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ORIGINAL ARTICLE

Centrally located breast carcinomas treated with central quadrantectomy and immediate nipple–areola reconstruction: a cohort study

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Abstract

Background Mastectomy has often been cited as the favoured option for centrally located breast tumours because lumpectomies or quadrantectomies that remove the nipple–areola complex often result in poor cosmesis. Currently, breast-conserving treatment is a preferred treatment for centrally located breast tumours, but this approach requires oncoplastic breast technique to avoid aesthetic sequels. This article describes the use of breast reduction techniques with immediate nipple–areola complex reconstruction (utilised to treat breast cancer) for centrally sited breast tumours

Patients Ten patients suffering from a centrally located breast carcinoma were treated at our breast unit over a period of 16 years (2006–2022). Oncologic and patient-reported outcomes were updated revising electronic reports and surveying with BREAST-Q module Breast conserving therapy (version 2, Spanish) postoperative scales.

Results Excision margins were complete in all cases. There have been no postoperative complications, all patients are alive and no cases of recurrence after 84.8 months of mean follow-up. Patients score the domain satisfaction with breast: mean 61.7 (Standard deviation 12.5) out of 100.

Conclusions Breast reduction mammaplasty with immediate nipple–areola complex reconstruction allows surgeons to carry out a central quadrantectomy to treat centrally located breast carcinoma with good oncologic and cosmetic outcome.

Keywords Central breast tumor · Central quadrantectomy · Immediate nipple reconstruction · Therapeutic mammaplasty · BREAST-Q

Introduction

Centrally located breast cancer (CLBC) refers to tumours located close to the nipple–areola complex (NAC). Owing to the nature of its position, mastectomy has often been cited as the favoured option for these tumours, in addition to the fact that surgeons are often disinclined to perform lumpectomies that remove the NAC as they often result in poor cosmesis.

According to recent reports [1–4], breast-conserving therapy (BCT) should be an acceptable and preferable alternative to mastectomy for well-selected, early-stage CLBC because it obtains better prognoses. These reports demonstrated significantly improved overall survival and breast cancer-specific survival for BCT in both the whole breast cancer cohort and CLBC alone cohort.

The removal of the central quadrant of the breast with the consequent loss of NAC carries a cosmetic sequel that can negatively affect the patient's quality of life. The oncoplastic techniques incorporated into breast cancer surgery [5–7] allow BCT in these tumours with an acceptable cosmetic result.

The aim of this study is to evaluate survival and quality of life of patients with CLBC treated with BCT using oncoplastic breast-conserving surgery, an onco-therapeutic reduction mammaplasty and immediate NAC reconstruction.

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Materials and methods

Ten women suffering from unilateral non-metastatic CLBC were treated with a central quadrantectomy and immediate nipple–areola reconstruction at our breast unit from 2006 to 2021. Clinicopathological data and status at last follow-up, radiologic and clinical examination, were collected retrospectively from hospital electronic patient records.

Satisfaction with breast and quality of life was evaluated using BREAST-QTM—Breast conserving therapy module (Postoperative) Spanish version 2.0. Women were surveyed after radiotherapy was completed and participants signed written informed consent and completed the questionnaire in paper format.

The BREAST-Q [8] is a validated, multidimensional questionnaire-based tool that assesses patient-reported outcome (PRO) measurements following breast surgery. There are different modules which evaluate some surgical procedures, the last one to be developed is for BCT. It measures patient experience and quality of life using a hierarchy of questions exploring physical, psychological and sexual well-being, cosmetic appearance and overall satisfaction, ranked using a simple Likert scale. Scores were derived for each of the questionnaire's nine domains. These were transformed on a scale from 0 to 100 according to the BREAST-Q protocol, with a higher value representing a more favourable outcome. Patients who answered fewer than 50% of the questions on a scale were excluded from that specific scale.

Surgical technique

All surgical procedures were carried out by a comprehensive breast surgeon with training in both oncologic and plastic breast surgery (HF). After central quadrantectomy with resection from a NAC had been performed, the surgical specimen was tested intraoperatively by a radiologist to assess radiological margins. Figure 1 shows the preoperative planning design and a schematic sequence of the operative technique. The contralateral breast was treated with a usual mammaplasty tailored to the specific needs of the opposite breast. It must be kept in mind that radiotherapy reduces the affected breast, so the reduction of the contralateral breast should be 15–20% higher to achieve a small breast with a NAC located in a higher position.

A specific patient. Case 6

A 62-year-old woman presented with a palpable mass in the retro-areolar area of the left breast was diagnosed by mammography, echography and core biopsy with an infiltrative ductal carcinoma. Echography and magnetic resonance imaging showed a solitary lesion in the retro-areolar area very close to the areola skin (Fig. 2). She had large breasts with a jugulum–nipple distance of 28 and 29 cm for right and left breasts, respectively. In addition, she referred that she was suffering from a symptomatic macromastia, and she desired a reduction of her breasts.

Surgery consisted of a central quadrantectomy with NAC reconstruction in the left breast and reduction mammoplasty using a bi-pedicle flap for NAC transposition in the right one. Figure 3 shows pattern design for nipple reconstruction using "arrow flaps". Sentinel lymph node biopsy of left axilla was done through the breast reduction incisions. Final pathological report was an infiltrative ductal carcinoma of 10 mm very close to the nipple without involvement, pT1 N0 M0 (Luminal A). After surgery she completed radiotherapy, and she has followed that up with hormone treatment. Mammography and clinical follow-up after six years are normal without signs of local recurrence or distant metastases. Figure 4 demonstrates cosmetic outcome after four years of bilateral surgery. She was surveyed using BREAST-Q BCT module, postoperative scales and satisfaction with breast scored 78 out of 100.

The procedure is indicated in tumours in which the removal of NAC is compulsory, tumours very close to nipple–areola complex (NAC) a distance lower than 15 mm or when they infiltrate the NAC. About the size of the breast, it can be used in moderate size breast or small breasts with enough degree of ptosis. Moreover, patients with large breasts can be more benefitted of a bilateral breast reduction because radiotherapy can be better administered in smaller breast and, in case of symptomatic macromastia, the patients could improve their quality of life.

Results

Patient and tumour characteristics of patients are described in Table 1. Patient 7 was operated on at the same time for a symptomatic cholelithiasis by performing a laparoscopic cholecystectomy without incident. Before surgery two patients (3 and 9) were treated with neoadjuvant treatment, one with six cycles of TAC chemotherapy (docetaxel, doxorubicin and cyclophosphamide) and another with letrozole and abemaciclib (CDK inhibitor). There were no postoperative complications and free margins were completed in all cases. In nine patients, surgery was bilateral with reduction of contralateral breast. There was no delay in administration of adjuvant therapy. All cases were treated with adjuvant radiotherapy and two patients (1 and 5) with adjuvant systemic treatment, one received four cycles of FEC chemotherapy (5-fluorouracil, epirubicin and cyclophosphamide) and another cyclophosphamide, doxorubicin and trastuzumad. Hormonotherapy was administered in seven patients with tamoxifen or aromatase inhibitors depending

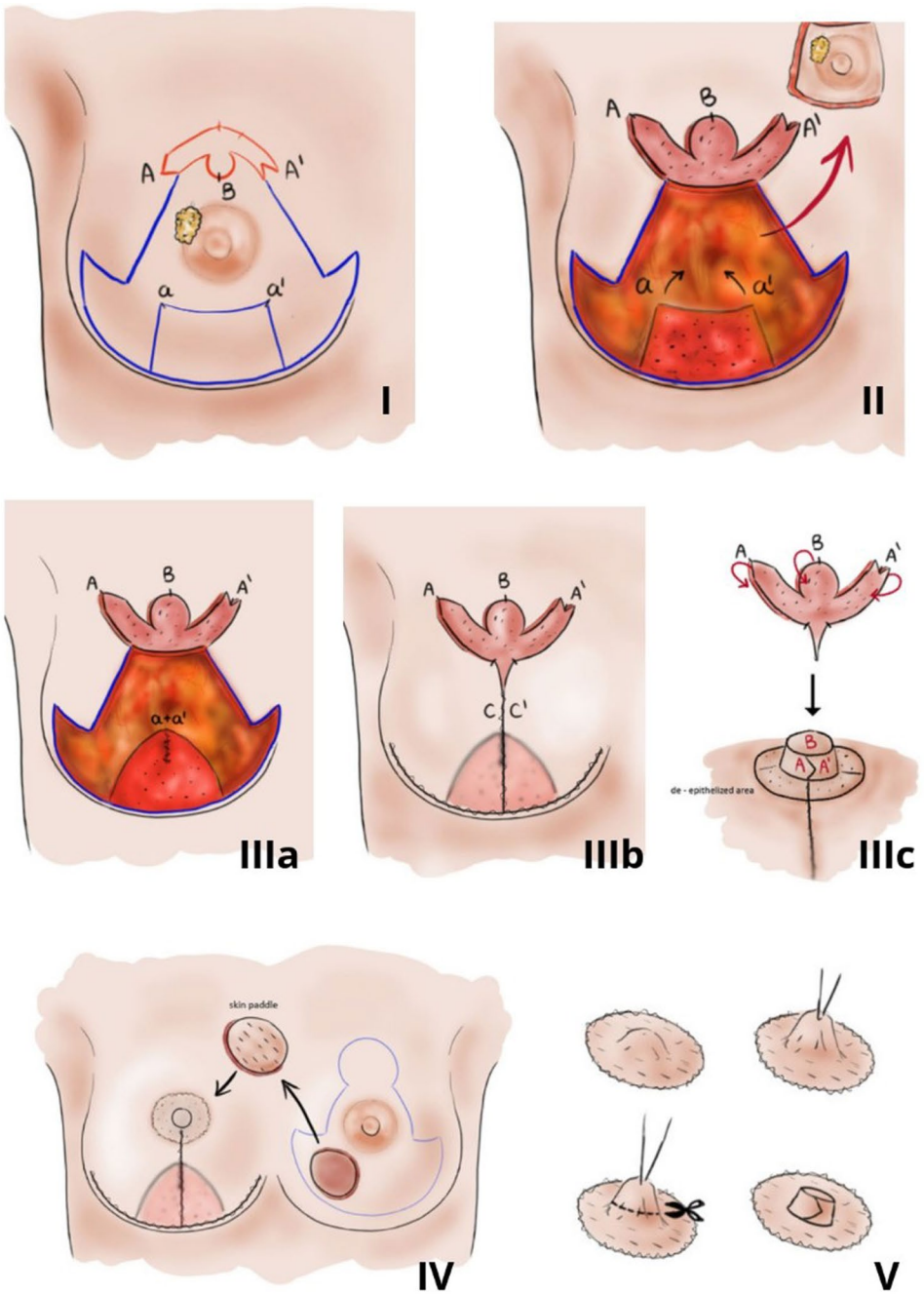

Fig. 1 **I**. Preoperative pattern design. Skin markings for T-inverted incision pattern of breast reduction mammaplasty, (a and a`) area of inferior pedicle and, in the superior angle where vertical branches join, skin marks of flaps for creation of a neo-nipple following the technique of "arrow flap" (A, B and A´), tumour and original nipple–areola complex (NAC). Sequence of the surgical procedure. **II**. After the removal of the tumour with NAC, in the inferior pole of the breast, a cone is made folding a short (< 7 cm long) and thin inferior de-epithelized pedicle to improve breast projection as auto prothesis and arrow flaps are elevated. **III** (a, b and c). The medial and lateral pillars are sutured as a standard breast reduction mammaplasty technique over the inferior cone and arrow flaps are sutured creating a neo-nipple. An area is de-epithelized to be a bed for full-thickness skin graft. **IV**. Sink paddle preferably from the discarded breast tissue of the contralateral breast is used to create an areola using as full-thickness skin graft. **V**. Reconstruction of neo-nipple–areola complex

on their status menstrual. After a follow-up of 84.8 months (67.44 standard deviation), all patients are alive without local or regional recurrence, or metastases. BREAST-Q scores are showed in Table 2.

Discussion

CLBC have usually been treated with mastectomy for two main reasons: fear of oncological safety and bad cosmetic outcomes following BCT. Some studies have suggested that tumours in the central and nipple portion of the breast had worse survival outcomes compared with tumours in the peripheral quadrant [9]. CLBC (tumours close to the areola or with nipple involvement) are difficult to manage using BCT as lumpectomies that remove breast tissue in the peri-areolar area often result in poor cosmesis, so this approach has been considered a less favourable option. Since the incorporation of oncoplastic breast-conserving techniques, this paradigm has changed, especially after the recent reports in favour of BCT as treatment of CLBC showing better oncologic outcomes than traditional mastectomy.

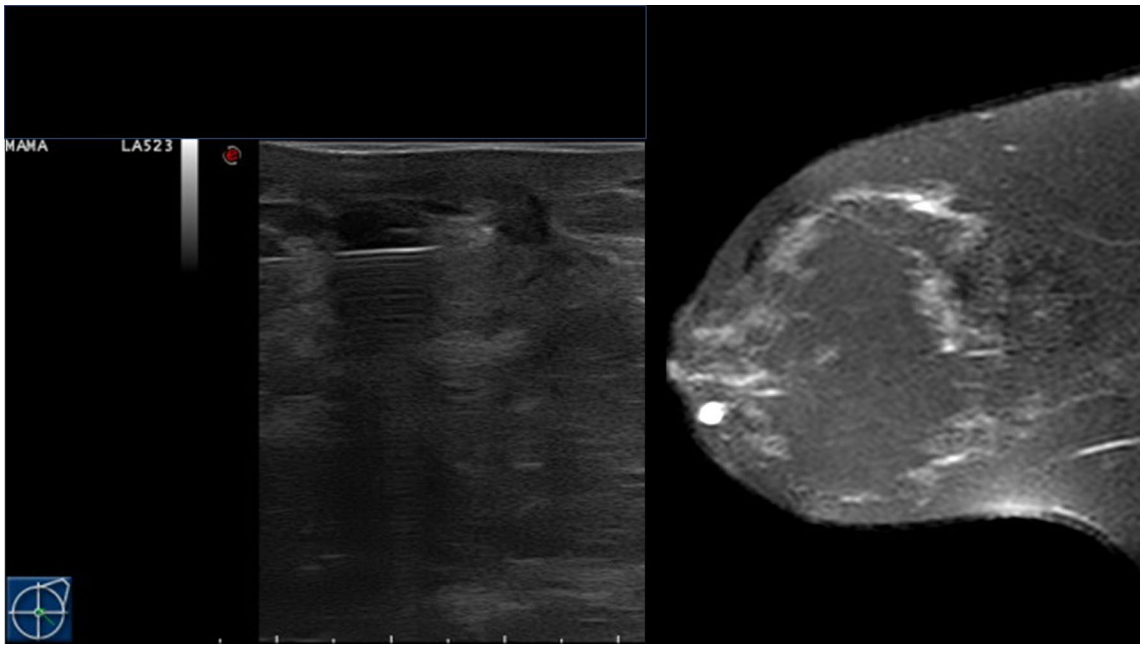

Fig. 2 Echography and magnetic resonance imaging showed a solitary retro-areolar mass

Fig. 3 On the left. Wise pattern incision of reduction mammaplasty and arrow flap for nipple reconstruction. On the right. Surgical design in both breasts. The evening before the surgery we designed a pattern incision in black lines which was adapted the day of the surgery lifting the new nipple position drawn in red lines

There are some publications describing different techniques for making a central quadrantectomy with immediate NAC reconstruction, all of which have a small number of patients and limited follow-up without an evaluation using a validated PROM measurement [10–14].

Approximately, CLBC represent no more than 20% of all breast locations and around 50–60% are treated with mastectomy. Therefore, the number of patients treated BCT using a central quadrantectomy and immediate NAC reconstruction is low. Our modest experience, gathering ten patients in a long period of time (from 2006 to 2021) has two important aspects, the evaluation of patient satisfaction using a validated questionnaire, the BREAST-Q and a long follow-up.

Fig. 4 Aesthetic outcome after 4 years of surgery

Table 1 Patient and tumour characteristics of 10 patients with centrally located breast carcinoma treated with central quadrantectomy and immediate nipple–areola reconstruction

Patient (year)	1 (2006)	2 (2008)	3 (2009)	4 (2011)	5 (2014)	6 (2016)	7 (2017)	8 (2020)	9 (2021)	10 (2021)
Age (years)	41	47	53	53	70	62	64	54	55	53
Menopausal status	Post	Pre	Post	Post	Post	Post	Post	Post	Post	Pre
Radiological tumour size mm	15	20	13	18	19	8	38	24	46	10
Type of tumour	IDC	ILC	IDC	IDC	IDC	IDC	DCIS	IDC	IMC	DCIS
Affected breast	Right	Right	Left	Right	Right	Left	Right	Right	Left	Right
Intrinsic type	Luminal B	Luminal A	Triple negative	Luminal A	HerB2	Luminal A	NA	Luminal A	Luminal B	NA
Axillary surgery	ALND	BSLN	ALND	BSLN	BSLN	BSLN	BSLN	BSLN	ALND	BSLN
Tumour/nipple	Involved	Close	Involved	Involved	Close	Close	Close	Involved	Involved	Close
TNM category	T1N1M0	T1N0M0	T4N0M0	T1N0M0	T1N0M0	T1N0M0	TisN0M0	T2N1M0	T2N1M0	TisN0M0
Follow-up* (months)	195	156	158	79	96	73	60	12	11	4
Time of survey** (months)	187.1	156.0	155.6	139.4	53.8	32.5	70.3	23.3	8.8	9.0
Satisfaction with breast BREAST-Q score	50	53	82	72	63	78	67	48	51	53

IDC Invasive ductal carcinoma, *ILC* Invasive lobular carcinoma, *IMC* Invasive medullar carcinoma, *DCIS* Ductal carcinoma in situ, *BSLN* Biopsy sentinel lymph node, *ALND* Axillary lymphadenectomy, *NA* Not applicable, Tumour/nipple: close (without tumour infiltration of NAC) or involved (with tumour infiltration) in the pathologic study

*Period from date of surgery to date of the last mammography and clinical examination

**Period from date of the end of radiotherapy to date of the BREAST-Q was answered

Table 2 Breast-Q postoperative scores

Variables and breast-Q domains	Patients (*n*)	Mean	Standard deviation
Age (years)	10	62.3	6.70
Time from the end of radiotherapy to complete questionnaire (months)	10	83.5	68.9
Satisfaction with breast	10	61.7	12.50
Adverse effects of radiotherapy	10	92.6	11.47
Psychosocial well-being	10	78.8	17.68
Sexual well-being	8	60.1	13.02
Physical well-being	10	84.4	15.58

Fig. 5 Late aesthetic results. Breast asymmetry caused by contralateral breast enlargement. The breast treated with radiotherapy is affected to a lesser extent by changes in weight and ageing

According to the latest publications [1–3], BCT in CLBC is a favourable and recommended option, and breast surgeons should incorporate oncoplastic techniques for attempting to treat these tumours with BCT. In addition, besides possible oncological and clear cosmetic advantages, this approach is frequently a single-stage operation with contralateral surgery to obtain symmetry if required. In our series, except for one patient [8], we carried out a breast reduction on the contralateral breast. The ideal patient for our technique is one with CLBC and large or ptotic breasts suffering from a symptomatic macromastia who desires a breast reduction to improve their affected quality of life as case 6.

Despite the breast asymmetry (Fig. 5), which frequently accompanies long cosmetic outcomes, due to which the changes in the contralateral breast (which is affected to a greater extent than the breast treated for cancer) for weight gain or ageing-ptosis leading to scores of satisfactions with breast around 50 points, the mean patient satisfaction with their breast 61.7 (standard deviation 12.5) is keeping with satisfactory scores. In other two studies conducted at our breast unit, an evaluation of 165 patients treated with BCT (standard lumpectomy and oncoplastic breast-conserving surgery) using BREAST-Q BCT module postoperative scales, the median of satisfaction with breast score was 59. Similar scores were observed in a series of 50 patients who were questioned using BREAST-Q BCT module pre- and postoperative scales before surgery and after radiotherapy [15, 16].

The greatest weakness of our work is the limited number of patients. This limitation, which is common to similar published articles, does not allow us to obtain robust results. It would be desirable that multicentre prospective studies that gather an adequate sample of patients, especially with tumours with infiltration of the nipple–areola complex, compare oncological results and PRO evaluated with validated PRO measurements of two different approaches (mastectomy with immediate breast reconstruction and BCT with immediate reconstruction of the areola–nipple complex).

Conclusion

The use of breast-conserving oncoplastic surgery based on the breast reduction technique and “flap arrow” nipple reconstruction allows BCT, and is a feasible and recommended surgical option for CLBC which, in our short experience, achieves comparable oncological and aesthetic results.

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Data availability statement The data that support the findings of this study are available on request from the corresponding author.

Declarations

Conflict of interest The authors have no conflicts of interest to declare.

Statement of ethics This study was conducted in accordance with the Declaration of Helsinki and was approved by the Clinical Research Ethics Committee of Cantabria (Comité Ético de Investigación Clínica de Cantabria). The participants signed the informed consent form and completed the Breast Conserving Therapy Module Postoperative Scales (Spanish for the Spanish version).

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