

Central round block repair of large breast resection defects: oncologic and aesthetic outcomes

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Background: The central round block repair is a volume displacement technique to reconstruct large wide local excision (WLE) defects in breasts with moderate ptosis or hypertrophy. There are limited published data on the outcomes of this technique.

Methods: Data were collected prospectively for 57 consecutive patients and follow up information obtained from patient records. The volume of breast resection was estimated geometrically from mammography. Aesthetic outcomes were assessed from clinical measurements and panel review of patient photographs.

Results: The median age was 51 [22–86] years and follow-up 5 (1.9–8.4) years. The median specimen resection weight was 50 [25–361] g and tumour size 25 [10–75] mm. Estimated volume of breast excised was 17.8% (6–31%). In total, 12/57 patients had incomplete margins: five patients had re-excision to achieve clear margins and seven required mastectomy. Two patients had local recurrence during the follow-up period, five developed distant metastases. Aesthetic data were completed for 35/50 patients. Twelve (34%) had no measurable asymmetry and 31 (89%) had a nipple position within 2 cm of the original height. Only two patients requested symmetrising surgery.

Conclusions: Central round block reconstruction of large defects after WLE is a safe technique with good aesthetic outcomes. Contralateral symmetrising surgery is not usually required.

Keywords: Oncoplastic; breast; cancer; mammoplasty; round

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Introduction

In contemporaneous practice 70% of women are suitable for wide local excision (WLE) followed by radiotherapy, which has been shown to be as effective as mastectomy in treating early breast cancer (1,2). Involved margins are a risk factor for local recurrence and acceptable rates of local recurrence for all breast cancer surgery are considered to be less than 3–5% at 5 years in the UK (3). Despite careful planning, up to 30% of WLEs lead to close or involved margins where further surgery for re-excision or mastectomy is then

required (4–6). With continued improvement in patient survival following effective breast cancer treatment, patient expectation of good long-term cosmetic outcomes has also increased significantly.

Oncoplastic surgery has evolved as a hybrid of oncologic and plastic surgery techniques (7,8). Larger tumours can be excised with immediate repair allowing breast conservation in comparatively smaller breasts, potentially reducing margin involvement, whilst facilitating superior cosmetic outcomes. These techniques offer an alternative to mastectomy in patients that would have previously

been denied breast conservation (9,10). A range of volume displacement techniques can be used to correct defects of up to 20% of breast tissue loss. Therapeutic reduction mammoplasty usually permit the greatest amount of volume displacement to correct large defects relative to breast size (7,8,11,12). Where resection requires less than 20% of the breast volume to be excised, skin excision is unlikely to be necessary (13). When the breast volume excised exceeds 20%, a formal mammoplasty incorporating skin excision is generally required (13).

The central round block repair is a volume displacement technique with varying amount of skin adjustment to take into account the volume loss or skin reduction requirement in breasts with low to moderate ptosis and hypertrophy. This modification of the circumareolar mammoplasty described by Benelli (14) has been adapted as an oncoplastic procedure (15-17). More recently, the technique has been applied in Asian women with smaller breast volumes in Japan (18), Korea (19) and Taiwan (20).

There are currently limited data on the likelihood of involved margins at primary resection, long-term oncological safety, aesthetic outcomes or the frequency of contralateral symmetrising surgery required following a round block repair of WLE defects. The aim of this study was to review a single institution's experience of central round block repair and assess surgical, oncological and aesthetic outcomes.

Methods

A clinical audit with ethical committee approval (reference SAG30) of 57 consecutive patients in a single tertiary referral institution were included. All patients underwent a central round block repair of WLE defects over a 4-year period from January 2008 to January 2012. Patients with a median follow-up of 5 years (range, 1.9–8.4 years) were included. Patients were selected based on the size of the tumour in relation breast volume and position. All were advised that a simple resection and advancement/rotation glanduloplasty alone would have left a significant residual contour deformity with excess skin envelope laxity. Every woman would have been suitable for a therapeutic reduction mammoplasty but the aim was to perform a simpler procedure with less scarring and to reduce the need for symmetrising surgery. Patients were excluded if they chose to have a therapeutic reduction mammoplasty (n=12) or a mastectomy (n=4) instead of the suggested round block technique.

Patients who needed further surgery for close or involved margins either had further margin resection or completion mastectomy. Adjuvant therapy recommendations were based on the final surgical pathology. All complications and their treatment along with secondary procedures to either the ipsilateral or contralateral breast were recorded. Complete data on oncologic outcomes of local recurrence and overall survival were obtained by case note review of the institutional electronic patient record.

Operative technique (Figure 1)

The required excision was planned preoperatively depending on the size and location of the tumour. A concentric circumareolar ring was marked and de-epithelialized to reduce the skin envelope sufficiently to account for both the reduction in volume as a result of the excision and any additional cosmetic benefit from a skin tightening mastopexy. A spherical block of tissue was removed from the subcutaneous fat down to the pectoral fascia with the intention of a 1 cm macroscopic margin. Excising this tissue as a radially orientated ellipse of parenchymal tissue may facilitate closure (Figure 1A). Any glandular dog-ears arising were excised under the skin flaps when closing if required.

For the repair, adjacent breast skin was widely undermined in the mastectomy plane between the subcutaneous fat and the breast parenchyma at the level of the superficial fascia. The parenchymal breast tissue was mobilised in the pre-pectoral plane (Figure 1B). As much as half of the breast may need to be undermined to facilitate sufficient mobilisation of the underlying glandular tissue and to facilitate re-draping of the tightened skin envelope. The 2-0 monocryl sutures were used to close the parenchymal defect radially and re-cone the breast tissue (Figure 1C). This can be used for all peripheral tumours. Central tumours may require a tri-radiant or "Mercedes-Benz" closure, excised initially as a cylinder and closed as appropriate. The skin was then re-draped accounting for contour irregularities. The dermis was closed with deep, buried, interrupted 2-0 vicryl-plus and a continuous subcuticular suture with 3-0 monocryl, reinforced by tissue glue and covered by water-resistant dressings (Figure 1D). Patients were treated as day cases and no drains were required.

Estimated volume of breast volume resected

Preoperative mammograms were reviewed and the

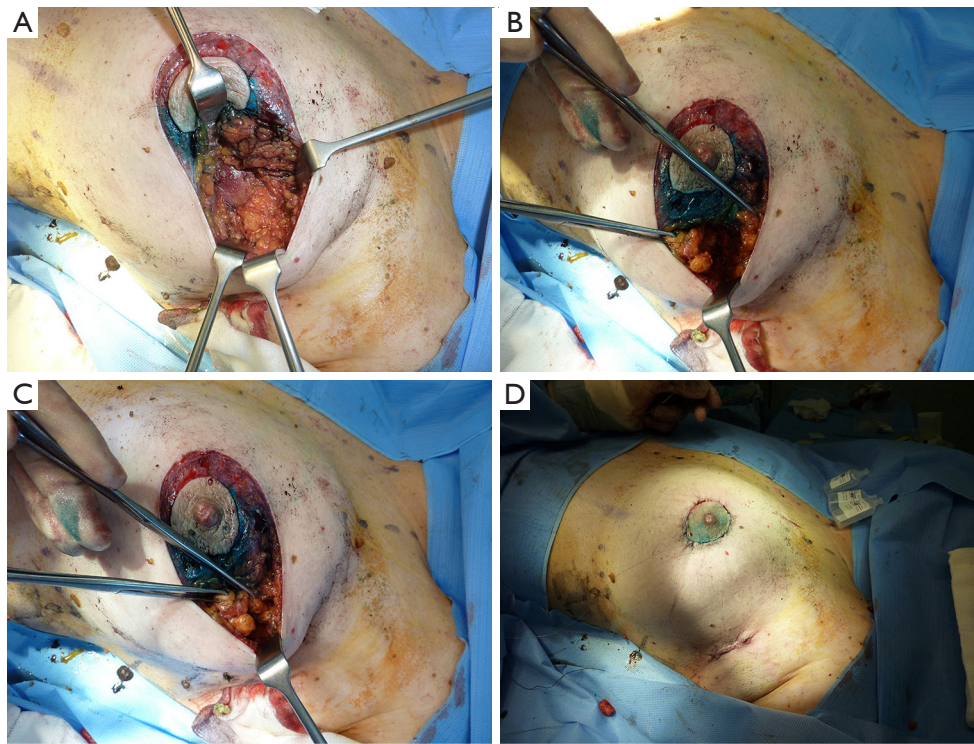


Figure 1 Operative technique. (A) WLE defect through de-epithelialised concentric circumareolar ring; (B) glandular flaps raised; (C) glandular flaps closed; (D) skin closure. WLE, wide local excision.

estimated percentage of breast volume resected calculated using a method previously described by Katariya *et al.* (21) and validated previously in the assessment of cosmetic defects after breast conservation surgery by Cochrane *et al.* (22). In brief, the estimate assumes the tumour to be a sphere and the estimated macroscopic resection undertaken with a planned 1 cm margin. The formula used to calculate this from the MLO view was $4/3\pi r^3$. The breast volume was estimated to be a cone based on the formula $1/3\pi R^2h$. Resolving this equation gave an estimated percentage of breast volume excised of $4\pi r^3/\pi R^2h$ where r = tumour radius +1 cm, R = breast radius and h = breast projection.

Photographs

Three observers evaluated patients' photographs, taken at their last follow-up appointment, in frontal views with arms in the neutral position on the hips (*Figure 2*), with arms raised and in profile. The three assessors were two surgeons (GP Gui and J Lee) and a specialist nurse practitioner (M Concepcion). Patients were assessed for shape, cleavage, scar visibility, volume deficit symmetry using a Likert scale

scored for poor, fair, good and excellent. As there were three observers, the median score was used, thus accounting for any non-concordance between the three assessors for each parameter evaluated in individual patients

Measurements

Sternal-notch-nipple distances with the hands on the hips were measured as an indicator of deviation of symmetry between the index and contralateral side in the neutral position. Sternal-notch-nipple distances were also measured with arms above the head. Measurements were taken pre-operatively and at their latest follow-up appointment. Both measurements were recorded and related to the site of tumour resection within the breast and the volume of excision as an indicator of factors that might influence symmetry after surgery.

Results

The median patient age at time of surgery was 51 (range, 22–86) years. The median follow-up duration was 5 (range, 1.9–8.4) years. The median specimen weight resected was

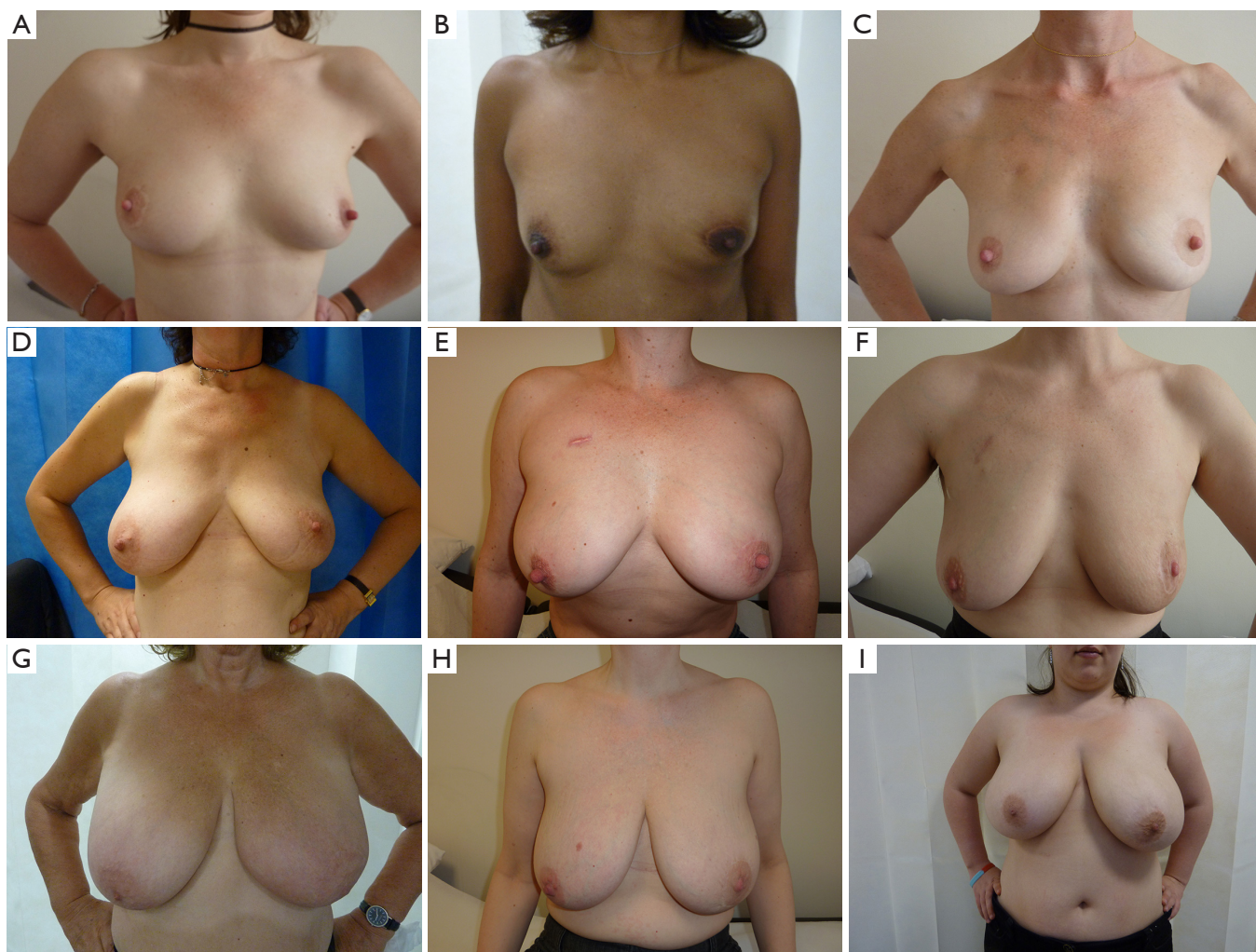


Figure 2 Post-operative photographs of patients with a range of breast size and ptosis: (A-C) small breasts; (D-F) medium breasts; (G-I) large breasts.

50 (range, 25–361) g and the median tumour size resected was 25 (range, 10–75) mm. The patient demographics and tumour profiles are summarized in *Table 1*. The median diameter of the estimated resection was 4.8 cm (range, 3.0–9.4 cm) and the median estimated percentage volume of breast excised using mammographic geometric estimation was 17.8% (range, 6–31%).

Three clinically significant seromas occurred. One was treated successfully by aspiration, one became infected that required intravenous antibiotics and the third developed an encapsulated seroma that was subsequently excised. Seven patients reported swelling attributed to a small seroma on ultrasound scan that could not be delineated clinically and was managed conservatively. All of these settled

spontaneously with no further intervention. There were two other infections defined by mild erythema which required antibiotics and one patient had a small superficial wound dehiscence. All of these were managed conservatively. One patient had persistent pain in the breast at 2 years and one patient developed limited shoulder abduction requiring prolonged physiotherapy.

In total, 12/57 patients required further surgery for close margins clear by less than 2 mm (95% CI, 12–33). Five patients proceeded to successful wider re-excision and seven women had a completion mastectomy, usually for multiple involved margins.

There were two local recurrences in the follow-up period. One of these occurred in a patient who had declined

Table 1 Demographics of study population (N=57)

Demographics	n
Age, median [range] years	51 [22–86]
Tumour size, median [range] mm	25 [10–75]
Tumour vertical position in breast	
Medial	10
Central	8
Lateral	17
Tumour horizontal position in breast	
Upper pole	20
Central	9
Lower pole	6
Cancer	
Invasive	51
DCIS	4
Phyllodes tumour	2
Invasive cancer grade	
I	6
II	23
III	22
DCIS grade	
High	3
Intermediate	1
Malignant phyllodes tumour	1
Borderline phyllodes tumour	1
Invasive cancer type	
IDC	45
Mixed IDC and ILC	3
ILC	2
Medullary cancer	1
Lymph node	
Negative	35
Positive [†]	19
Not done [‡]	3
ER positive (of invasive cancers)	38/51 (75%)
Her-2 positive (of invasive cancers)	8/51 (16%)

Table 1 (continued)**Table 1** (continued)

Demographics	n
Adjuvant therapies	
Radiotherapy	49
Adjuvant chemotherapy	20
Neoadjuvant chemotherapy	11
Herceptin	8
Endocrine therapy	38

[†], patients with positive nodes had axillary dissection surgery;
[‡], axillary staging was not routinely performed in patients undergoing surgery for DCIS.

the recommended adjuvant breast radiotherapy. Five patients developed distant metastases (one lung, one brain, one liver, one bone and one bone with brain), four of whom died from their disease. One patient died from other causes.

Aesthetic outcomes were evaluated in 50/57 patients after excluding the seven patients who required a mastectomy. No patient had clinically significant asymmetry pre-operatively. There was incomplete data for photographic assessment in 14 patients. The median of all three observers assessing photographic outcome is shown in *Table 2*. There was no statistical significant difference in symmetry between the location in the breast of tumour resection, with similar proportions of poor and good outcome assessed using Fisher's exact test (data not shown).

Patients' sternal notch-to-nipple distance were measured with the arms in the neutral position and with the arms above the head. Data were available from 35 patients and showed no significant differences in nipple height between the operated and non-operated sides. There was no measurable asymmetry in any parameter in 12 patients (34%). The 31/35 (88.6%) of patients had a final nipple position to match the unoperated contralateral side for symmetry within 2 cm (*Table 3*). In those where there was a measurable difference, only two elected to have surgery to the contralateral side for symmetry, with no patients planning or awaiting further secondary surgery at the time of census.

The sector of the breast involved was assessed as a factor contributing to measured differences in sternal notch to nipple distances. There was a small statistically significant difference in sternal notch-nipple distance if the tumour was located in the upper rather than the central/lower

Table 2 Average score of assessment of patient photographs (N=36) by three observers directed at specific breast characteristics, sequelae of surgery and symmetry on a four-point Likert scale

Variables	Poor, n	Fair, n [%]	Good, n [%]	Excellent, n [%]
Ipsilateral shape	0	1 [3]	4 [11]	31 [86]
Cleavage	0	0	1 [3]	35 [97]
Scar visibility	0	2 [6]	9 [25]	25 [69]
Dent visibility	0	3 [8]	4 [11]	29 [81]
Symmetry	0	5 [14]	16 [44]	15 [42]

Table 3 Aesthetic outcome determined by differences in sternal-notch to nipple measurements in cm between the operated and non-operated sides

Variables	Difference arms neutral	Difference arms up
N	35	35
Mean difference	0.94	1.13
Standard deviation	1.59	1.33
Median difference	0.50	1.00
Minimum difference	-2.0	-1.0
Maximum difference	5.0	5.0
No measurable diff (0)	12 (34%)	12 (34%)
Index breast lower (0-2 cm)	3 (9%)	2 (6%)
Index breast lower (>2 cm)	0 (0%)	0 (0%)
Index breast higher (0-2 cm)	16 (46%)	14 (40%)
Index breast higher (>2 cm)	4 (11%)	7 (20%)

horizontal sectors of the breast which resulted in the nipple on the index side being slightly higher ($P=0.038$, Kruskal-Wallis test).

Discussion

A recent systematic review by Haloua *et al.* (23) identified 12 publications between 2000 and 2011 assessing oncoplastic breast surgery that fulfilled adequate criteria for analysis (19,24-34). No randomized controlled trials were identified. In these studies, 80% to 93% of patients had invasive tumors; cancer-free resection margins were observed in 78% to 93%, resulting in a 3% to 16% mastectomy rate. Local recurrence rates were 0% to 7%. Good cosmetic outcomes were achieved in 84% to 89% of

patients. The authors commented that most studies showed significant weaknesses including lack of robust design and methodological shortcomings. Well-designed prospective longitudinal studies with adequate follow-up are the only realistic way in which critics, who remain unconvinced by the existing data over three decades of oncoplastic surgery may be silenced (35-39).

Breast conservation surgery is well established and the desire to achieve optimum aesthetic results is a natural continuation in the development of oncoplastic surgery. The predictable factors which increase the risk of local recurrence following breast conservation include age, tumour size, lymph node involvement, tumour histologic type, grade and hormone receptor status (6,40-42). The only parameter that can be influenced by surgery is the achievement of clear surgical margins. Incomplete or uncertain surgical margins were shown in a meta-analysis with rigorous methodology to have an odds ratio of 2.44 for local recurrence when compared to clear margins (6,43). Margin re-excision is often technically difficult to achieve with absolute certainty, particularly after the tissue rearrangement involved in some complex oncoplastic procedures. Some surgeons therefore elect to perform these procedures staged and reconstruct after histological confirmation of clear margins are obtained. The simplicity of the round block technique favours the ability to perform a re-excision of margins compared to wise pattern mammoplasty approaches. In our series, there were 5/12 patients with involved margins having a successful cavity re-excision. The circumareolar incision also allows easy incorporation of the pre-existing surgical scar into mastectomy planning should this be required to achieve adequate oncologic excision.

Definition of margins extend beyond surgical technique. Variables such as surgical orientation of the specimen and the methods used by pathologists to process tissue also

make the reproducibility of pathological and oncological outcomes between different centres difficult. The agreement of what constitutes a clear margin also varies between units and remains an international area of controversy despite the recent ASCO guidelines (44). Whilst extensive DCIS is associated with local recurrence (45), clear excision margins after breast conservation are still considered adequate when followed with adjuvant radiotherapy. Modern adjuvant treatments have significantly helped to reduce local recurrence and the multimodal treatment required to treat breast cancer is established as gold standard. Future horizons are likely to see the development of better selection tools to identify patients for therapies that may extend beyond chemotherapy, radiotherapy and endocrine therapy, into an arena of personalized treatment strategies, and targeted immunotherapy.

Oncoplastic surgery represents an excellent alternative to mastectomy where the resection might otherwise have necessitated a more radical procedure with better aesthetic outcomes than would be possible with simple WLE. The messages from the current literature are clear: oncologically, patients should be appropriately selected for segmental resection to achieve complete excision, excluding patients with multicentric disease across different sectors of the breast where breast conservation is unlikely to be successful. Aesthetically, patients are selected based on tumour size in relation to the size of the breast, the position of the tumour, and the tissue elasticity (8,12). This study contributes to this further by showing that good aesthetic and oncological results can be obtained for tumours in all sectors of the breast, including central tumours.

This study represents a comprehensive prospective evaluation of oncologic parameters and complications in central round block repairs with circumareolar skin reduction in a cohort of patients with long term follow-up. The prospective data for this technique show good aesthetic outcomes can be achieved with reproducible results. The technique is oncologically safe with low complication and comparable local recurrence rates to breast conservation surgery in general or other oncoplastic techniques. Large proportional oncologic resection to breast size can be achieved and the technique is not limited to small breasts.

Low rates of planned and subsequent contralateral surgery can be expected with excellent measured symmetry at follow-up. Younger patients with good tissue elasticity may have an advantage to be exploited in this technique allowing better symmetry with the un-operated side without contralateral symmetrisation. It is prudent to limit

the dissection in the pre-pectoral plane given the extent of subcutaneous undermining to ensure maximum vascularity to the glandular flaps. This may be particularly important in fatty breasts. However, our study shows that this technique gives safe and predictable results in patients of all ages regardless of the breast gland and fat composition. Clough *et al.* describes this point of principle with reference to choice of oncoplastic techniques in fatty/glandular breast types which we can validate for the central round block procedure in this study (13). We acknowledge that one criticism of the circumareolar round block mammoplasty is that it flattens the breast mound slightly. Although this was not specifically looked for in our series, it has not been a significant limitation noted by patients. Projectional differences such as this may also be difficult to demonstrate on conventional two dimensional photographs. Whilst any breast surgery involving circumareolar incisions can affect nipple sensation that may be worsened by radiotherapy, the authors believe these changes are less marked compared to therapeutic mammoplasties where surgical incisions are longer and greater volumes of breast tissue are resected.

A preferred outcome measure for breast aesthetics including reconstructive surgical procedures is now patient recorded outcomes (PROMS). Tools such as the BREASTQ have been developed relatively recently and provide excellent data on how patients feel about their surgery. We did not apply these current techniques to our historical and large cohort of patients with now mature data accumulated over several years. Future PROMS data with defined long-term outcomes would certainly be helpful in assessing the results of this, and indeed other, oncoplastic techniques.

The authors advocate the use of the central round block technique in patients of any age, with a wide range of breast size, shape and composition, various degrees of ptosis and all tumour positions within the breast to good effect. It is a simple procedure that gives good results with minimal compromise of future mastectomy and reconstructive options in the event of failed conservation.

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None.

Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

Ethical Statement: The study was approved by the Royal Marsden Ethics Committee (No. SAG30) and written informed consent was obtained from all patients.

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