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BREAST

Oncoplastic surgery for breast carcinoma in South Africa – an audit of outcomes from a single breast unit

J Khan,[1] I Buccimazza,[2] E Mansoor[1]

[1] *Department of Surgery, University of KwaZulu-Natal, South Africa*
[2] *Department of Specialised Surgery, Breast and Endocrine Unit, Inkosi Albert Luthuli Central Hospital, South Africa*

Corresponding author, email: *jaavedk@gmail.com*

Introduction: Oncoplastic breast surgery permits tumours traditionally requiring total mastectomy to be excised with acceptable oncological and aesthetic outcomes. The purpose of this study was to evaluate outcomes following oncoplastic breast surgery in the breast unit at Inkosi Albert Luthuli Central Hospital in Durban.
Methods: This was a retrospective analysis of patient records. Patients who underwent oncoplastic breast surgery with curative intent from 2011 and 2012 were included in this study. Male patients, those with contraindications to breast conservation, and those with metastatic disease were excluded. Demographic and tumour-related data were collected and margin status, surgical site sepsis, recurrence and overall survival (OS) were recorded over a 5-year period starting from the date of presentation.
Results: Forty-five patients with 45 tumours were evaluated. The most prevalent tumour size at presentation was T2 (55.6%), and the most commonly performed procedure was a therapeutic mammoplasty. Twelve patients (27%) developed surgical site infection (SSI), eight of which were classified as deep SSI with wound breakdown. The resection margin was clear in 95.6%. Recurrence was noted in 8.9% of patients, with an OS of 91.1%.
Conclusion: Breast-conserving surgery (BCS) using oncoplastic techniques results in favourable oncological outcomes in patients treated in a resource-constrained setting.
Keywords: oncoplastic, breast carcinoma, breast conservation, therapeutic mammoplasty

Introduction

Breast carcinoma is the most common carcinoma in women worldwide.[1] According to the 2019 South African National Cancer Registry, the incidence of breast carcinoma was 33.86/100 000 females.[2] Surgery is an important component in the multimodal treatment of breast cancer. The NSABP B-6 trial found no significant difference in overall survival (OS) or disease-free survival (DFS) between patients undergoing lumpectomy or a modified radical mastectomy for early breast cancer.[3] These results were maintained after 20 years of follow up.[4] Breast-conserving surgery (BCS) aims to minimise the morbidity associated with breast cancer surgery; however, the amount of breast tissue which can be excised without compromising cosmesis is often limited.

Pukancsik et al. evaluated quality of life scores in 350 patients who underwent BCS. The authors noted that the maximum amount of tissue that can be removed without resulting in an unacceptable aesthetic and functional outcome or decreased quality of life was 18–19% in the upper-outer quadrant, 14–15% in the lower-outer quadrant, 8–9% in the upper-inner quadrant, and 9–10% in the lower-inner quadrant.[5] With new developments in the surgical management of breast carcinoma, oncoplastic procedures, particularly therapeutic mammoplasty, have become an attractive option. Audretsch first described these procedures and Clough further classified them.[6] Volume displacement level I technique is used for resections less than 20% of the breast volume in medium-sized, minimally ptotic, dense breasts, and comprises removal of the tumour with a 1 cm macroscopic margin followed by filling of the defect with adjacent mobilised breast tissue. Volume displacement level II techniques are reserved for excision volumes of between 20–50% and require more complex mammoplasty techniques depending on the location of the tumour. This technique invariably requires symmetrisation of the contralateral breast.[6] A volume replacement procedure is performed in laterally placed tumours where the patient declines contralateral surgery. This entails excision of the primary tumour with a 1 cm macroscopic margin and filling the defect with extramammary autologous tissue utilising an intercostal artery perforator flap (ICAP). The use of oncoplastic techniques has the advantage of improved cosmesis and extends breast conservation to locally advanced and adversely situated tumours. This improves subjective patient outcomes regarding body image, psychosocial score and return to work function.[7,8]

A concern of oncoplastic techniques is the potential for postoperative complications such as seroma, haematoma formation and surgical site infection (SSI). Furthermore, there is concern regarding adequate margins and local recurrence following oncoplastic surgery (OPS).[9] A single centre, retrospective cohort study evaluated the complication rate, OS and DFS of 9 861 patients undergoing breast surgery for

cancer.[10] BCS with reconstruction (BCS+R) was compared to BCS, total mastectomy (TM) and TM with immediate reconstruction (TM+R). The authors defined BCS+R as a wide local excision followed by an adjacent tissue transfer and re-arrangement, corresponding to a level II as described by Clough et al.[6] This study found that there was a lower rate of seroma formation and positive margins in the BCS+R group and that there was no statistically significant difference in DFS and overall mortality among groups. De Boniface et al. reported the outcomes of 48 986 women who underwent surgery for breast cancer. The interventions were divided into breast conservation, TM with radiotherapy and TM without radiotherapy. The authors concluded that OS and breast cancer specific survival was better in the breast conservation group.[11] Similar findings were reported in a large systematic review of 55 studies.[12]

Most studies evaluating outcomes only included T1 and T2 tumours.[13-15] However, oncoplastic techniques can also be utilised for large areas of ductal carcinoma in situ (DCIS),[16] T3 and some T4 tumours,[17-19] with few studies listing this as part of their inclusion criteria. It must be noted, however, that patients with T3 and T4 tumours usually receive neo-adjuvant therapy followed by oncoplastic procedures. Little data exists on patients undergoing oncoplastic breast surgery in South Africa. Concomitant HIV infection, poor patient follow-up and system delays may contribute to both short- and long-term outcomes.[20] Recent oncological and surgical advances have encouraged a trend towards more breast conservation and enhanced aesthetics in patients with breast carcinoma. These approaches have been well-validated in the international literature. The only South African data is from the private sector. Grubnik and Benn published their 7-year experience of 251 patients treated with a therapeutic mammoplasty. In this cohort of patients with a mean tumour size of 1.5 cm, only 2% of patients had involved margins. At a mean follow-up of 50 months, disease recurrence, mortality rate and OS was 4%, 3.2% and 96.4%, respectively.[21] An audit of local results from a public sector unit is necessary to ascertain whether adopting international guidelines is appropriate in our environment. This study aimed to evaluate the outcomes following breast conservation with OPS in a resource-constrained public sector unit of an upper- to middle-income country (UMIC).

Methods

This was a retrospective cohort study using chart reviews. The breast unit at Inkosi Albert Luthuli Central Hospital keeps electronic records of all patients who have undergone breast surgery. This is the only centre providing OPS to a population of 10 million. Reliability and validity were achieved in this study by ensuring that strict objective criteria were used when measuring outcomes. The timelines used during measurements were standardised according to the dates that the patients were seen.

All female patients with a histologically confirmed breast cancer diagnosis, who underwent oncoplastic breast conserving surgery at Inkosi Albert Luthuli Central Hospital in 2011 and 2012 were included in the study. Patients who underwent surgery for palliation, those who underwent curative surgery without an oncoplastic component and those who had mastectomies were excluded.

Data were collected on a spreadsheet which facilitated data analysis. Captured variables included patient demographics, disease-associated factors such as tumour stage at presentation, receipt of neo-adjuvant therapy, type of surgery performed, adjuvant treatment and outcomes. Outcomes were evaluated over a 5-year period beginning with the date that the patient underwent surgery. The period of follow-up was chosen to enable comparison with similar studies reported in the international literature.

Both volume displacement or volume replacement oncoplastic breast surgery techniques were utilised. We used the definitions of the respective techniques and levels described by Clough et al.[6]

IBM SPSS version 27 was used for data analysis. Where more than one tumour was recorded for a participant, the larger of the two was considered. Descriptive statistics such as frequency tables and percentages were used to summarise categorical data. Summary statistics such as median, interquartile range (IQR) and range were used to summarise quantitative data in the case of non-normally distributed data, while mean and standard deviation (SD) were used for normal quantitative data.

Results

Forty-five female participants fulfilled inclusion criteria and were evaluated in this study. Their mean age at diagnosis was 58.4 years (range 31–79 years). The remaining 91 patients who had surgery over the study period did not have any form of BCS.

Their demographics and other relevant clinical parameters are listed in Table I. The majority of patients had no family or personal history of breast cancer. Only 22% had previous oral contraception use, and two-thirds were post-menopausal. None of the patients in this study had a history of hormone replacement therapy use.

There were 42 participants with unilateral disease and three participants with bilateral disease. No patients had multifocal disease in a single breast. For those with bilateral disease, the breast with the larger tumour was evaluated in this analysis of 45 tumours. Tumour size ranged from 1–7.4 cm with a median of 2.7 cm (IQR = 1.5 cm). Tumour size and nodal status are shown in Table II. T2 tumours were the most common (56%), followed by T1 (20%). One patient had a T4b tumour at the time of surgery. N1 nodal status was found in 71% of patients.

The staging was done per the American Joint Committee on Cancer 8th Edition. 75.6% of patients were stage 2 at the time of presentation. The stage at initial presentation was unknown for three patients as they had undergone wide

Table I: Patient demographics and risk factors for developing breast carcinoma

Demographic and risk factor variables		*n*	%
Family history of breast carcinoma	1st degree	5	11.1
	2nd degree	1	2.2
	None	39	86.7
Personal history of breast carcinoma	None	41	91.1
	Other breast	1	2.2
	Same breast	3	6.7
Previous contraceptive use	No	35	77.8
	Yes	10	22.2
Pre/postmenopausal	Postmenopausal	30	66.7
	Premenopausal	15	33.3

Table II: TNM status, stage and prognostic factors of oncoplastic cohort

Prognostic variables		*n*	%
Tumour status	Tis	2	4.4
	T1	9	19.9
	T2	25	55.6
	T3	4	8.9
	T4	1	2.2
	Tx	4	8.9
Nodal status	N0	13	28.9
	N1	32	71.1
Metastatic status	M0	45	100.0
*Stage at diagnosis	Unknown	3	6.7
	0	1	2.2
	1	4	8.9
	2A	12	26.7
	2B	22	48.9
	3A	2	4.4
	3B	1	2.2
Histological subtype	Ductal	39	86.7
	Medullary	1	2.2
	Papillary	4	8.9
	Tubulo-lobular	1	2.2
ER status	Positive	37	82.2
	Negative	8	17.8
PR status	Positive	31	68.9
	Negative	14	31.1
HER2 status	Positive	7	15.6
	Negative	38	84.4

*American Joint Committee on Cancer 8th Edition

Table III: Details of margin status and adjuvant radiotherapy of oncoplastic cohort

		n	%
Resection margin	Clear	43	95.6
	Involved	2	4.4
Adjuvant radiotherapy	Yes	42	93.3
	Nil	3	6.7
Tumour bed boost	Yes	40	88.9
	Nil	5	11.1

local excisions with positive margins at another institution before referral. Invasive duct carcinomas comprised 87% of tumours.

Stage, histological subtype, and receptor status are shown in Table II. During the study period, reporting the Ki67 index was not routine and was not captured.

Thirty-one per cent (n = 14) of the study sample received neoadjuvant therapy. These patients had an unfavourable mass to breast ratio, and neoadjuvant therapy aimed to downsize the lesion for BCS.

A hook wire was used in nine patients to localise and remove the tumour. Three of these patients had a wide local excision performed at another institution before referral, two had in situ (TIS) lesions at presentation, and four had a complete clinical response to neoadjuvant therapy.

Mammoplasties were performed in 36 patients (80%). All mammoplasties were performed using an inverted T skin pattern. One patient had a round-block mastopexy, and the remainder eight had volume replacement procedures – wide local excision followed by an intercostal artery perforator flap (ICAP). No level I OPS was performed over the study period, as no patient fulfilled criteria for this procedure.

Two patients had involved margins; the remainder had clear margins on histological assessment (95.6%). The patients with involved margins had a repeat excision performed, and clear margins were obtained. The reason for margins being involved was not further investigated in this study.

Forty-two patients received adjuvant whole breast radiotherapy. Of those who received adjuvant radiotherapy, only two received a boost to the tumour bed. It is unclear why three patients did not receive any adjuvant radiotherapy (Table III).

Twelve patients developed SSI at the incision. Four of these were superficial incisional SSI, and eight were deep incisional SSI with associated minor wound breakdown at the T-junction of the Wise skin pattern. This confers an overall infection rate of 27% and a wound breakdown rate of 18%. Wound breakdown was associated with a delay in initiating adjuvant radiotherapy in three patients.

Forty-one patients did not experience any recurrence in the follow-up period. After their surgery, recurrence was diagnosed in four patients (8.9%) at 8 months, 12 months, 16 months and 20 months, respectively. Three patients experienced systemic recurrence and one loco-regional recurrence. All of these patients had received adjuvant radiotherapy. Four deaths were recorded during the follow-up period. The OS was 91.1% (n = 41). Of the four who died, three were due to breast cancer recurrence. The remaining patient demised following surgery for an unrelated condition.

Discussion

Breast conservation has surpassed mastectomy in the management of early breast cancer, and oncoplastic breast surgery has extended the indications beyond that of only small tumours. The breast unit at Inkosi Albert Luthuli Central Hospital serves a population with poor access to health education, and thus patients present with larger and more advanced tumours. Nevertheless, it was possible to offer OPS techniques to those who fulfilled the criteria for BCS.

Forty-five patients and 45 tumours were assessed in this study. A systematic review by De La Cruz et al. evaluated 55 studies which assessed oncological outcomes following BCS across the spectrum of resource settings. The mean age at diagnosis was 54.6 years, similar to our patient cohort.[12] In the same review, the mean tumour size was T1 in 43.8% and T2 in 39.3% of patients. The ratio of T1 (20%) to T2 (56%) tumours in our study contrasts with those seen in the studies reviewed by De La Cruz. A possible reason for this may be due to the delay in diagnosis in a resource-constrained setting, lack of appropriate health education, and lack of formal screening programmes for breast cancer. Despite the larger mean tumour size at diagnosis, our selection for patients undergoing breast conservation is in keeping with other centres when considering the T-stage.

Volume displacement procedures enable a larger volume of tissue to be excised when compared to traditional BCS. Keleman et al. compared the outcomes of oncoplastic volume displacement procedures with those of conventional BCS in 700 patients with stage 0-III breast carcinoma. They demonstrated that a larger volume of breast tissue could be excised with no difference in the cosmetic outcome, time to adjuvant therapy and local recurrence.[22] Therapeutic mammoplasty was the volume displacement procedure of choice, with 80% of our patients undergoing this procedure. Eight of our patients underwent volume replacement using an ICAP, as their tumours were too laterally situated to perform a level II volume displacement procedure. Out of 540 oncoplastic breast surgery cases performed at the Institut Curie between 1986 and 2008, 192 (35.6%) were inverted T mammoplasties resulting in it being the most frequently performed procedure.[23] The choice of mammoplasty in our sample was commonly the inverted T mammoplasty due to the excellent aesthetic outcome. Thus, breast conservation can still be carried out using the techniques available even in a patient population where the malignant lesion is predominantly larger at presentation. Where a volume displacement procedure is inappropriate, a mastectomy can still be avoided with neoadjuvant therapy, which can down-size the tumour sufficiently to permit BCS, as was the case with 14 of our patients.

Oncoplastic techniques also allow for excision further away from the palpable and radiologically defined tumour, resulting in a lower rate of tumour on ink than conventional breast conservation and, in turn, a more favourable oncological outcome.[24,25] This is reflected in our study, with only two (4.4%) patients having an involved margin. Both these patients presented with T2 tumours; however, neither had a mass to breast ratio large enough to require neoadjuvant therapy. In the case of involved margins, re-excision is needed and was performed on these two patients without compromising the cosmetic outcome. Our positive margin rate is well within the range of 2.7–18.9% reported in the literature.[26]

The high SSI rate is a cause for concern, as 18% of patients had deep SSI with subsequent minor wound breakdown. Many of these patients were noted to have a breakdown of their wounds at outpatient follow-up. The rate of SSI following OPS ranges from 1–30% in the literature, the large range being attributed to varying definitions of SSI, follow-up period, procedure and perioperative therapy.[27] A single centre prospective study reported SSIs over 15 years and noted a reduction from 33.3–18.9% once risk factors were identified and the quality of postoperative care improved.[28] The aetiology of wound breakdown is multifactorial and may result from tension at the suture lines, ischaemia at the Wise pattern T-Junction, or poor wound care at step-down facilities. Techniques should be utilised to limit tension at the suture lines at the time of closure. Furthermore, SSI and subsequent delay in wound healing are associated with a delay in commencing adjuvant therapy;[29] however, this was the situation with only three of the eight patients in our study who developed wound breakdown. We recommend that further research be conducted to evaluate the postoperative wound care patients receive once they are discharged from the surgical inpatient service.

The recurrence rate in our study was 8.9%, which is in keeping with the 11% described by other reports on BCS.[13,25] Recurrence risk is independent of margin width; however, a higher T stage has been associated with a higher recurrence rate.[30] We did not find this association in our study population; however, our sample size was a limiting factor. Our OS of 91.1% and disease-specific survival of 93.3% are in line with the survival of 95.3% found in the data reviewed by De La Cruz et al., who followed up patients in a 3–5-year period.[22]

Study limitations

Since the population included in this study was operated on when the unit first began oncoplastic breast surgery, this study suffered from a limited number of participants. The number of OPS procedures in subsequent years were far higher, and future research will reflect this.

The unit was also very selective of which patients with larger tumours (T3 and T4) would be amenable to breast conservation so that no conclusions could be drawn about outcomes in this subgroup.

A single mammoplasty technique was utilised for the vast majority of patients, so SSI rates could not be compared among the various techniques.

Furthermore, risk factors for SSI (BMI and smoking history) were not reported and are a significant limitation to the study.

No level I OPS was performed at this institution during the study period, with results only being obtained and comparable to level II procedures.

Conclusion

Our study demonstrated that oncoplastic breast conservation in a resource-poor setting and with larger tumours is a viable and acceptable option for many patients. Our rate of SSI, although high compared to other clean operations, is within the rate reported by other institutions. The important long-term outcomes following OPS in our study cohort, namely recurrence and 5-year mortality, compared favourably with those reported in the literature. A follow-up study with a larger population size is recommended to perform subgroup analyses which were not possible in this study.

Conflict of interest

The authors declare no conflict of interest.

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Ethical approval

Ethical approval was obtained via a formal submission to the Biomedical Ethics Research Committee of The University of KwaZulu-Natal. BREC protocol reference number BREC/00004040/2022.

ORCID

J Khan https://orcid.org/0000-0002-1580-8577
I Buccimazza https://orcid.org/0000-0002-5399-3101
E Mansoor https://orcid.org/0000-0002-8958-7703

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