Round block technique in the management of early stages of breast cancer: an assessment of the technique, oncological safety, and cosmetic outcomes

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Background
The round block technique is a unique breast resection through a periareolar doughnut incision. However, it is more technically challenging and time consuming. The aim of this study was to introduce our round block technique and to evaluate the results of oncological and cosmetic outcomes.
Patients and methods
A total of 60 female patients diagnosed with early stages of breast cancer (T1–2, N0–1, ≤M0) were treated with breast-conserving surgery using the round block technique at Ain Shams University Hospitals from March 2014 to March 2017. Patients with advanced breast cancer, with tumors less than 1.5 cm from the nipple, multicentric breast cancer, and pregnant women were excluded from the study. We minimized the extent of skin removal and used the purse–string technique in doughnut closure. Patients' related complications, oncologic safety, cosmetic outcome, and patient satisfaction were assessed.
Results
The mean size of the tumors was 2.7 cm (range: 0.9–4.5 cm). The mean distance of the tumors from the nipple was 6.25 cm (range: 1.5–11 cm) on sonogram and most of the tumors were located on the upper breast (46.6%). The median operative time was 120 min (range: 90–145 min), including axillary surgeries. The median follow-up duration was 12 months (range: 2–36 months). Up to the longest 3 years of follow-up, favorable cosmetic results have been found in patients treated with the round block technique, with no cases of local recurrence.
Conclusion
The round block technique is oncologically safe and feasible for early stages of breast cancer, with favorable cosmetic results.

Keywords:
breast cancer, oncoplastic breast surgery, round block technique

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Introduction

Oncoplastic breast surgery is the surgical treatment of breast lesions with various plastic surgery reconstructive techniques. It allows complete resection of local disease while achieving better cosmetic outcomes [1–6]. Increasing demand for reduced scars has led to the development of numerous minimal-incision procedures. Many novel oncoplastic techniques have emerged for the management of central breast tumors.

Various periareolar techniques have been introduced in an attempt to eliminate scars on the breast by limiting them to the periareolar region. Among the oncoplastic techniques, the round block technique was a useful procedure for resection of centrally located breast malignancies [7–9].

The round block technique, also known as Benelli mastopexy, was devised by Louis Benelli in 1990 [10]. It is a minimally invasive breast lift technique that is ideal for correcting ptosis in small-sized to moderate-sized breasts. Only using the incision around the perimeter of the areola allows us to remove the excess skin of breast ptosis, manipulate the breast tissue, and place the nipple in a higher position. This procedure can be applied for tumor removal in patients with breast cancer. However, the round block technique is more technically challenging and time consuming than the radial or the circumareolar approach. Because the technique is a complex operation, it should not be performed until basic oncoplastic techniques are fully understood and mastered [2].

The round block technique is a unique breast resection procedure in which breast tissue is removed and the breast is reshaped through a periareolar doughnut incision. For patients with breast cancer, it provides

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the advantage of an inconspicuous postoperative scar and a favorable aesthetic result. Moreover, compared with circumareolar incision, the doughnut incision in this technique provides wider exposure for tissue resection and remodeling without sacrificing cosmetic outcome. However, a disadvantage of this approach is its complexity, which makes it difficult to apply to oncologic breast surgery [8,9].

In its original description and associated literatures, the round block technique for breast cancer can be adapted for resection of tumors located at any quadrant of the breast. The increasing area of the skin removal for tumors located away from the nipple–areolar complex, however, might leave a considerable amount of skin tension around the areola. Therefore, it is essential to make a periosteal mastopexy and a solid cerclage, fixing scar block around the areola [10,11].

Round block cerclage is a purse-string suture in the periareolar dermal shelf to manage the discrepancy between the larger diameter of the periareolar incision and the smaller diameter of the areolar incision [12,13].

Patients and methods

From March 2014 to March 2017, a total of 60 female patients with early breast cancer were enrolled in this descriptive analytic study. They were admitted to Ain Shams University Hospitals.

The inclusion criteria of this study were female patients up to 60 years of age with early stages of breast cancer (stages cT1–2, N0–1, ≤M0), with no or small intraductal component (≤25%) and with breast mass located at least 1.5 cm from the nipple–areola complex.

The exclusion criteria were patient choice, stage more than cT2 N1 M0, central retroareolar breast mass, Paget's disease of the breast or mastitis carcinomatosis, large in-situ component (>25%) or multicentric disease, previous radiotherapy, and pregnancy.

Patients were diagnosed by assessment of history, physical examination, and sonomammography. Tru-cut needle biopsy – with radiology-based guidance when needed – was always performed to confirm the cancer diagnosis. Before surgery, each woman received basic information on tumor location, size, and histology. After this step, women who fulfilled the criteria were invited to participate in the study. After being informed of the risks and benefits associated with this treatment alternative, informed consents were obtained from all patients who agreed to participate in our study.

Preoperatively, detailed assessment of history including age, marital status, smoking status, previous breast surgery, and/or breast radiation, chronic illness, and relevant family history was performed. General examination including vital signs (pulse, blood pressure, temperature), general appearance (jaundice, pallor, cachexia), head, neck, chest, abdominal, limbs and back, and calculation of the BMI was performed. Local examination of both breasts, axillae, and supraclavicular lymph nodes was performed. Comments on the size, degree of preoperative ptosis, and tumor location were recorded.

Investigations including routine laboratory investigation and sonomammographic examination for both breasts and axillae were performed. Determination of preoperative surgical fitness was also performed. Metastatic workup was performed for all patients in the form of chest radiograph, pelviabdominal ultrasound, and bone scan. cTNM classification was determined and recorded.

The patients' images were used in this study with the patients' consent. The information on personal identity was removed from those images.

Patients were admitted to the hospital on the same day as the surgery, except for patients with chronic illness and morbid obesity; these patients were admitted 1–2 days before surgery.

Surgical technique

With the patient in the upright position, preoperative drawings were performed (Fig. 1). An outline of the de-epithelialization zone through outer and inner incision lines was marked; the area in between to be de-epithelialized ranged from 1 to 4 cm distance

Figure 1

Fifty-two-year old patient with moderate-sized breasts with moderate ptosis in the left upper inner quadrant with a malignant mass, preoperative drawing.

between the inner and the outer incision line depending on the tumor size, location, and nipple position. The more the breast volume to be excised and the more ptosis to be corrected, the larger the distance between the inner and the outer incision line (Fig. 2a and b). In small tumors and breasts with similar nipple positions, the distance between the inner and the outer incision line was as close as possible. The new nipple areola complex may be between 38 and 42 mm in diameter depending on the other nipple–areola size.

In the absence of ptosis and in case of normal breast symmetry before surgery, the lateral incisions were about 1–1.5 cm away from the inner new nipple–areola incision to keep the nipple–areola complex in the same place. In the presence of mild ptosis, the upper border may be 2–3 cm away from the inner nipple–areola incision, whereas the lower and side borders may be 1–1.5 cm away from the inner incision line to lift the breast.

In cases of larger tumors and thus larger defects, it may be necessary to increase the distance between the two incision lines at the side of the tumor by up to 4 cm.

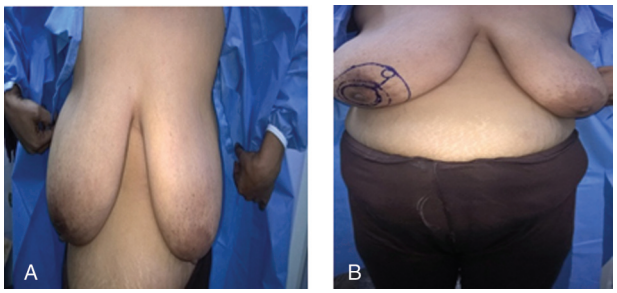
The areolar skin was stretched only mildly when the inner circle was designed, so that the final areolar diameter does not become smaller than desired.

Then, the tumor location was marked and a line was drawn from the tumor site to the areola indicating the direction of dissection to reach the tumor. The site of the axillary incision was determined and marked.

The patient was operated upon in the supine position with both arms elevated at 90°. Under general anesthesia, the ipsilateral chest and arm should be prepped, with a sterile sleeve covering the arm to allow changes in position during surgery. The initial step is the incision of the inner circle, which will represent the new border of the areola. The outer circle is then incised and the donut of skin between the two circles is excised (Fig. 3).

De-epithelialization between outer lateral borders and the inner (neoareola) incision line was performed (Fig. 4). As the nipple–areola complex is supplied by dermal vessels from all sides, we tried not cut through the dermis. We attempted to cut through the dermis at the side of the tumor location only whenever possible.

Figure 2

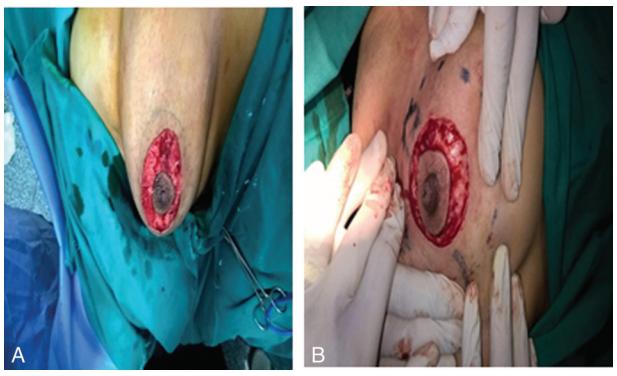


(a) A fifty-year-old patient with large breasts with severe ptosis and wide areola presented with a right breast upper inner quadrant malignant mass 2 cm from the nipple and areola complex. (b) The preoperative drawing with minimization of the areola and larger distance between the outer and inner circles in the inferior part.

Figure 3

The incision of the inner and outer circles.

Figure 4



(a, b) De-epithelialization between the outer and the inner incisions in two different patients.

We lifted and undermined the skin to free the breast parenchyma from the skin above the tumor and at least 5 cm laterally and medially from the tumor and up to the upper end of the breast for good exposure (Fig. 5).

The nipple and areola complex is still supplied by dermal vessels. After dissecting the breast parenchyma and the lump with the tumor from the skin, the lump was lifted up with the pectoralis fascia and elevated outside the skin envelope to optimize palpable control during lumpectomy (Fig. 6). The breast mass borders were marked with clips.

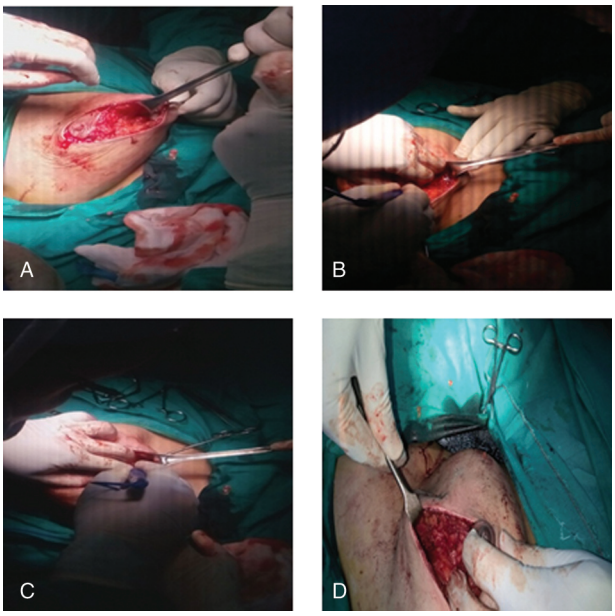
Orientation of the removed specimen was performed using stitches of variable lengths and numbers; the specimen was sent to the pathologist in a fresh state and measured. Frozen section examinations were then performed to report on margins: anterior, both lateral and posterior. In case of close or positive margin, re-excision of the safety margin was performed and sent for a pathological examination. In case of failure to obtain a safety margin after re-excision, the procedure was converted to mastectomy and the patient was excluded from the study.

Reshaping of the breast could be performed appropriately by displacement of the residual gland. In this respect, we normally proceeded to separate the residual gland off the pectoralis fascia using electrocautery, paying attention to limit the number of major perforating vessels that are sectioned to ensure that the blood supply to the residual glandular tissue was not affected.

After careful hemostasis had been achieved, the residual breast parenchyma was re-approximated to facilitate a natural-appearing breast. Sutures were placed in the deep portion of the residual gland, above the fascia, to secure the posterior edges in their new position (Fig. 7).

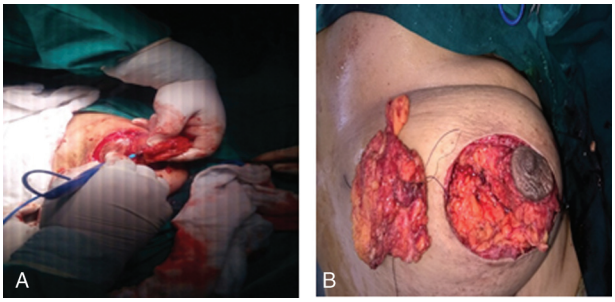
We normally used 2-0 Vicryl sutures for this purpose, whereas for re-approximation of the superficial portion of the breast, we used 4-0 absorbable sutures in the dermis (Fig. 8).

Figure 5



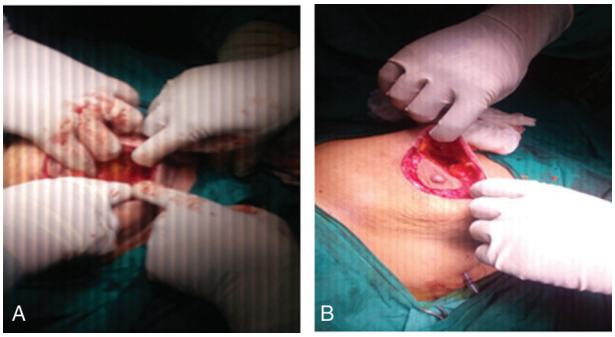
(a–d) Freeing the breast parenchyma from skin overlying the tumor medially and laterally in two different patients.

Figure 6



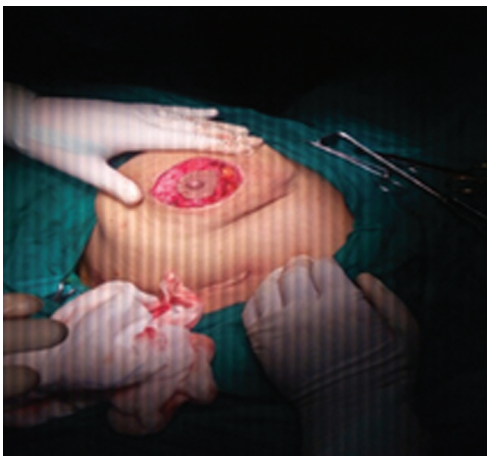
(a, b) The lump was lifted up with the pectoralis fascia and elevated outside the skin envelope.

Figure 7



Reshaping of the breast.

Figure 8



Re-approximation of the superficial portion of the breast.

A purse-string suture is used to reduce the diameter of the larger circle and is then sutured to the new border of the areola, leaving only a periareolar scar at the end of the procedure using polydioxanone sutures (PDS) 2-0 (Fig. 9). Leaving a suction drain is not a routine procedure; however, it was left in patients with high BMIs, large breasts, large residual defect, and patients with chronic liver disease. In cases where suction drains were use, the exit was below the axilla.

The dermis was closed with interrupted single stitches using absorbable 4-0 and the epidermis was closed with running absorbable 4-0 (Fig. 9), with steri-strips applied to the wound (Fig. 10).

Antibiotic therapy was used preoperatively and postoperatively for 6 days with parenteral or oral analgesia when necessary. The patient was instructed to wear a brassiere day and night for 2 months.

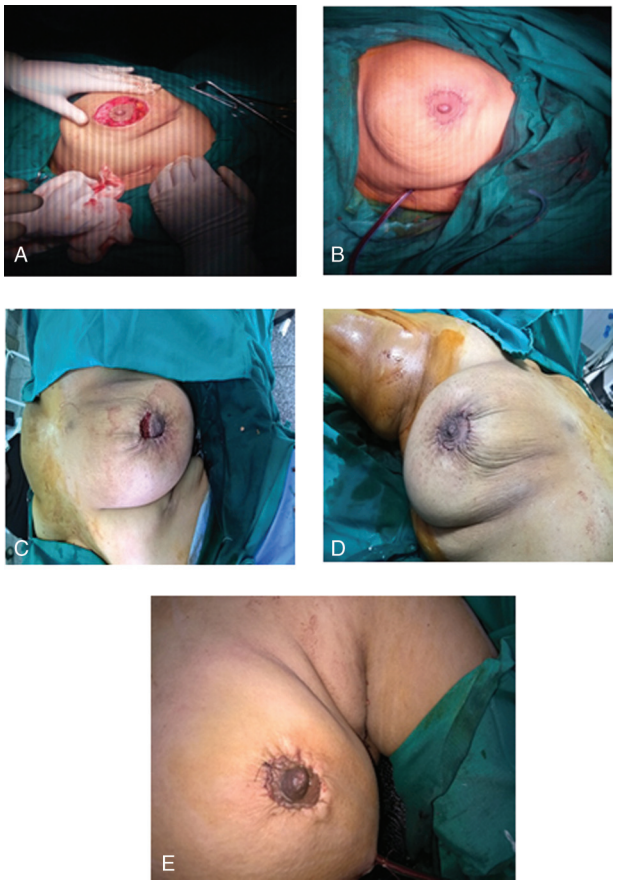
For axillary dissection, a separate incision was performed transversely, gently curved following a skin line, about two fingerbreadths inferior to the axillary skin crease, with adequate length for exposure, but not extending beyond the pectoral border anteriorly; extensions, if needed, were posterior (Fig. 11). Levels 1 and 2 axillary dissection was performed.

After inspecting the field for hemostasis, a suction drain was placed in the axilla. Skin incision was closed and confirmed to be air-tight by applying suction to the drain.

A dressing was applied; if needed, the thorax of the patient was wrapped in an elastic bandage to reduce the risk of hematoma formation and the patient was awakened and returned to the recovery room.

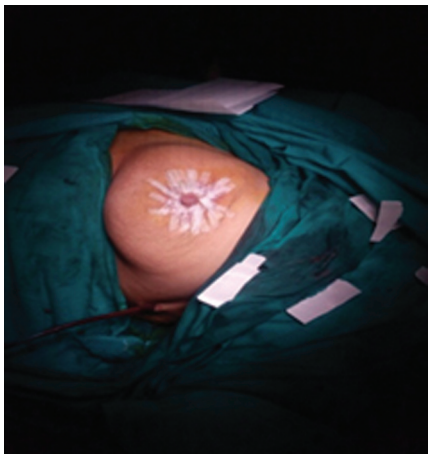
Patients were generally discharged the following day. Patients' discharge plan included an explanation of the importance of early signs of complication and action to be taken, arrangements for access to the team including a contact telephone number, and determination of

Figure 9



(a, c) A purse-string suture. (b, d, e) Closure of the dermis.

Figure 10



The final breast wound appearance with steri-strips over it.

Figure 11

Axillary incision.

the date of clinical visits. All patients were instructed on wound care, the drains were removed when 24-h drainage was less than 30 ml, and postoperative shoulder exercises were recommended.

Margin status was analyzed on the anterior side of the specimen (close to the breast skin), the posterior side of the specimen (close to the pectoralis major muscle), and on the lateral sides. Tumor sizes, as determined by the maximal histological size and margin widths, were measured by ocular micrometry.

For the purpose of this study, we used a 2-mm surgical margin on the lateral side of the specimen as the cut-off point for negative margins. Positive margins were defined as those with tumor cells directly at the cut edge of the specimen. Close margins were defined as those with tumor cells between the cut edge of the specimen and the boundary defined as negative (<2 mm).

Patients with free margins underwent full breast radiation therapy. The other adjuvant therapy lines including chemotherapy and hormonal therapy were decided by the oncology consultants according to the standard protocols.

Recording of outcome measures was performed, and included preoperative radiological and histological tumor size, tumor location, and postoperative histological data. The latter were of particular importance for the purpose of the study, and included the size of the breast glandular resection, the width of the nearest margins obtained (lateral, anterior, and posterior margins of the tissue specimen), the ratio of clear margins, and the number of patients who underwent secondary surgery (re-excisional surgery or radical mastectomy).

Data on hospital stay, overall postoperative complications, including both axillary and breast wounds, and short-term complications (during a 3-week postoperative period) were recorded for each patient. These complications included postoperative hematoma, surgical site infection, flap necrosis (partial skin necrosis, nipple necrosis), axillary or breast seromas, wound dehiscence, and delayed wound healing. All patients received radiotherapy and adjuvant chemotherapy according to the stage and type of tumor as scheduled.

All patients were evaluated for fat necrosis, cosmetic outcome, and symmetry completion of the radiotherapy course.

Six months postoperatively, all patients were evaluated in terms of the appearance of the breast scar, the presence and degree of breast fibrosis, breasts' asymmetry, and major deformities including the appearance of the inframammary fold, the presence and degree of skin retraction, and nipple areola complex position and shape (Fig. 12).

All patients were also evaluated in terms of reports of breast pain, presence of lymphedema, local recurrence, and metastasis every 3 months for 1 year and then after 6 months. Patient satisfaction was evaluated using subjective parameters as evaluated by patients 6 months after surgery, and then every 6 months for 1.5 years (answer and analysis) (Table 1).

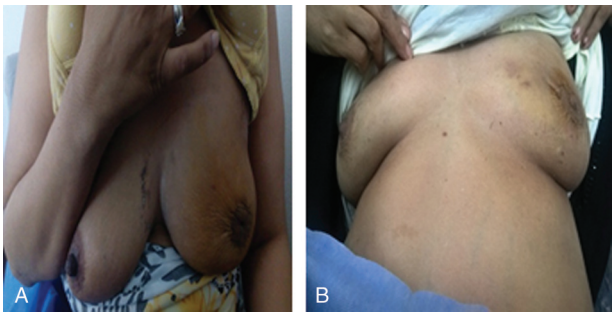
Follow-up and evaluation were carried out using assessment of history, physical examination, sonomammography, pelviabdominal ultrasound, computed tomography (CT) chest, CT brain, bone isotope, and laboratory investigation. Breast MRI, if local recurrence was suspected, and/or biopsy and histological examination were performed. Triphasic pelviabdominal CT was performed for patients with suspected visceral or peritoneal metastasis.

Results

The characteristics of the 60 patients who underwent surgical management of breast cancer using the round block technique are listed in Table 2. Their ages ranged from 31 to 60 years, with a mean age of 46.9 years. The mean BMI was 23.6 kg/m^2.

With regard to location of tumor, it was 31 in the left breast and 29 in the right breast. The tumor was located in the superior external quadrant in 22 (36.6%) patients, in the superior internal quadrants in six (10%) patients, in the inferior external quadrant in four (6.6%) patients, in the inferior internal quadrant in

Figure 12



Periareolar wound: (a) early postoperative, (b) 6 months postoperatively.

Table 1 List of questions of all evaluated parameters in terms of the side of surgery only as described by Eichlier *et al*. [12]

1	Evaluate the overall cosmetic outcome of your breast	On a scale from 1 to 5 (1: very satisfied, 5: very unsatisfied)
2	Are you satisfied with the appearance and amount of scar tissue?	
3	Do you like the current shape of the breast?	
4	Are you currently satisfied with the appearance of the breast?	
5	Are you currently satisfied with the size of the breast?	
6	Evaluate your current quality of life	
7	Has sensitivity changed in the nipple/areola complex, increased/decreased?	On a scale from 1 to 5 (1: very little/least amount, 5: a lot/largest amount)
8	Was there a significant amount of swelling in and around the breast area?	
9	Are you less likely to show yourself in public?	
10	Has your self-confidence level changed due to the surgery?	

Table 2 Characteristics of the patients included

	Mean±SD (range)/*n* (%)
Age (years)	45.5±10.25 (31–60)
BMI [weight/(height)^2]	24.55±5.20 (17.2–31.9)
Breast size	
Small	17 (28.33)
Medium	34 (56.66)
Large	9 (15)
Degree of ptosis	
No	10 (16.66)
Mild	25 (41.66)
Moderate	19 (31.66)
Sever	6 (10)
Distance from the nipple and areola complex (cm)	6.25±3.36 (1.5–11)
Radiological evaluation	
T1	28 (46.66)
T2	32 (53.33)
Tumor size	2.7±1.27 (0.9–4.5)
BI-RADS classification	
Grade 4	14 (23.3)
Grade 5	46 (76.7)
Preoperative Tru-cut biopsies	
Infiltrative ductal carcinoma	41 (68.33)
Infiltrative lobular carcinoma	5 (8.33)
Ductal carcinoma *in situ*	12 (20)
Mucinous carcinoma	2 (3.33)
The in-situ component	
No in-situ component	15 (25)
≤5%	20 (33.33)
>5–25%	25 (41.67)

eight (13.3%) patients, in the central quadrant between the superior quadrants in 11 (18.3%) patients, in the central quadrant between the internal quadrants in six (10%) patients, and in the central quadrant between the inferior quadrant in three (5%) patients (Fig. 13).

The distance from the nipple areola complex ranged from 1.5 to 11 cm, with a mean of 6.25±3.36 cm. On examination, 28 (46.7%) patients had palpable discrete suspicious axillary lymph nodes, whereas 32 (53.3%) patients had no palpable lymph nodes.

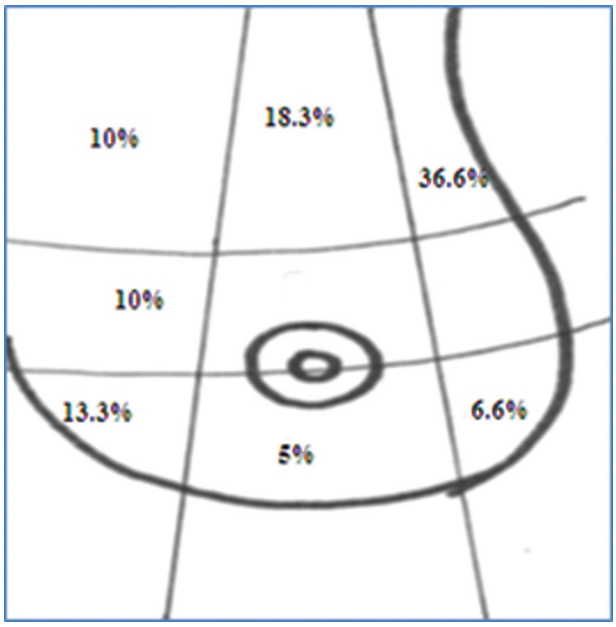
Radiological evaluation showed that the mean tumor size was 2.7±1.27 cm (range: 0.9–4.5 cm); with 46 (76.7%) patients had breast imaging radiology and data systems (BI-RADS) classification grade 5 and the rest of the patients (23.3%) had grade 4.

The operative time ranged from 95 to 145 min, with a mean of 120±17.68 min. The hospital stay ranged from 2 to 5 days, with a mean of 3.5±1.06 days.

The distribution of pathological results of the studied group is listed in Table 3.

Early follow-up of the patients indicated that three (5%) patients developed postoperative hematoma, two of them treated by aspiration and one requiring reoperation, two (3.33%) patients developed surgical site infection, one with moderate infection and the other with mild infection, whereas partial nipple/skin necrosis was encountered in one (1.66%) patient.

Figure 13



Tumor location.

Table 3 Pathological results' distribution of the studied group

Pathological results	Mean±SD (range)/*n* (%)
Intraoperative analysis of resection margins	
Negative	48 (80)
Close	9 (15)
Lateral	5 (8.33)
Posterior	3 (5)
Anterior	1 (1.67)
Positive (lateral margin)	3 (5)
Postoperative paraffin examination	
pT1N0	21 (35)
pT1N1	6 (10)
PT2N0	2 (3.33)
PT2N1	31 (51.67)
Tumor grade	
Grade I	6 (10)
Grade II	39 (65)
Grade III	15 (25)
Histological type	
Infiltrative ductal carcinoma	42 (70)
Infiltrative lobular carcinoma	5 (8.3)
Ductal carcinoma *in situ*	11 (18.3)
Mucinous carcinoma	2 (3.3)
Breast tissue resection size (cm)	
Length	8.5±2.12 (5.5–11.5)
Width	7.0±1.77 (4.5–9.5)
Height	4.75±0.88 (3.5–6)
Volume [(3.14/6)×histological size]	147.91±1.73 (–)
The latest excision margin (cm)	1.0±0.42 (0.4–1.6)
Hormonal receptors	
Estrogen	50 (83.33)
Progesterone	48 (80)
Her2/neu	6 (10)
Negative	4 (66.67)

Three (5%) patients showed delayed wound healing, with wound dehiscence in one (1.66%) patient. Postoperative breast seromas were encountered in six (10%) patients, whereas axillary seromas were reported in two (3.33%) patients (Table 4).

All patients received radiotherapy postoperatively. For 49 patients, the oncologists recommended chemotherapy; three these patients refused chemotherapy. Hormonal therapy was recommended for 56 patients. The time interval for the initiation of postoperative radiotherapy ranged from 14 to 42 days, with a mean of 28.0±9.9 days.

Six months postoperatively and after all the patients had completed their radiotherapy, their breast scars were evaluated according to their appearance; these ranged from good to poor, with fair value in-between (Poor indicated hypertrophied and contractured scar; fair indicated wide scar, poor color match, but without hypertrophy or contracture; whereas good indicated thin with good color match scar.).

Table 4 Short-term complications in our study

Short-term evaluation	Number of patients [*n* (%)]
Breast complications	
Hematoma	3 (5)
Infection	2 (3.33)
Partial nipple/skin necrosis	1 (1.66)
Delayed wound healing	3 (5)
Wound dehiscence	1 (1.66)
Seroma	6 (10)
Axillary wound seroma	2 (3.33)
Time to start postoperative radiotherapy (days)	28.0±9.9 (14–42)

A total of 50 (83.33%) patients showed good scar, 10 (16.66%) presented with fair scar, with five (8.33%) showing persistence of pleats, whereas no (0%) patient presented with poor scar. Two (3.33%) cases showed areola enlargement.

The breast asymmetry and major deformities were also evaluated at the same time using a scale that ranged from excellent (no asymmetry) to poor (breast asymmetry with major deformities); fair results were indicated by breast asymmetry without major deformities and good results were indicated by asymmetry with no deformities.

In this study, we noted that two (3.3%) patients showed poor symmetry, eight (13.33%) patients showed fair symmetry, 19 (31.7%) presented with good symmetry, whereas 31 (51.66%) showed excellent symmetry. One case (1.66%) showed ptosis recurrence, she had large breasts with severe ptosis.

Evaluation of the inframammary fold indicated that 55 (91.7%) patients presented with a defined and symmetrical inframammary fold, whereas five (8.3%) patients presented with a defined and asymmetrical inframammary fold.

Skin retraction and breast fibrosis were mild in eight (13.33%) patients, moderate in two (3.33%) patients, severe in two (3.33%) patients, and had not occurred in 48 (80%) patients. Nine (15%) patients developed ipsilateral upper limb lymphedema and two (3.33%) cases of fat necrosis were recorded.

According to results of the questionnaire used, 23 (38.33%) patients were very satisfied with the overall cosmetic outcome of their breasts, the appearance and amount of scar tissue, the current shape of their breast, the appearance of the breast, and the size of the breast, and in terms of their current quality of life, 29 (48.33%) were satisfied, three (5%) were fairly

Table 5 Short-term outcomes of our study and some other studies

References	Procedure	Complications
This study	Round block technique	Postoperative hematoma: 5% Infection: 3.33% Partial skin necrosis: 1.66% Delayed wound healing: 5% Wound dehiscence: 1.66% Axillary seroma: 3.33% Breast seroma: 10% Required reoperation: 1.66%
Clough *et al.* [5]	101 patients treated with reduction mammaplasty superior pedicle technique, reduction mammaplasty posterior pedicle technique, and other techniques	Postoperative hematoma: 2% Abscess: 2% Partial skin necrosis: 1% Delayed wound healing: 9% Axillary seroma: 4% Breast seroma: 1% Required reoperation: 4%
Giacalone *et al.* [18]	31 patients treated with reduction mammaplasty without specification of the pedicle and round block technique used43 patients treated with quadrantectomy	Postoperative hematoma: 6% Partial skin necrosis: 68% Delayed wound healing:16% Postoperative hematoma: 7% Delayed wound healing: 2%
Giacalone *et al.* [18]	39 patients treated with doughnut mastopexy lumpectomy8 8 patients treated with standard lumpectomy	*Doughnut mastopexy group*: Postoperative hematoma: 1 patient Partial nipple necrosis: 1 patient Delayed wound healing: 2 (5.1%) patients *Standard lumpectomy group*: Postoperative hematoma: 1 patient Delayed wound healing: 3 (3.4%) patients
Gulcelik *et al.* [24]	101 patients underwent reduction mammaplasty inferior pedicle technique and reduction mammaplasty superior pedicle technique	Postoperative hematoma: 2% Surgical site infection: 3% Partial skin necrosis: 1% Dehiscence: 4% Breast seroma: 5%
Meretoja *et al*. [3]	90 patients underwent nipple–areolar complex centralization or elevation, glandular rotation technique, reduction mammaplasty	Postoperative hematoma: 3% Surgical site infection: 13% Delayed wound healing and required reoperation: 9%
Rietjens *et al*. [25]	148 patients underwent reduction mammaplasty superior pedicle technique, reduction mammaplasty inferior pedicle technique, round block technique, latissimus dorsi myocutaneous flap and reconstruction with silicone implant	Postoperative hematoma: 3% Surgical site infection: 5% Partial skin necrosis: 1%
Rusby *et al*. [26]	110 patients underwent latissimus dorsi myocutaneous mini flap	Unspecified: 3%
Yang *et al*. [9]	58 patients with Superiorly located breast cancers underwent the round block technique, batwing mastopexy, the tennis racket method, glandular rotation technique, and parallelogram mastopexy	Partial skin necrosis: 2% Dehiscence: 3%
Benelli [27]		Hematoma: 1.7%

(*Continued*)

Table 5 (*Continued*)

References	Procedure	Complications
	340 cases of mastopexies, Reduction, or Augmentation	
		Infections: 0.8%
		Skin flap partial necrosis: 0.8%
		Total or marginal areola necrosis: 0.0%
		Seroma: 0.2%
Rose *et al*. [14]	72 patients with 74 breast cancers underwent both volume-replacement and displacement oncoplastic surgery	*Patients needed secondary surgery because of hematoma*:
		In reconstruction site: 5.4%
		In the contralateral breast: 4.1%
		Axilla: 2.7%
Ogawa [21]	18 patients, 11 of these underwent the modified round block technique (of these 2 had large breasts) and 7 underwent the round block technique	Modified round block technique group: no patient experienced any complications
		Round block technique group: 4 patients had blood flow insufficiency in part of the nipple areola complex
Tenofsky *et al*. [15]	In the oncoplastic group: 58 patients	*In the oncoplastic group*:
		Hematoma: 17.2%
		Infection: 8.6%
		Nipple necrosis: 0%
		Wound dehiscence: 6.9%
		Nonhealing wound: 8.6%
		Seroma: 17.2%

satisfied, four (6.66%) were unsatisfied, and one (1.66%) was very unsatisfied.

Sensitivity in the nipple–areola complex showed very little change in 17 (28.33%) patients, little change in 26 (43.33%) patients, average change in 11 (18.33%) patients, considerable change in four (6.66%) patients, and marked change in two (3.33%) patients. There was very little swelling in and around the breast area in 18 (30%) patients, little swelling in 29 (48.33%) patients, fair amount of swelling in six (10%) patients, considerable swelling in four (6.66%) patients, and marked swelling in three (5%) patients.

In terms of 'less likely to show herself in public' and 'changes in self-confidence levels because of the surgery', 52 (86.66%) patients reported very little change, five (8.33%) patients reported a slight change, three (5%) patients a fair degree of change, and no (0%) patient considerable or marked change. There were reports of breast pain in three (5%) patients. No local recurrence or metastasis was recorded in the first 6 months.

Follow-up of all the patients was performed for another 6 months every 3 months, and then after 6 months for local recurrence and distance metastasis. Every patient was evaluated by clinical examination and sonomammographic examination; MRI was required in seven (11.66%) patients with suspected recurrence. Biopsy was needed in two (3.33%) suspected lesions. No case of local recurrence or metastasis was recorded during the period of study.

Discussion

In this descriptive analytical study, 60 patients presented with early breast cancer (T1–2, N0–1, M0) and were treated by the standard round block technique to evaluate the use of this technique in surgical treatment of early breast cancer.

The mean age of the patients was 45.5±10.25 years, which was relatively lower than the mean age of the patients who participated in the study carried out by Rose *et al.* [14], which was 53 years, ranging between 31 and 69 years. Moreover, the mean age was higher in some studies such as that carried out by Tenofsky *et al.* [15], which was 60.9± 11.8 years, with a range of 35–85 years. The mean age of the patients was 53.3±8.8 years in the mastopexy group in the study carried out by Eichlier *et al*. [12].

Relatively younger age of the included patients increased the cosmetic and aesthetic demands. This made patient satisfaction a more challenging goal [16].

In our study, the mean BMI was 24.55±5.20 kg/m^2 (range: 17.2–31.9 kg/m^2); this is in agreement with the BMIs in the studies carried out by Kim *et al.* [17] (23.2±2.5 kg/m^2) and the doughnut mastopexy lumpectomy group in the study carried out by Giacalone *et al.* [18] and Dua and Smith [19] (23.7 ±4.4 kg/m^2). It should be noted that high BMI, together with the presence of other comorbidity and chronic illness, were found in most patients with early complications, in addition to the direct impact of obesity on the final aesthetic results of the procedure.

In terms of breast size, it was estimated roughly using the clinical norm 'a small breast measures up to 250 cm^3, a medium one measures 250–500 cm^3, and a large one measures 500 cm^3 or more' [20].

Our study included nine patients with large breasts, four with severe ptosis and five with moderate ptosis. An attempt was made to evaluate the use of the round block technique in patients with large breasts as most previous studies such as the study carried out by Chen [20] only included patients with small-sized to medium-sized breasts.

In our study, among the nine patients with large breasts, all patients with severe ptosis (four patients) developed early postoperative complications, with two (50%) of them developing only breast seroma, which was associated with excision of large tissue volume, one (25%) patient developing only axillary seroma, and the last patient (25%) showing surgical site infection.

By contrast, moderate-sized to large-sized breasts were found to have poor outcomes because of asymmetrical breast size caused by a shrinking volume if the excision volume was more than 20%. However when the form of the breast is kept beautiful even when the size of the left and the right breast differ considerably, the patient satisfaction can be high. Therefore, patients with moderate-sized to large-sized breasts may also be indicated for these techniques [21].

As reported by Rose *et al.* [14], the tumor size itself does not have any impact on the decision to perform an immediate partial reconstruction. Rather, the size of the tumor relative to the affected breast, that is, the size of the defect after tumor resection in relation to the size of the breast, determines whether an immediate partial reconstruction is feasible. If so, the location of the tumor also has to be taken into consideration [14,16].

In this study, the mean tumor size ranged from 0.9 to 4.5 cm, with a mean of 2.7±1.27 cm, in agreement with the size reported for Egyptian patients of 2.9 cm [22].

From these data, it could be concluded that this technique is considered in cases of breast cancer whose excision volume is up to 20% in the upper portion. However, because small-sized to moderate-sized dense glandular breasts can be mobilized easily by advancing the breast tissue into the excision cavity without the risk of creating fat necrosis or increasing the rate of complications, the cosmetic results may be relatively good if the excision volume is more than 20% in such cases [21].

In this study, the tumor distance from the nipple and areola complex ranged from 1.5 to 11 cm, with a mean of 6.25±3.36 cm; this was higher than those of patients included in the study carried out by Chen [20] (2–6 cm apart from the center of the nipple) and also that reported by Giacalone *et al.* [18], where the average distance of the tumor from the areola was 4.72 cm, aiming at the evaluation of the efficacy of the procedure in patients with distant lesions from the nipple areola complex.

The incidence of positive axillary nodes was 61.66%, which is almost identical to the reported incidence in breast cancer in Egypt (63%) [23].

In this study, we encountered early wound complications in 10 (16.66%) patients. Three (5%) of these patients developed postoperative hematoma; two were treated by aspiration and one required reoperation. On the second day postoperatively, she also developed partial nipple necrosis and delayed wound healing later on. We found that two (3.3%) patients had other comorbidities (chronic liver disease and diabetes mellitus), and the third patient had a large-sized breast with moderate ptosis with BMI of 32 kg/m^2.

The incidence of postoperative hematoma was higher than that reported in the studies of early complications listed in Table 5, but it was lower than the incidence of postoperative hematoma reported – in both oncoplastic and quadrantectomy groups – by Giacalone *et al.* [18]. The incidence of postoperative hematoma was lower in patients who underwent the round block technique

than those underwent other techniques of oncoplastic breast surgeries. It was found that good hemostasis and the use of aspiration drain can avoid postoperative hematoma formation, especially in patients who required excision of large tissue volume. However, axillary seromas were reported in two cases despite the routine use of a suction drain in the axillar wound.

In the current study, two (3.33%) patients developed breast surgical site infection, one had moderate infection and the other had mild infection, whereas partial nipple necrosis was encountered in one (1.66%) patient. The patients who developed surgical site infection had high BMI (31–33 kg/m^2) with large breasts, and one of them had severe ptosis. Comorbidities were presented in both patients; one patient had diabetes mellitus, while the other one had chronic liver disease along with diabetes mellitus.

The patient with partial nipple necrosis had large breast resection tissue size (10×9×4 cm) with a mass located 2 cm from the nipple areola complex, in addition to chronic illness (chronic liver disease and diabetes mellitus); this patient also showed delayed wound healing.

In comparison with the incidence of surgical site infection reported in the listed studies in Table 5, it was almost identical to that reported by Clough *et al.* [5] and lower than the incidence reported by Gulcelik *et al.* [24], whereas it was higher than that reported by Benelli [27].

The incidence – reported in the listed studies in Table 5 – of partial nipple–skin necrosis was nearly identical to that reported in six of the listed studies, whereas it was much lower than that reported by Giacalone *et al.* [18] and Ogawa [21].

In our study, three (5%) patients showed delayed wound healing, with two of them associated with large breast tissue volume and one with a large breast size with severe ptosis. Mild wound dehiscence was reported in one (1.7%) patient. All these patients had other chronic illnesses.

Postoperative breast seromas were encountered in six (10%) patients; all of these were associated with excision of large breast tissue volume, and large-sized breasts were found in three of these patients, with two patients with severe ptosis with a tumor located 9 and 11 cm from the nipple areola complex, which required excessive dissection and excision of large tissue volume. These were lower than the results reported by Tenofsky *et al.* [15]. However, axillary seromas were reported in only two (3.3%) patients; this was associated with the routine use of suction drain in the axillary wound.

In our study, only one (1.7%) patient required reoperation; this was much lower than that reported by Clough *et al.* [5] and Meretoja *et al.* [3]. Both used oncoplastic techniques not including the round block technique.

We found that the round block technique required lower operative time and hospital stay than other oncoplastic techniques as most of the comparable studies had used oncoplastic techniques other than the round block technique.

We found that as the breast wound was confined only to the periareolar area, which requires short time to heal, and patients could start adjuvant treatment as early as possible.

In this study, the intraoperative frozen sections showed that the lateral margin was close in five (8.3%) patients and positive in three patients (5%); four of these patients had small-sized breasts and relatively large tissue was excised. The posterior margin was close in three (5%) patients; in two cases, the tumor was located 9 and 11 cm in the outer and inner upper quadrants, respectively, with large breast sizes in both, whereas the anterior one was close in one (1.66%) patient with a tumor located 9 cm in the upper outer quadrant. All these patients needed further resection of the safety margin intraoperatively, with negative margins after resection. The breast tissue resection size ranged from 5.5 to 11.5 cm in length, 4.5–9.5 cm in width, and 3.5–6 cm in height, with an average volume of 147.9 ±1.73 cm. The latest excision margin was 0.4–1.6 cm, with a mean of 1.0±0.42 cm [26].

These results was comparable to the results reported by Giacalone *et al.* [18] in terms of the lateral margins; they reported 13% positive cases in the doughnut mastopexy lumpectomy group, which was nearly equal; however, it was lower than that reported as regard to the anterior and posterior margins, which were 2.5 and 10%, respectively [18].

In our study, two (3.33%) cases of fat necrosis were recorded; one of these required resection of large tissue sizes and the other one required reoperation for hematoma evacuation. This was comparable to the incidence reported by Clough *et al.* [5], which was 3%, and 1.7% by Benelli [27].

In terms of the assessment of aesthetic outcomes, in our study, evaluation of the breast scar indicated that 50 (83.3%) patients showed good scar, 10 (16.7%) showed fair scar, with five patients with persistence of pleats, and no patient presented with poor scar. Two cases showed areola enlargement.

In terms of the breast asymmetry and major deformities, we noted that two (3.3%) patients showed poor symmetry, both of them had large breasts with severe ptosis, eight (13.3%) patients showed fair symmetry, 19 (31.7%) showed good symmetry, and 31 (51.7%) showed excellent symmetry. One case developed recurrence of ptosis, she also had large breasts with severe ptosis.

Evaluation of the inframammary fold indicated that 55 (91.7%) patients presented with a defined and symmetrical inframammary fold, whereas five (8.3%) patients had a defined and asymmetrical inframammary fold; in these cases, excision of relatively large tissue volume was performed with all lesions located in the inferior quadrants.

Skin retraction and breast fibrosis was mild in eight (13.4%) patients, moderate in two (3.3%), severe in two (3.3%), and did not occur in 48 (80%) patients. Nine (15%) patients developed ipsilateral upper limb lymphedema.

These results were comparable to those reported by Chan *et al.* [28], who treated patients by oncoplastic techniques without including the round block technique; according to which the results of the cosmetic surgery in surgeon's opinion were nearly identical in 41%, slightly identical in 48%, and clearly different in 11%.

These results were also comparable to those reported by Yang *et al.* [9], who reported excellent in 31%, good in 52%, fair in 15%, and bad in 2% with regard to surgeon evaluation and excellent in 38%, good in 45%, fair in 15%, and bad in 2% with regard to patient evaluation. However, Meretoja *et al.* [3] reported acceptable cosmetic results in 84% of their patients.

Veiga *et al.* [29] reported higher scores for the oncoplastic group than the breast conservative therapy group. Moreover, Clough *et al.* [5] reported a hypertrophied scar in 3%, breast fibrosis in 3%, and fat necrosis in 3% of patients.

In the current study, cases with small-sized to medium-sized breasts with up to moderate ptosis showed the best results in terms of asymmetry.

In this study, evaluation of patient satisfaction showed that 23 (38.3%) patients were very satisfied with the overall cosmetic outcome of their breasts, the appearance and amount of scar tissue, the current shape of the breast, the appearance of the breast, the size of the breast, and current quality of life, 29 (48.3%) were satisfied, three (5%) were fairly satisfied, four (6.7%) were unsatisfied, and one (1.7%) was very unsatisfied.

We used the list of questions on all evaluated parameters conducted by Eichlier *et al.* [12].

This was comparable to the results of the study carried out by Chan *et al.* [28], in which 60% of patients were very satisfied, 34% were satisfied, 5% were acceptable, and 1% was dissatisfied.

Sensitivity in the nipple–areola complex showed very little change in 17 (28.3%) patients, little change in 26 (43.3%) patients, average change in 11 patients (18.3%), considerable change in four (6.7%) patients, and marked change in two (3.3%) patients. There was very little swelling in and around the breast area in 18 (30%) patients, little swelling in 29 patients (48.3%), fair amount of swelling in six patients (10%), considerable swelling in four patients (6.7%), and marked swelling in three (5%).

As regard to 'less likely to show herself in public' and 'changes in self-confidence levels because of the surgery', 52 (86.7%) patients reported very little change, five patients (8.3%) reported little change, three (5%) reported a fair amount of change, and no patient reported considerable or marked change.

Analysis of the questionnaire showed that as poor cosmetic results after breast surgery are a very undesirable outcome, especially for younger women who have high expectations and active social lives, the round block technique usually uses optimal one-stage glandular reconstruction, which is well accepted by younger women. This was supported by the relatively high satisfaction score in relation to the patients' age group included in the current study (mean: 45.5±10.25 years).

The local recurrence rate after oncoplastic breast surgery has not been studied thoroughly as yet. Most of the available studies on oncoplastic breast surgery have shortcomings in their methodology, which undercuts their conclusive robustness. However, a number of studies have reported a 0–7% local recurrence rate after up to 54 months of

follow-up. Studies on the long-term outcomes after oncoplastic breast surgery are not available, but the local recurrence rate of 0–1.8% per year for oncoplastic breast surgery on intermediate follow-up suggests that these techniques are associated with low local recurrence rates [30].

Summary and conclusion

The primary goal of tumor excision using breast-conserving surgery is to achieve tumor-free resection margins, although an important secondary goal in breast-conserving surgery is to achieve a satisfactory cosmetic outcome, a factor crucial to patient satisfaction and quality of life.

To improve the aesthetic results of breast-conserving therapy, a variety of surgical procedures have been developed, encompassed in the term 'oncoplastic surgery'.

Oncoplastic surgery refers to several surgical techniques by which segments of breast tissue are removed to achieve wide margins around the tumor while the remaining glandular tissue is transposed to achieve the best possible aesthetic outcome.

Oncoplastic breast surgery is based on two broad techniques: volume-displacement and volume-replacement techniques.

The round block technique is one of the volume-displacement techniques for mammaplasty that restricts the scar to the areola. It can compensate for the disadvantages of periareolar incision with a wider skin incision that enables easy access to tumors with almost the same short periareolar scar.

In this study, we focused on the use of the round block technique in conservative oncoplastic surgical treatment of breast cancer in terms of oncological safety, efficacy, final cosmetic results, effect on quality of life and patient satisfaction, and advantages and disadvantages.

It is suitable for all patients who are candidates for conservative breast surgery, especially patients with small-sized to medium-sized breasts without major ptosis and who may not require contralateral breast surgery for symmetrization and those with periareolar lesions.

With some modifications, this can be a useful oncoplastic technique in patients with small areolae and/or when the tumor location is distant from the nipple, and for patients with large-sized breasts.

Periareolar de-epithelialization, which is a fundamental step in this technique, provides a large operative area and a final aesthetically acceptable periareolar scar. This surgical exposure was performed with a rate of early postoperative complications lower than that recorded by other oncoplastic techniques.

The round block technique allows larger superficial dissection and finally yields greater volume tissue resection with lower incidences of positive margins than other conservative and oncoplastic techniques.

The rate of long-term complications was comparable to or lower than that reported in many studies carried out using various conservative and other oncoplastic techniques, with better scar outcomes, and less fibrosis and fat necrosis, better symmetrization, especially in small-sized to medium-sized breasts without major ptosis, and who may not require contralateral breast surgery for symmetrization.

In addition, this technique – which usually uses optimal one-stage glandular reconstruction with the production of a discreet scar and a more regular breast contour – is well accepted by patients, with an acceptable rate of satisfaction.

Obviously, a large controlled trial with a longer follow-up duration is needed to confirm the long-term oncological safety of the procedure.

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Conflicts of interest

There are no conflicts of interest.

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