

ORIGINAL ARTICLE

## Simultaneous reconstruction of breast and well-projected nipple after expansion of mammary skin

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### Abstract

The problem of postoperative reduction of projecting reconstructed nipples remains to be resolved. To this end we did a clinical study of reconstructing the nipple at the same time as the breast. A tissue-expander was placed under the skin of the breast at the first operation, and then the breast and nipple were reconstructed at the second. A nipple was reconstructed using a dermal-fat flap harvested from the myocutaneous flaps used for reconstruction of the breast. A small hole was made in the corresponding site of the skin of the breast, and the reconstructed nipple was projected through the hole. This method was used in 8 cases. This method is useful in reconstructing a breast without a pad of skin and a projected nipple simultaneously. Its disadvantages are the relatively weak blood supply of the flaps, and difficulty in calculating the position of the nipple. The procedure may be beneficial for selected cases.

**Key Words:** *Mastopexy, nipple, simultaneous reconstruction, implant, latissimus dorsi*

### Introduction

Reconstruction of the nipple-areola complex (NAC) is the final, but key procedure in reconstructing the breast. A number of surgical techniques have been described including skin grafting [1], tattooing [2], application of a composite graft with several kinds of tissue [3–5], local skin flaps [6–15], and a combination of methods [16,17]. Some of the tissue harvested from the mastectomy specimen has also been used for reconstruction in selected patients with early breast cancer [18]. A number of local flaps, including subcutaneous flaps such as a quadrapod flap [14] and propeller flap [15], and dermal-pedicled flaps [7,9,11,12] such as the skate flap [13], the double-opposing-tab flap [12], and the star and wrap flap [6], have been widely used. The combination of a local flap with tattooing or a skin graft, or both, enables reconstruction of a pleasing complex, but the problem of postoperative reduction of the projecting nipple remains to be resolved. Long-term results have shown that the height of reconstructed nipples declined by about 60%–80% in 12–36 months [19–22].

We propose a new method for reconstruction of the nipple to permit long-lasting projection of the reconstructed nipple. This method can be done at the same time as the breast is reconstructed and tattooing applied, although the vascularity of the nipple flaps is not good and minor correction may be needed afterwards.

### Patients and methods

#### *Surgical procedure*

The present method was applied to breasts the skin of which had been expanded with a tissue-expander in all but one case. During resections of breast cancer or secondarily, a tissue-expander (600–1000 ml) was placed under the breast skin just beneath pectoralis major. After gradual expansion (usually to 100%–150% of the designated volume) over 3–6 months, the expander was removed and the breast was reconstructed with a myocutaneous flap. A butterfly-shaped, dermal-fat flap was designed on the myocutaneous flap (Figure 1a). The width and

height of the flap depended on the size and height of the nipple to be reconstructed. (In this study nipples were overcorrected in some cases.) The site where the blood supply seemed to be best was selected for the flap to be raised. This was done with subcutaneous fat tissue (Figure 1*b*), and after proper trimming of the tissue both "wings" were sutured to each other with 6/0 nylon to produce the cylindrical shape of the nipple (Figure 1*c, d*). After the flap had been raised, the skin on the other area of the myocutaneous flap was de-epithelialised with great care so as not to damage the subdermal circulation, particularly surrounding the pedicle of the flap.

With the patient in a sitting position, the site of the nipple was chosen to match the healthy side, and a hole 10 mm in diameter was made. The myocutaneous flap was then transferred to the breast and the reconstructed nipple was introduced and projected through the hole. The lower margin of the nipple was sutured to the hole margin with a 6/0 nylon

suture. The nipple and areola can be tattooed at the same time if necessary.

#### Patients

Eight nipples on eight patients were reconstructed using this technique at the time of reconstruction of the breast. Nipples were overcorrected in some cases. For reconstruction of breast and nipple at the same time, the pedicled-TRAM flap was used in seven patients (the supercharged-TRAM flap was employed in three), while the latissimus dorsi myocutaneous flap was used together with implantation of a saline prosthesis (220 ml) in the other patient. A tissue-expander was inserted at the same time of resection of the cancer in two cases, and later in five. Tissue expansion was omitted in the other case. The nipple and areola was tattooed at the same time as the reconstruction in two cases, and separately in the other six.

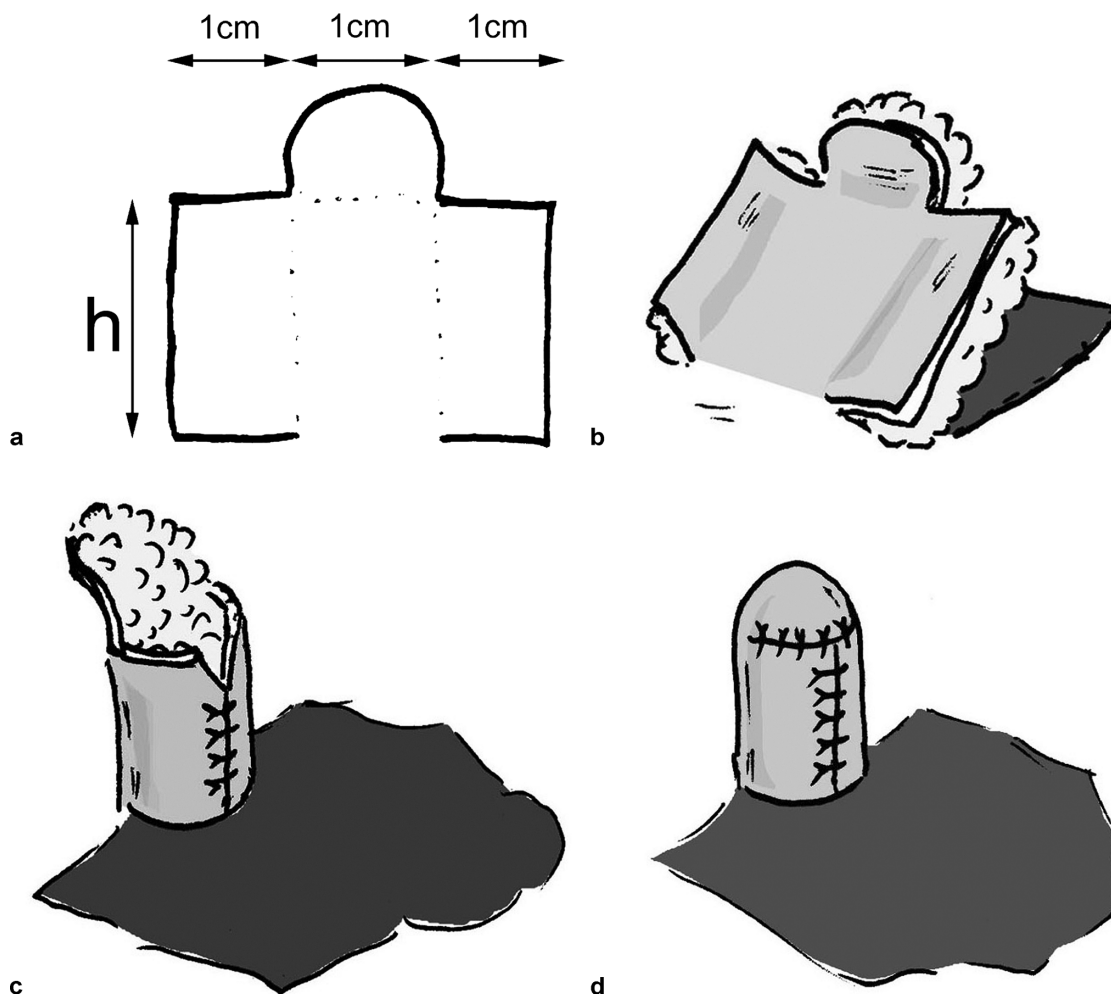


Figure 1. Design and surgical procedure of the nipple flap.

## Results

The breast was successfully reconstructed in all cases. Partial lysis of the fat developed in two cases with no deformity.

In three of eight cases, the reconstructed nipple partially necrosed postoperatively. In one of the three cases, the flap had been raised at the lateral margin of zone III of the TRAM flap, and the nipple was reconstructed at 30 mm to evaluate its vascularity. In the other two cases, the TRAM flap was inserted without supercharging, and the nipple was reconstructed projecting more than 15 mm. In two cases, projection of the nipple was reduced 3–4 months after reconstruction at the same time as tattooing, because the nipple projected too high. The projection gradually reduced, but not by much.

Breast and nipple were symmetrical in four patients with relatively small breasts, while mastopexy of the opposite breast was subsequently needed in the other four cases with ptotic breasts to achieve a symmetrical nipple within the contour of the breast.

### Case reports

*Case 1 (a 38-year-old woman).* An expander (1000 ml) was placed secondarily beneath pectoralis major (Figure 2a). The breast skin was gradually expanded and the total volume of saline injected was 1400 ml (Figure 2b). A nipple flap was designed at the distal end of zone III of the TRAM flap (Figure 2c). In this first case, we produced a nipple 30 mm high to evaluate the viability of the flap (Figure 2d). The pedicled TRAM flap was transposed to the right breast with supercharging between the inferior epigastric vessels and the thoracodorsal vessels (Figure 2e). The reconstructed nipple necrosed partially postoperatively (Figure 2f), and subsequently, the necrotic tissue was debrided and the nipple reconstructed. Projection of the nipple after correction was 12 mm. Twelve months after the reconstruction, the reconstructed nipple and areola were tattooed together with a mastopexy on the healthy side (Figure 2g). The projection of the nipple was maintained quite well and it was 8 mm 24 months postoperatively (Figure 2h).

*Case 2 (a 55-year-old woman).* An expander containing 600 ml was inserted at the same time as the tumour was resected (Figure 3a). The pedicled TRAM flap was transplanted to the breast without supercharging, and the flap for the nipple was designed in zone I (Figure 3b). The reconstructed nipple projected 10 mm (Figure 3c) and was

tattooed three months postoperatively. The breast and nipple were well preserved (Figure 3d) and the height of the nipple was 7 mm 10 months after reconstruction (Figure 3e).

*Case 3 (a 62-year-old woman).* In this exceptional case, a reduction mammoplasty had previously been done on the healthy side on her first visit to our hospital (Figure 4a). As the breast on the healthy side was small, we did not expand the skin on the other side. The breast was reconstructed using a pedicled TRAM flap with supercharging between the inferior epigastric vessels and the thoracodorsal vessels. The flap for the nipple was raised over zone II, and the reconstructed nipple was 20 mm high, and was tattooed at the time of reconstruction (Figure 4b). The circulation of the flap was good, and the projection of the nipple had not differed after three months (Figure 4c, d). The nipple was therefore corrected secondarily to reduce the projection to 6 mm (Figure 4e, f) and this was intact six months after correction.

*Case 4 (a 36-year-old woman).* A tissue expander capable of containing 1 L of saline was placed under pectoralis major when the cancer was resected. The skin of the breast was expanded gradually until 1 L had been injected into the expander (Figure 5a; preoperative view). The latissimus dorsi myocutaneous flap and a flap for the nipple were designed (Figure 5b). The myocutaneous flap was raised, transposed anteriorly, and de-epithelialised (except the donor region of the nipple flap) (Figure 5c). A saline bag prosthesis (220 ml) was implanted under the flap to augment the volume of the reconstructed breast (Figure 5c). The projection of the reconstructed nipple was initially 10 mm, and reduced gradually to 7 mm after six months (Figure 5d, 5e). The ptotic breast on the healthy side was then corrected with a mastopexy to match the shape and position of the nipple to that on the reconstructed side.

## Discussion

Expansion of the skin of the breast before reconstruction contributes considerably to the cosmetic results in terms of natural contour and minimal scarring [23,24]. If the skin is not expanded a pad of skin that is part of the transferred flap usually has to be exposed on the reconstructed side because of a shortage of skin. The pad gives rise to a patchwork-like appearance and abnormal sensation of the reconstructed breast. However, in large and ptotic



Figure 2. Case 1 (a 38-year-old woman). (a) Before placement of tissue expander. (b) Before reconstruction of the breast and nipple. (c) Design of the nipple flap on the TRAM flap. (d, e) Just after reconstruction. (f) The reconstructed nipple at 10 days. (g, h) After 24 months.

breasts, and those in which breast cancer has been treated early with a skin-sparing mastectomy, the remaining skin may be sufficient [18,25]. Additional

skin may also be provided to construct a breast with a natural contour and the required size in other cases, particularly those with non-ptotic or relatively



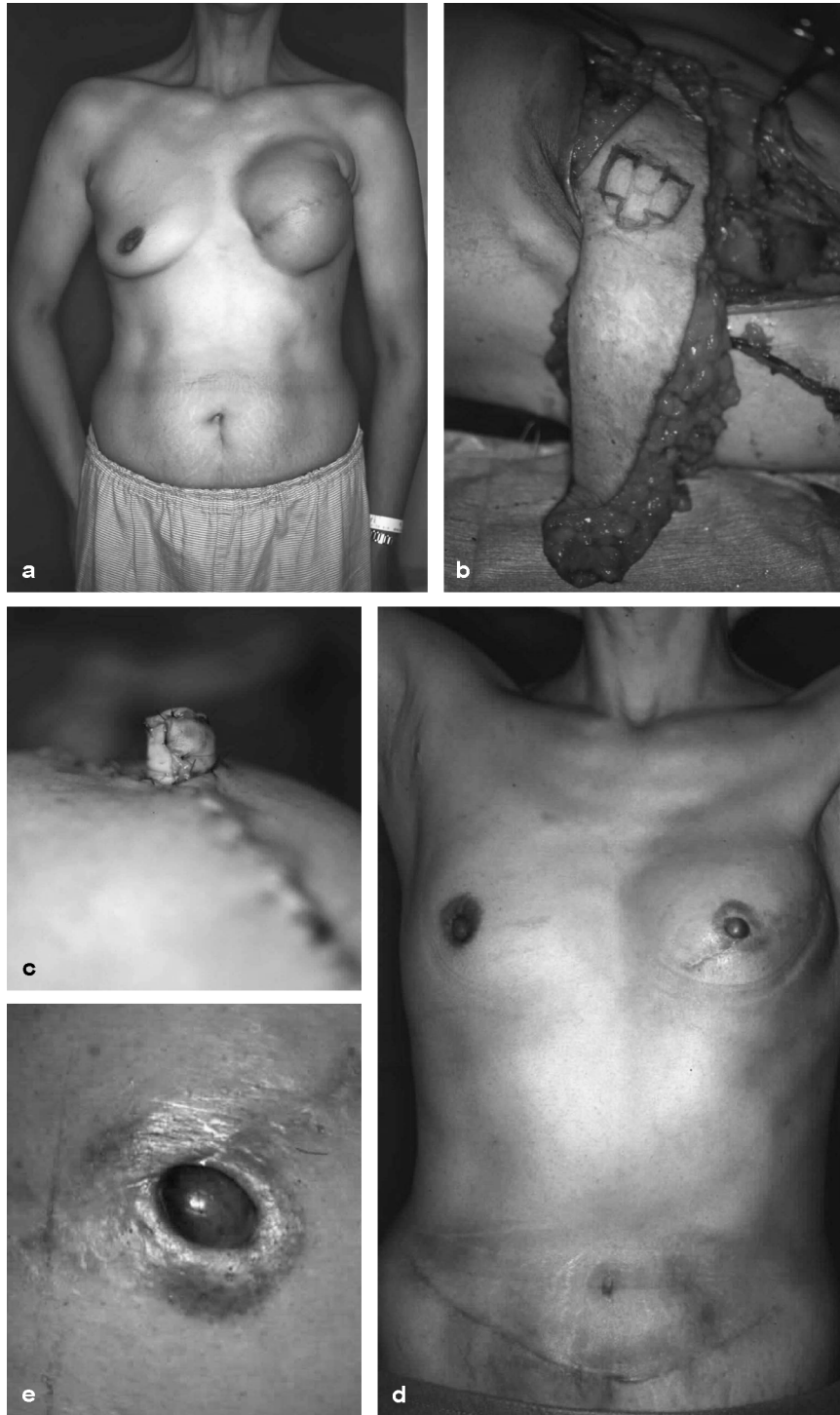


Figure 3. Case 2 (a 55-year-old woman). (a) Before reconstruction of the breast and nipple. (b) Design on the transposed TRAM flap. (c) The nipple just after reconstruction. (d, e) After 10 months.

small breasts. Expansion of the skin enables the breast to be reconstructed with a normal colour match, texture, sensation, and natural contour [23].

Nipple reconstruction by this technique has some advantages. Since we used a myocutaneous flap inserted under the skin rather than the breast no skin graft is necessary; there is no limitation in size

for the reconstructed nipple; the projection of the reconstructed nipple is good and long-lasting, and the flattening of the breast usually seen after reconstruction of the nipple can be avoided. In addition, the nipple can be reconstructed at the same time as the breast, and may be tattooed at the same time if desired, although a further study on



Figure 4. Case 3 (a 62-year-old woman). (a) Preoperatively. (b) Just after reconstruction of the breast and nipple with tattooing. (c, d) After 3 months. (e, f) After reduction of the nipple to 6 mm.

long-term projection of reconstructed nipples is needed.

This method applies not only to TRAM flaps but also to others, including the latissimus dorsi myocutaneous flap; in these cases the volume of the breast

is usually insufficient, so augmentation with a mammary prosthesis is often necessary [26]. Other flaps, such as the parascapular or scapular, may be also used. In cases with prostheses, the transferred flap has an important role in providing the nipple



Figure 5. Case 4 (a 36-year-old woman). (a) Before reconstruction of the breast and nipple. (b) Design of the flaps at operation. (c) Transplanted flap and a saline bag prosthesis (220 ml). (d, e) After 6 months.

with a high projection and a layer of subcutaneous fat that is sufficiently thick to cover the prosthesis under the expanded thin skin. Reconstruction with implants alone has been widely used, but the loss of covering soft tissue has often resulted in an unna-

tural appearance with the breast feeling hard to the touch.

The present technique requires a dermal-fat flap with a subcutaneous pedicle for reconstruction of the nipple. Because all other areas on the transferred



myocutaneous flap were de-epithelialised, the vascularity of the nipple flap is poor compared to that of a derma-fat flap with a dermal pedicle such as the skate flap. A minor correction was needed because of partial necrosis of the nipple in three cases in which the nipple projected more than 15 mm. Great care should therefore be taken not to damage the subdermal plexus when de-epithelialising the surrounding skin. A supercharged pedicled flap or a free flap may be a reasonable option under these circumstances.

Symmetry is another issue in unilateral reconstruction. It is not easy to obtain symmetrical nipples when reconstructing the breast and nipple simultaneously. However, the breast on the healthy side is often ptotic, and sometimes not the favourable size. On the other hand, the reconstructed breast is usually not ptotic, and its size can be adapted with an additional mammary implant. To adjust the shape of the healthy breast to match the reconstructed side is a reasonable way to acquire symmetrical breasts. The need for an additional operation on the other side may not be a disadvantage in terms of achieving the ideal appearance of the breasts, and a mastopexy of the ptotic breast on the healthy side can be done later.

The placement of a mammary implant on the reconstructed side, or on both sides, may be more preferable for Asian patients because they often have small and minimally ptotic breasts with a thin fatty layer, which leads to difficulty in reconstructing large, natural breasts with either autologous tissue or a prosthesis alone.

In conclusion, the present study showed that this method can achieve a relatively high projection of nipple, no skin pad on the breast, simultaneous reconstruction of breast and nipple (even tattooing of the areola as well), and a combination of mammary implant, although it is not easy to achieve symmetrical nipples without operating on the healthy side, and there is the disadvantage of the poor vascularity of nipple flaps. Patients with non-ptotic and relatively small breasts may be good subjects for this technique.

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