–3	<0.001
Mean±SD	1.60±0.48	2.40±0.70	

Table 12 Seroma formation rate in the two groups

Postoperative seroma formation	Round block technique [n (%)]	Inferior pedicle mammoplasty [n (%)]	P value
Positive	1 (10)	2 (20)	0.543
Negative	9 (90)	8 (80)	

Table 13 Hematoma formation in the two groups

Hematoma formation	Round block technique [n (%)]	Inferior pedicle mammoplasty [n (%)]	P value
Positive	1 (10)	0	0.543
Negative	9 (90)	10 (100)	

Table 14 Wound infection in the two groups

Wound infection	Round block technique [n (%)]	Inferior pedicle mammoplasty [n (%)]	P value
Positive	0	2 (20)	0.593
Negative	10 (100)	8 (80)	

Table 15 Partial NAC necrosis in both groups

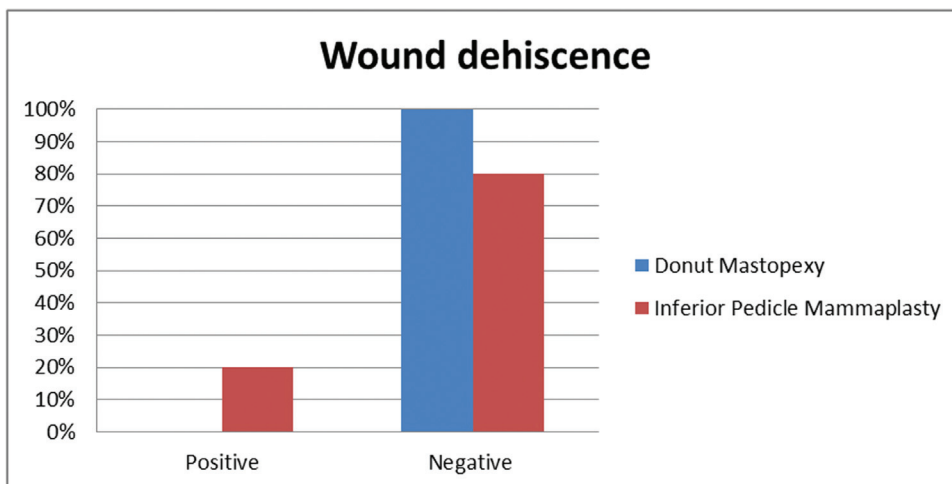
NAC necrosis	Round block technique [n (%)]	Inferior pedicle mammoplasty [n (%)]	P value
Positive	0	1 (10)	0.051
Negative	10 (100)	9 (90)	

NAC, nipple areola complex.

Table 16 Wound dehiscence in both groups

Wound dehiscence	Round block technique [n (%)]	Inferior pedicle mammoplasty [n (%)]	P value
Positive	0	2 (20)	0.028
Negative	10 (100)	8 (80)	

Figure 15

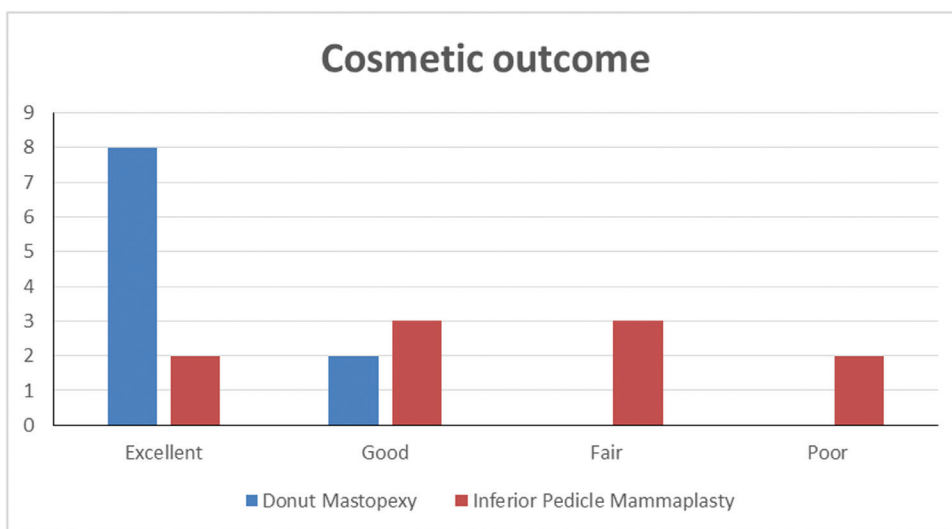


Cosmetic outcome.

Table 17 Cosmetic outcome

Cosmetic outcome	Round block technique [n (%)]	Inferior pedicle mammoplasty [n (%)]	P value
Excellent	8 (80)	2 (20)	0.019
Good	2 (20)	3 (30)	
Fair	0	3 (30)	
Poor	0	2 (20)	

Figure 16



Contralateral surgery.

Table 18 Local recurrence

Local recurrence	Round block technique [n (%)]	Inferior pedicle mammoplasty [n (%)]
Positive	0	0
Negative	10 (100)	10 (100)

In the Zaha *et al.* [23] study in a total of 40 patients who underwent modified round block technique, the

cosmetic outcome was excellent in 65%, good in 25%, fair in 7.5%, and poor in 2.5%.

Denewer *et al.* [24] in a total of 50 patients that underwent reduction mammoplasty group, the cosmetic outcome was 64% excellent, 30% showed good results, and 6% rated the outcome as fair.

In our study, there was no local recurrence for 12 months (Table 18). In the Niinikoski *et al.* [25] study, local recurrence rate during a median of 75 months follow-up was 2.3%. This is comparable to other studies. Romics *et al.* [26] reported a local recurrence rate of 2.7% during a median follow-up of 30 months and Clough *et al.* [27] reported a local recurrence rate of 2.2% during a median follow-up of 55 months.

Conclusion

The location of the defect after partial mastectomy is also a significant influence on the cosmetic result. For example, surgery for upper inner quadrant cancers is associated with poor cosmetic outcome even in small-scale cases that are candidates for either inferior pedicle mammoplasty or doughnut mastopexy. Doughnut mastopexy is better for them as there is less morbidity, better cosmesis, no need for contralateral symmetrization, and fewer complications, and therefore no delay in radiotherapy, and inferior pedicle mammoplasty needs more surgeon experience.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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