An oncoplastic procedure for central and medio-cranial breast cancer

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Abstract
Breast conserving therapy shows remarkable oncologic results and is eligible for up to 73% of patients with breast cancer. Cosmetic results are good, however, in patients with central or medio-cranial (“no-man’s land”) located breast cancer, the cosmetic result may be unsatisfying. The use of different breast reduction techniques have been shown to increase resection free margins and improve cosmetic results. We report here about the use of the Hall Findlay breast reduction technique for oncoplastic surgery to improve the cosmetic result in 11 patients. The Hall Findlay technique shows good postoperative breast symmetry, all patients had resection free margins above 5 mm and are free of disease at a mean follow-up of 12 months. The technique may be used for breast cancer at various locations and reduces scar visibility and morbidity.

Keywords: Breast surgery; Breast conserving therapy; Breast cosmesis; Breast reduction

Introduction
The debate about the oncologic safety of breast conserving therapy (BCT) in patients with stage I and II breast cancer is over after Veronesi and Fisher published the results of their prospective randomised trials.1,2 In about 15% of patients the quadrantectomy may lead to a significant lack in cosmetic outcome, which may be improved by the lumpectomy technique.3–5 However, 23% are still dissatisfied with their appearance.6 This may be due to the use of BCT in patients with unfavourable cancer locations. In the last 10 years our institution operated on 2090 breast cancer patients using the lumpectomy technique. The BCT-rate in this cohort was 78%. Patients undergoing BCT were very much satisfied with their results except singular patients with central, medio-cranial or caudal cancer locations.

Several oncoplastic techniques have already been described to improve the cosmetic outcome after BCT,7–9 such as concomitant breast reduction and local parenchyma flaps. Moreover these techniques have been shown to increase the size of the resection free margins and improve the cosmetic outcome.10,11 We report here about the use of the Hall Findlay vertical breast reduction technique12 to improve cosmetic outcome in patients with “central breast cancer” or breast cancer located in the upper inner quadrant called the “no-man’s land”.

Patients and methods

Inclusion criteria and eligibility

Patients with histologically verified stage I or II breast cancer were eligible for combining BCT with the Hall Findlay breast reduction. Oncologic exclusion criteria for this modified BCT were the same as for all BCT: no microscopic resection free margin (R0 resection) after reasonable attempts, multicentric carcinoma, inflammatory breast cancer, progressive disease after neoadjuvant chemotherapy, contraindication for radiotherapy and the patient’s own preference. Non-oncologic exclusion criteria was small breast size (Cup A or B). Smoking, diabetes or BMI above 30 were no exclusion criteria. If necessary, immediate or
late contra-lateral breast reduction has been done to the patient’s own preference.

We included only patients with centrally located breast cancer (within 2 cm distance from the nipple—areola complex) and breast cancer in the medio-cranial quadrant of the breast to be treated with lumpectomy and concomitant Hall Findlay breast reduction.12

Operative procedure for BCT

Patients with breast cancer first underwent lumpectomy with microscopically free margins (R0 resection: at least 2 mm resection free margins). Intraoperative frozen sectioning was used to ensure cancer free resection margins. Patients with positive margins at definitive histology were either resected or treated by mastectomy depending on the extent of residual cancer. One suction drain was placed at the end of the operation to ensure drainage of wound seroma and hematoma. All patients had sentinel lymph node biopsy before lumpectomy using lymphazur blue dye applied subcutaneously. Axillary level I and II dissection was done in cases of cancer involvement of the sentinel lymph node.

Operative procedure for centrally located breast cancer

Preoperative markings were done as shown in Fig. 1A. The resection line for the central lumpectomy is drawn circumferentially around the nipple. The total length of this incision should be about 14 cm (semicircular line around the nipple in Fig. 1A, right breast). A neo-nipple—areola complex (NAC) was planned on a medial dermoglandular pedicle reconstructed from the skin below the lumpectomy area as shown in Fig. 1B. The base of the pedicle measured at least 6 cm and the neo-NAC had a diameter of exactly 4 cm.

After skin incision central lumpectomy has been performed. After frozen sectioning revealed negative resection margins, the tumor bed was marked with titan clips for radiotherapy guidance. Thereafter, the dermoglandular flap was designed. The area around the neo-NAC was deepithelialized (Fig. 1C) and 2 cm of parenchyma underneath the neo-NAC was left for better blood supply. The base of this flap was between 6 and 8 cm long. The distance from the sternum to the base of the flap was 10 cm. The neo-nipple was reconstructed by a local flap technique (Fig. 1C). The skin over the lower outer and inner pole of the breast was undermined to allow rotation of the breast and closure of the inferior vertical scar which should have a length of 5–6 cm with a distance to the sternum of 10 cm. The deepithelialized flap was rotated upward into the central lumpectomy defect to reshape the breast (Fig. 1D). The resected skin and tissue underneath the neo-NAC helps to reduce bottoming out and gave the breast a rounder shape. Parenchyma sutures may be necessary to hold the breast in shape. The vertical scar under the neo-NAC ended 2 cm above the submammary fold. To achieve a distance between the submammary fold and the areola between 5 and 6 cm, the lowest portion of the vertical scar was closed with a purse string suture. This resulted in a small bulky skin mass, which flattened during the first 2 weeks after operation due to skin undermining in this area. This technique avoids the use of an inverted T-scar and was first described in 1999 for breast reductions.12

Operative procedure for medio-cranial breast cancer (the ‘‘no-man’s land’’)

In patients with medio-cranial breast cancer we used a different approach than for central breast cancer. The Hall Findlay technique was used with a lateral dermoglândular pedicle supplying the patient’s own NAC. Skin incisions follow preoperative markings (green line in Fig. 2A). First the skin was undermined from the breast parenchyma except the area of the lateral dermoglândular pedicle to ensure blood supply (Fig. 2B). The medio-cranial breast quadrant is resected including the pectoral’s fascia and the patient’s own NAC is supplied by a lateral pedicle constructed by deepithelialization of the surrounding skin (Fig. 2C). Resection margins were histologically determined by frozen sectioning and the tumor bed was marked with titan clips. The defect in the upper medial quadrant was filled with the parenchyma of the lower inner pole by up rotation of the breast and the NAC is rotated into its new position (Fig. 2D).

Follow-up

During the first year, patients had a close follow-up every 3 months with clinical examination, laboratory test including tumor marker and a CT-scan of the thorax and the abdomen every 6 months as well as 1 mammogram plus ultrasound per year. Clinical evaluation consisted of palpation and quality of life questions such as arm mobility, nipple sensation and breast sensation (normal or not normal, no scale). Furthermore, patients were asked to judge their cosmetic result on a scale from 1 to 4 according to the Harris scale.13 The cosmetic result was objectively documented by the breast symmetry index (BSI) and given as % difference [%d] comparing several length parameters of one side with the other.14

Results

Operative procedures

From September 2005 to September 2006, 11 women were operated with this technique due to central (n = 7) or medio-cranial (n = 4) breast cancer. Five patients were operated by a single surgeon (F.F.); the other 6 patients were operated by 2 surgeons (G.N. and S.G.). Four women had undergone secondary mastectomy 2 weeks after the first operation. In these 4 women, 3 had multicentric intraductal breast cancer not seen in the mammogram or during intraoperative frozen sectioning, 1 woman had...
a hemangiosarcoma within a phylloides tumor. All other 7 women had BCT with adjuvant radiotherapy.

Postoperative morbidity

We had 1 haematoma formation which did not necessitate any second operation and was treated conservatively. There was 1 epidermal necrosis (3 × 1.5 cm) below the nipple—areola complex, which was treated conservatively with moisturized crème and necrosectomy at the outpatient ward. The mean hospitalization time was 6 days.

Demographic data and follow-up

Table 1 shows the demographics. All but 2 had hormonal responsive breast cancer. After a median follow-up of 12 months there were no systemic or local recurrences or cancer related deaths.

Quality of life

Patients with medio-cranial breast cancer had normal sensibility over the nipple, patients with a neo-NAC had a different feeling (not normal) on the new nipple. The

median BSI of all 7 patients treated with BCT and Hall Findlay breast reduction was 22 ± 8% d. Figs. 1E and 2E illustrate the cosmetic results. All women were satisfied (Harris scale 1–2) with their symmetry and very satisfied (Harris scale 1) with their general appearance. Arm mobility was normal in all patients at follow-up.

Contra-lateral breast reduction has not been done in 2 patients because of excellent symmetry after the first operation (medio-cranial breast cancer). The other 4 patients underwent contra-lateral breast reduction using the Hall Findlay technique after radiation therapy. One patient underwent immediate contra-lateral breast reduction (Fig. 2E).

Discussion

General considerations

Oncoplastic surgery defines the combination of reconstructive techniques with oncologic surgery. Recently, Clough et al. presented excellent cosmetic and oncologic results of 300 women after oncoplastic surgery. Main advantages are the increased distance of the resection margins and the improved cosmetic outcome.

Not all patients with breast cancer may need oncoplastic surgery. Eligible patients usually have an unfavourable
relation in size between breast and tumor, medium or large breasts as well as tumor locations leading to large visible scars and deep breast defects if BCT is performed. In this respect patients with medio-cranial or centrally located breast cancer fulfill these criteria. For medio-cranial tumor location, the scar and the tissue defect may be easily visible by routine quadrantectomy technique. Oncoplastic surgery may improve the cosmetic result by reconstructing the tissue defect with the medio-caudal breast parenchyma and placing the scar around the NAC. For central breast cancer the resection of the NAC is necessary and cosmetic result is poor if standard BCT is performed. Thus most surgeons perform a mastectomy in patients with central breast cancer. Oncoplastic surgery may omit mastectomy and reconstruct the NAC immediately.

Study data

We describe here the use of a breast reduction technique with a vertical scar and a medial or lateral pedicle for the NAC to improve the cosmetic outcome in patients with central or medio-cranial located breast cancer. In our series of 11 patients we were able to achieve subjective and objective good cosmetic results in 7 after oncoplastic surgery. Four had to undergo subsequent mastectomy. All 7 patients with lumpectomy had resection free margins of at least 5 mm. There were no local or distant recurrences during a median follow-up of 12 months.

Comparing Hall Findlay with other techniques

Several oncoplastic techniques have been described using breast reduction. For central breast cancer the Grisotti flap was described by Galimberti et al. This technique shows a perfect cosmetic result, however, in some cases, especially in larger breasts, the lateral end of the scar may exceed the submammary fold and may thus be visible. The same is true for breast reduction techniques using an inverted T-scar with the disadvantage of a medial scar crossing the submammary fold and showing hypertrophy in some cases. Moreover most inverted T-scar techniques necessitates a large dissection area resulting in increased morbidity and long operation times. The use of the vertical scar technique improves the cosmetic aspect in this regard as there are no scars along the medial or lateral side of the breast reducing scar visibility and hypertrophy. Extensive dissection may be avoided reducing morbidity, especially after radiotherapy, and increasing the learning curve.

Others reported about simple central resection of the tumor and immediate closure of the defect. This technique with a short operation time, however, may only be possible in small sized breast cancer. Defects of simple central resection of tumors may result in less projection and a flat neo-NAC after reconstruction. Using the modified Hall Findlay technique as described above the central lumpectomy defect is filled with breast parenchyma resulting in good projection and a natural breast shape.

Another advantage of the Hall Findlay technique is the low rate of skin and areola necrosis and the fast learning curve. In our first 7 cases we observed 1 skin necrosis and no areola necrosis. There were no complications which necessitated re-operation. Although the numbers were small these early results indicate a fast learning curve and a low morbidity rate.

Several authors describe different oncoplastic techniques according to the tumor location depending on the site of the pedicle for the NAC. For the Hall Findlay breast reduction technique different pedicles for NAC blood supply were described. Thus, medial and lateral pedicles may be used for all patients with breast cancer independent of their tumor location. This may be the most important advantage of this technique for oncoplastic surgeons. In this regard we used the Hall Findlay technique with a lateral pedicle for medio-cranial breast cancer. Mean operation time was 2.5 h and cosmetic result was good. One patient had concomitant contra-lateral breast reduction with the same technique (Fig. 2B).

Table 1

Demographic data from patients with central or medio-cranial located breast cancer

<table>
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<th>Patient</th>
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Three patients underwent mastectomy after BCT and Hall Findlay breast reduction due to multicentric disease and 1 due to hemangiosarcoma. Two patients were eligible for neoadjuvant chemotherapy and yielded a pathologic partial remission. All patients are free of disease at a median follow-up of 12 months.

All patients except 3 (chemotherapy ± herceptin) had adjuvant anti-hormone therapy.

Three patients underwent mastectomy after BCT and Hall Findlay breast reduction due to multicentric disease and 1 due to hemangiosarcoma. Two patients were eligible for neoadjuvant chemotherapy and yielded a pathologic partial remission. All patients are free of disease at a median follow-up of 12 months.
Anatomic and clinical studies demonstrated that the main nerve branches reach the nipple from the lateral and the medial side as well as through the Cooper ligaments.\textsuperscript{27–29} Thus it may be important to avoid superior and inferior pedicles to preserve nipple sensation. Nipple sensation was normal in all patients after Hall Findlay technique in our series, however, the number was too low for statistic evaluation. Other techniques for medio-craniol breast cancer location, such as the round block technique\textsuperscript{17} may result in reduced nipple sensation, however, this has to be proven as there are no data in this respect.

**Conclusive remarks**

In conclusion we suggest that the use of the Hall Findlay breast reduction technique to improve cosmetic outcome after BCT is safe, improves cosmetic results and is feasible for all breast cancer locations. It may be superior to inverted T-scar techniques due to the reduced dissection and the fast learning curve. For smaller centrally located breast cancer, the round block technique or the Grisotti technique are excellent alternatives.

**References**