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Reconstruction in Breast Conservation Therapy—Single Tertiary Care Institution Experience with 472 Patients

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Abstract Breast conservation therapy (BCT) is now internationally accepted treatment for early breast cancer. Despite of high incidence of carcinoma breast in India, BCT rates are very low as compared to the west. In this article, we wish to share our experience of breast conservation with oncoplasty in Indian women. A retrospective analysis of case records of patients treated with oncoplastic breast conservation from January 2009 to June 2014 in a single surgical oncology unit in a tertiary cancer institute. Demographic patient data, stage of disease, location of primary tumour, use of neo-adjuvant chemotherapy if received, tumour size and breast size ratio, reconstruction method used, post-operative complications and aesthetic score of patients were analysed. Various methods of oncoplasty and partial breast reconstruction used are discussed. Four hundred and seventy-two patient records were found suitable for analysis. Most common stage of presentation was T2N0 in 189 patients (40%). Forty-one patients received neo-adjuvant chemotherapy (NACT). Tumour arising in upper outer quadrant was most common site, seen in 268 (56.7%). The most common method of reconstruction was volume displacement, done in 57.6% patients. Overall surgical complications included wound infection with or without dehiscence, seroma formation, partial flap necrosis and fat necrosis. Cosmesis was found to be excellent in 23.09% and

good in 58.47% at 6-month follow-up. Breast conservation with oncoplasty is oncologically safe for early breast cancer treatment and has good cosmetic outcome with high patient satisfaction rates.

Its practice should be encouraged in Indian set-up also.

Keywords Oncoplasty · Early breast cancer · Volume displacement · Volume replacement · Latissimus dorsi flap · Fasciocutaneous flap

Introduction

Breast cancer is the most common cancer in women in urban India, comprising 34% of all cancers in women [1]. The surgical management of early breast cancer has evolved from the era of radical mastectomy as proposed by Halsted to modified radical mastectomy (MRM) to the present era of breast conservation surgery (BCS) and oncoplasty. MRM and BCS remain the most commonly performed surgical procedures in early breast cancer (EBC). However, in spite of advances in principles of surgery and breast reconstruction as well as availability of newer imaging modalities and radiation facilities, the overall acceptance of BCS remains poor, 11–34% in India as compared to 60–70% in western countries [1].

Breast conservation therapy (BCT) comprises wide local excision of tumour with adequate circumferential margins along with axillary dissection or sentinel node biopsy for axillary staging and followed by adjuvant radiotherapy to whole breast with or without boost to tumour bed and index quadrant. In spite of equivalent overall survivals and local recurrence rates when compared with mastectomy, lot of Indian women still choose MRM for EBC. The most common reasons include a fear of local recurrence, certain community beliefs and financial restraints. BCT can also be offered after

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good response with neo-adjuvant chemotherapy in selected patients with locally advanced breast cancers.

The combination of BCS with reconstruction is termed oncoplasty. In this technique, oncological resection of breast cancer is done by using several different plastic surgery techniques to reshape, replace or rearrange the noncancerous breast tissue [2, 3]. It also incorporates surgery on the healthy, contralateral breast to improve breast symmetry as an expansion of its spectrum [4]. In order to achieve a good cosmetic outcome and to have an aesthetically pleasing result, breast oncoplasty should be an integral aspect of breast conserving surgery. The choice for reconstruction method used depends on tumour size, tumour-breast ratio, location of the tumour and density of breast tissue.

Materials and Methods

We retrospectively analysed case records of patients who underwent BCT with oncoplasty from January 2009 to June 2014 in a single surgical oncology unit in a tertiary cancer institute. Demographic patient data, stage of disease, location of primary tumour, use of neo-adjuvant chemotherapy if received, tumour size and breast size ratio, reconstruction method used, post-operative complications and aesthetic score of patients were analysed.

All patients were evaluated clinically and radiologically by ultrasound, mammography or MR mammography in selected cases. Tissue diagnosis was made with either fine needle aspiration cytology or tru-cut core biopsy under local analgesia. Metastatic work up included chest radiograph, ultrasound abdomen and bone scan. Whole body PET CT was done in select cases only.

Breast Oncoplasty and Partial Breast Reconstruction

When the tumour breast ratio is favourable, i.e. when the post-lumpectomy defect is less than 20% of the total volume of the breast, volume displacement techniques are used, and when the volume of excised specimen exceeds 20% of the total volume of the breast, volume replacement techniques are chosen [5].

The volume displacement techniques (OPS) used at our centre are rotation and advancement of fibro-glandular flaps of the breast (oncoplasty level I) and mammoplasty procedures (oncoplasty level II) [6].

Level I oncoplasty is done where the resected specimen is less than 20% of the breast volume without skin loss and the breasts are dense, fibroglandular flaps of the breast parenchyma are developed for reconstruction. The breast can be mobilized from pectoral fascia or skin or both depending upon the defect. The flaps are sutured together and the cavity is reconstructed. The size of the reconstructed breast may become slightly smaller than the contralateral side, but the difference is not discernible in a clothed patient.

Level II oncoplasty or mammoplasty techniques that are utilized for reconstruction of defects at specific sites at our centre are wise pattern reduction mammoplasty for nipple areola complex or for tumour around 6 o'clock position, batwing or hemi-batwing mammoplasty for peri-areolar tumours and Grissotti rotation flap for tumours at lower inner quadrant.

Local fasciocutaneous transposition flaps, latissimus dorsi mini flap and latissimus dorsi myocutaneous flap comprise the volume replacement techniques. Volume replacement is done where the resected specimen is more than 20% of the total breast volume.

Local fasciocutaneous flaps can be planned where there is an abundant fatty tissue around the breast and the donor site closure falls in the inframammary crease. Fasciocutaneous flaps are either based inferomedially on superior epigastric artery perforators for lower-medial quadrant defects or laterally on thoracodorsal perforators for lateral defects. The flap is elevated deep to the deep fascia so as to incorporate the perforators and their supply into the flap. While dissecting the flap, care is taken not to dissect into the breast tissue as this will prevent migration of inframammary crease with donor site closure. The donor site is closed primarily after transposition of the flap into the defect. The flap skin can be de-epithelialized and used to fill in the defect cavity, and in situations where parenchymal loss is accompanied with skin loss, skin of the flap can be used as such and the subcutaneous fat will provide the bulk to the breast.

Latissimus dorsi can be used only as a muscle for filling the defect as a mini flap or as a myocutaneous flap where the defect is extensive along with the skin. Mini latissimus dorsi (LD) flap [7] is muscle only or myofascial flap which is dissected via the same incision used for axillary clearance without changing the patient's position. The LD muscle is dissected till its attachment to the 9th rib inferiorly. If more bulk is needed, the fat layer overlying the muscle can also be incorporated with the flap, akin to extended LD myocutaneous flap. This has the advantage of no extra scar at the back for flap harvest and no need to change the position of the patient. When the defect comprises bulk (40–50% of breast volume) and overlying skin, a formal myocutaneous LD flap is done.

Results

A total of 508 case records of patients who underwent breast conservation surgery with reconstruction from January 2009 to June 2014 were reviewed. Thirty-six patient records were excluded from the study due to incomplete data availability, so only 472 patient records were found suitable for analysis. Age of the patients varied from 24 to 76 years (median age 46 years). A total of 113 patients had co-morbidities including hypertension (55 patients, 11.6%), diabetes (36 patients, 7.8%) and hypothyroidism (10 patients, 2%). One hundred

and three patients had right sided lesions while 244 patients had left sided lesions. Bilateral lesions were seen in 35 patients.

Most patients in our series had early breast cancer: T2N0 in 189 patients (40%) followed by T2N1 in 111 patients (23.5%). Seven patients had large operable cancers (T3N0) while 10 patients had stage III disease (Table 1). Forty-one patients received neo-adjuvant chemotherapy (NACT) to down size the tumour. More than half of the patients had tumour arising in upper outer quadrant ($n=268$, 56.7%), while 18 patients (3.8%) had tumours in central quadrant (Fig. 1, Table 2).

The most common method of reconstruction was volume displacement, done in 57.6% patients, which was closely followed by Latissimus dorsi mini flap, done in 17.4% of patients (Fig. 2, Table 2). Nipple-areola reconstruction was done in only 2 patients using the c-v flap technique out of total 18 patients having a central quadrant reconstruction. None of the patient consented for contralateral symmetrising procedures.

Overall surgical complications included wound infection with or without dehiscence (8.5%), seroma formation (11.7%), partial flap necrosis (2%) and fat necrosis in 12% cases (Table 3).

Post-operative histopathology revealed infiltrating ductal carcinoma in 444 patients, ductal carcinoma in situ in 17 patients and lobular carcinoma in 4 patients. Estrogen receptor positivity was seen in 295 patients (62.5%), progesterone receptor positivity in 251 patients (53.1%) and positive HER-2 neu receptor in 247 patients (52.6%).

All patients received adjuvant radiotherapy to whole breast to a total dose of 45–50 Gy/25 fractions plus 14 Gy/7 fractions boost to tumour bed. All 457 patients received post-operative adjuvant chemotherapy depending on final histopathology and receptor status.

The mean follow-up in our study was 23 months (range 12–70 months). The follow-up data was available for 366 patients. Local recurrence was seen in 07 patients (1.9%). Two patients underwent wide local excision of the local recurrence, and the rest 5 patients were managed by completion mastectomy. All patients with local recurrence received adjuvant therapy depending upon the final histopathology report.

The cosmetic outcome was assessed using Harvard scale at 6 and 18 months post-treatment, and it was taken by an independent observer (a nurse). As per the Harvard scale, excellent result means treated breast nearly identical to untreated breast, good is defined as treated breast slightly different than untreated breast, fair is when treated breast clearly different from untreated but not seriously distorted and poor is when treated breast seriously distorted [8]. It was found to be excellent in 109 patients (23.09%), good in 276 patients (58.47%), fair in 57 patients (12.07%) and poor in 30 patients (6.35%) at 6-month follow-up after radiotherapy completion. The cosmetic outcome assessment at 18 months was done in 398 patients. It was found to be excellent in 75 patients (18.84%), good in 225 patients (56.53%), fair in 64 patients (16.08%) and poor in 34 patients (8.54%). None of the patients with poor cosmetic results agreed for further corrective surgery.

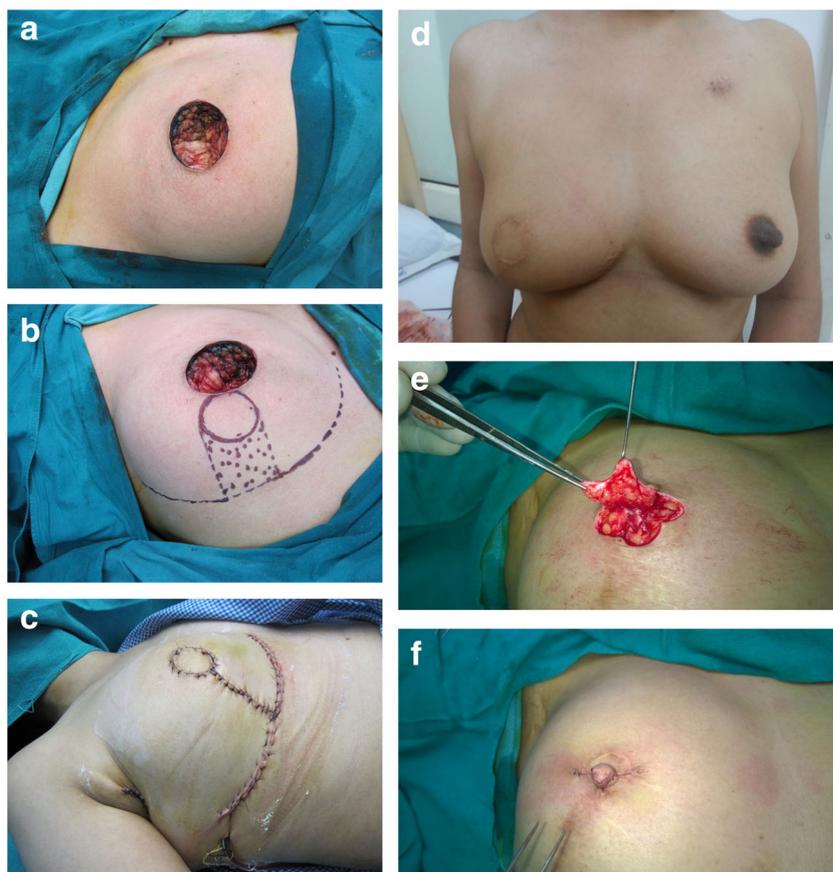
Discussion

Breast conservation surgery is an internationally accepted treatment for early breast cancer [9]. Currently, the use of BCS is rapidly expanding its horizons to selected cases of locally advanced breast cancer after neo-adjuvant chemotherapy. It has been proven equivalent to modified radical mastectomy in terms of disease-free survival and overall survival [10–15]. So, doing more surgery does not therefore give patients better outcomes. In recent studies, the overall survival rates were shown better with conservative surgery compared to mastectomy. A study based on the Netherlands Cancer Registry includes all patients diagnosed with cancer from 1989 forward and compares 10-year overall survival rates for 37,207 patients after either breast conserving therapy or mastectomy. Regardless of stage at diagnosis, women with conservative surgery and radiation did better, with 20% increased overall survival compared to mastectomy [16]. In a similar study presented at San Antonio Breast Cancer Conference (SABCS 2015) even in a cohort of women receiving neo-adjuvant systemic therapy at 9 NCI designated cancer centers, the type of surgery did not impact DFS, OS or TTP, suggesting that women who were suitable candidates for BCS

Table 1 Quadrant wise reconstruction method used

Quadrant of breast type of reconstruction	Upper outer	Lower outer	Lower inner	Upper inner	Central	Total no. of patients
OPS	153	29	25	53	12	272 (57.6%)
Fasciocutaneous flap	41	10	13	12	00	76 (16.1%)
LD mini flap	52	07	05	18	00	82 (17.4%)
LD myocutaneous flap	22	08	03	03	06	42 (8.9%)
Total no. of patients	268 (56.7%)	54 (11.4%)	46 (9.7%)	86 (18.2%)	18 (3.8%)	472

Fig. 1 Central tumour excision and reconstruction with inferior pedicle mammoplasty technique (volume displacement). **a** Post-central quadrant tumour excision. **b** Inferior pedicle mammoplasty technique marking. **c** One-week post-operative result. **d** Result after 18 months of treatment. **e** Nipple reconstruction using C-V Flap technique. **f** Final closure of nipple reconstruction



after NACT and BCS do not compromise long-term cancer outcomes [17]. Recently developed guidelines for loco regional breast cancer treatment also suggest that breast conservation should always be offered to all the patients who are suitable for it [18].

Oncoplasty was first described by Audretsch in 1998 as the incorporation of principles of plastic surgery for removal of tumours of the breast with adequate surgical margin along with immediate breast reconstruction [19]. Breast conservation alone leads to significant deformity of the breast, and margin clearance may also get compromised, but when breast conservation is performed by oncoplastic methods, the outcome in terms of cosmesis is much better and wider margins could be achieved [20–22]. Moreover, with oncoplasty and

partial breast reconstruction, BCS can be even offered to selected patients with multifocal lesions in the same quadrant [23].

We routinely perform breast oncoplasty in all patients undergoing breast conservation surgery at our Institute as it offers excellent cosmetic outcome. It also offers the possibility of altering the size of her breasts as per her desire simultaneous to the breast cancer surgery in the same sitting. It also results in improving the positive self-image as well as self-confidence. Therefore, oncoplasty is very essential aspect and the need of the hour for management of early breast cancer.

In a developing country like India where a large population lives in rural areas with meager oncology treatment facilities, nearly 60% of women are diagnosed with locally advanced breast cancers at presentation. With advances in care and the introduction of newer chemotherapeutic agents, it has now become feasible to offer neo-adjuvant therapy with effective tumour downsizing, thus making it possible to even consider breast conservation surgery along with appropriate reconstructive techniques in select patients with locally advanced cancers [24]. The indications of BCS in LABC include significant reduction in tumour size with adequate tumour to breast ratio with complete resolution of skin oedema. Absolute contraindications include extensive micro calcifications and or

Table 2 Pathological stage distribution of patients

T stage N stage	T1	T2	T3	Total no. of patients
N0	21	189	07	217
N1	26	111	08	145
N2	10	66	02	78
N3	07	25	00	32
Total no. of patients	64	391	17	472

Fig. 2 Latissimus dorsi mini flap for volume replacement for an upper outer quadrant defect. **a** Right sided upper outer quadrant tumour of size 4 × 3 cm. **b** Excised specimen, 8 cm × 7 cm in size, weight 185 g. **c** The defect after tumour wide local excision. **d** Latissimus dorsi muscle dissected through same incision and delivered into the defect. **e** Final closure



multi centric disease at presentation and persistent skin deem or erythema, presence of lymphatic permeation or inflammatory breast cancer at presentation.

Further advances in breast surgery would allow extending the concept of oncoplasty in patients undergoing mastectomy.

Table 3 Complications encountered

Complications	OPS	Fasciocutaneous flaps	LD mini flap	LD myocutaneous flap
Wound infection/dehiscence	26	6	5	3
Seroma	15	2	23	15
Partial flap necrosis	–	10	0	0
Fat necrosis	48	9	0	0

Even in mastectomy, incisions need to be well planned so that scars created are low lying, dog ears are prevented and a flat surface is created to accept prosthesis. In patients with severely ptotic breasts, contralateral breast reduction in patients undergoing mastectomy for cancer breast in extremely ptotic or large-breasted patients, even with no reconstruction, is an oncoplastic approach which gives good quality of life [25].

Oncoplasty techniques have been classified by many surgeons. Oncoplasty is broadly classified into volume displacement and volume replacement techniques by Rainsbury in 2007 [5]. This classification is based on the concept of volume of tissue lost. When the resected breast volume is less than 20% of the total volume, breast tissue itself is used to reconstruct the defect, it is called volume displacement. Volume replacement is done when the defect is more than 20% of the total breast volume and tissue from outside the breast is added. Volume displacement has been further classified as level I and level II depending upon the method of reconstruction by KB Clough in 2010 [6].

Recently, oncoplasty has been classified under four categories, namely, simple wide local excision, therapeutic breast reduction, therapeutic mastopexy and volume replacement [23]. Simple wide excision in defect <5% of total volume in a large breast usually suffices on its own. Therapeutic breast reduction is done in large breasts with contralateral symmetrising procedure. Therapeutic mastopexy is performed in case of largely ptotic breasts. Volume replacement finds its place in patients with small breasts with large defect. In large breasts, if the defect is anticipated to be large, it is preferable to do reduction mammoplasty than to do volume replacement.

In the present study, the cosmetic outcome was excellent and good in 81.7%, and these were the women satisfied with their result. In a study from India done over 35 patients, 96% patients were satisfied with the results after oncoplasty [26] and western literature shows patient satisfaction rate ranging from 71 to 100%. [5, 27–29].

The Indian scenario with respect to breast conservation is very different. Lack of awareness is the root cause of such low rates of breast conservation therapy for early carcinoma breast and much lower are rates of oncoplasty. The myth of high recurrence of cancer with breast conservation is highly prevalent amongst all, namely the patient, family and also the health care providers. The right of making decision regarding the type of treatment is not always with the woman who is suffering with the disease; rather, it is done by the senior male member of the family. Spreading correct knowledge regarding the advances in breast cancer treatment is the need of the hour. The frequency of doing contralateral symmetrising procedures and nipple areola reconstruction is also very low in India. This may be due to the conservative nature of the Indian society, where these procedures are considered meaningless as far as the aesthetics of the patient are considered.

Conclusion

Breast conservation therapy is the choice of treatment for early breast cancer, including centrally located lesions and selected cases of locally advanced breast cancer. Oncoplasty permits excision of large tumours, where tumour to breast ratio used to be a limiting factor for excision alone. Hence, BCS with oncoplasty is the treatment of choice to have oncological safety as well as acceptable cosmesis.

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