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The permanent expandable implant in breast aesthetic, corrective and reconstructive surgery

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Summary. Since 1986 we have considered the permanent expandable implant (PEI) as the first choice of prosthesis in breast surgery. The possibilities offered by multiple over-expansions and deflations have been explored; 187 PEI were utilized in 136 patients for aesthetic (32 with bilateral hypoplasia), corrective (17 with asymmetry, tubular breasts or Poland's syndrome) and reconstructive breast surgery (87 patients for immediate or delayed reconstruction following radical, modified radical, partial or subcutaneous mastectomy). All implants were positioned submuscularly; a latissimus dorsi muscular flap was transposed when the pectoralis major was absent or damaged. Either the Becker or the Gibney implant was used. The filling port was retained in order to take permanent advantage of the properties of the PEI. The dome was placed deep in the axilla, where it could not readily be palpated by patients. All PEI were immediately or progressively overinflated by 25–80% and then deflated to the planned optimal volume. Twenty-two patients developing capsular contracture were treated by overinflations and deflations with subjective and objective improvement. Many of the augmentation mammaplasty patients refused implant deflation to the planned preoperative volume. The over-expansion/deflation process proved to be effective in obtaining ptosis, in maintaining permanent volume symmetry and in keeping the base of tubular breasts unfolded. Moreover, the psychological advantages of patient's involvement in the procedure are significant.

Key words: Permanent expander implants – Augmentation – Reconstruction

In the past five years, the permanent expandable implant (PEI) has been our first choice of prosthesis in breast aesthetic, corrective and reconstructive surgery, as it allows volume adjustments. However, other applications of the overinflation/deflation process were hypothesized and have been confirmed by clinical experience. In our opinion, removal of the filling port is an unnecessary step leading to loss of a useful possibility; thus, dome removal was not planned and patients were informed about the multiple long-term applications of volume modifications including topping up after leakage.

Materials, methods and results

Between 1986 and 1989, 187 PEI were implanted in 136 patients. Either the Becker (Mentor Co.) [1–4] or the Gibney (Cox-Uphoff Int.) [7] implants were used; in the former, the gel/saline ratio is 1:4 to 1:5 while in the latter it is 1:1 to 1.5:1. All prostheses were placed in a submuscular pocket. Methods and results will be reported together for brevity and clarity in three groups of patients who had aesthetic, corrective and reconstructive surgery. Capsular contracture rate will not be evaluated since reliable data are not available.

Aesthetic surgery

Thirty-two patients underwent breast augmentation: all PEI were inserted subpectorally through a 3 cm incision placed in the axillary hair bearing area. Careful blunt subpectoral dissection was extended inferiorly and laterally deep to the rectus fascia and to the serratus anterior muscle; these were maintained in continuity with the pectoralis muscle. Care was taken to avoid undermining the pectoralis major muscle too far superiorly, as implant displacement superiorly can result. The introduction was easier and quicker than with gel protheses due to the lower start-up volume, and it was sometimes facilitated by the use of an implant injector [6]. The port was placed in the axilla, a few centimeters behind the axillary incision, in order to allow easy access should the patient request dome removal.

Elastic compression pushing the implant downwards was maintained continuously for two weeks and then at night for a further three weeks in order to expand the inferior breast quadrants. At surgery, the implants were overexpanded 30% above the final planned volume; during this maneuver and prior to suture, competence of the dome and function of the device were checked, since in our early experience port defects were found.

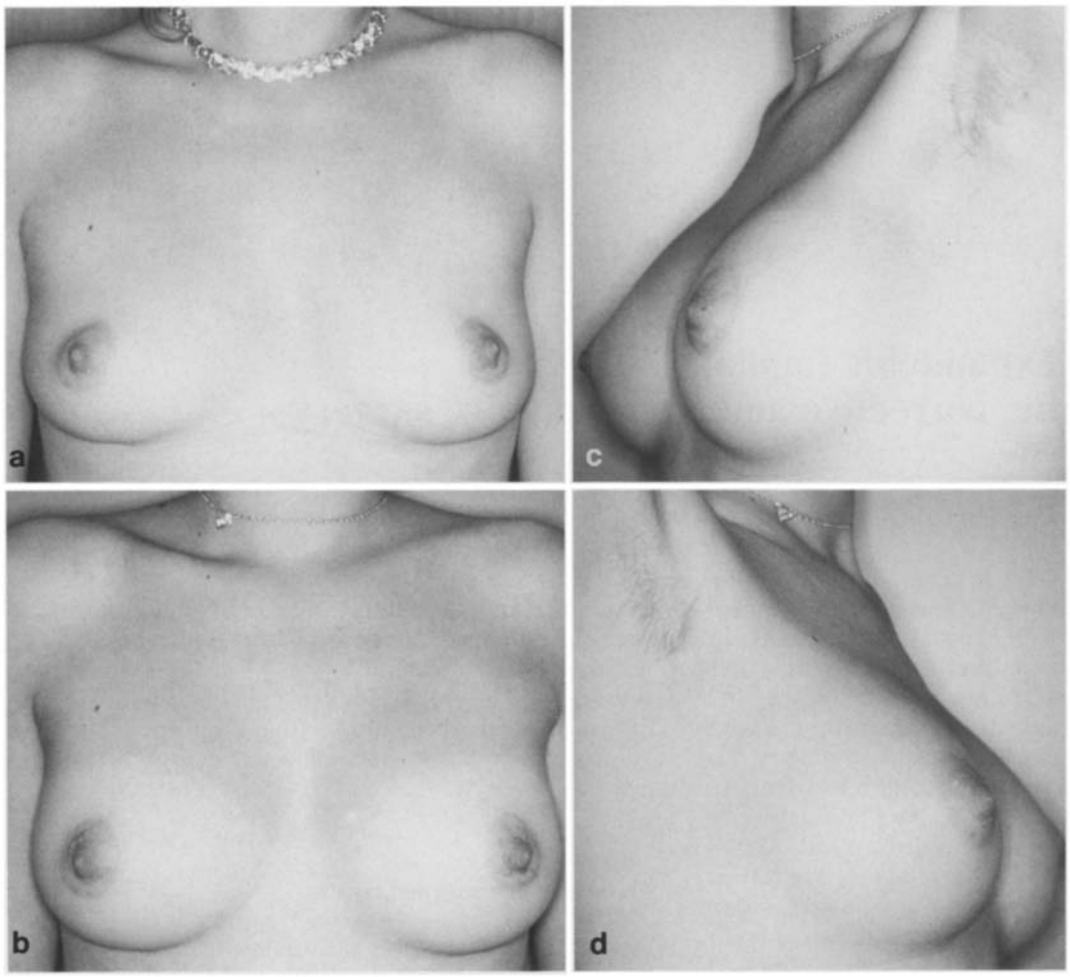

Fig. 1. a 25-year-old patient with breast hypoplasia. **b** Postoperative view following transaxillary submuscular placement of a 150+ 100 ml (final volume) PEI. **c, d** Lateral views showing minimal axillary scarring; the domes are still in place in the axilla

A few drops of methylene blue are always added to the saline in order to check intraoperative leakage and to facilitate puncture of the port for expansions and deflations.

Further postoperative expansion (20%) is suggested and deflation to the preoperatively planned volume was programmed three months after surgery. However, only thirteen patients (40.6%) agreed to have the implants deflated as planned; seven patients (21.8%) wished to maintain, at least temporarily, a >30% over-expansion. Twelve patients needed various degrees of overinflation. It should be underlined, however, that request for excessive augmentation is often a psychological reaction to the previous hypoplasia, especially in young women with unreasonable expectations and unrealistic views of their body image. These unstable patients often asked for volume reduction at a later stage: while the surgeon could not cope with such demands using standard prostheses, the PEI allows this. On the other hand, only one patient wished to have the PEI deflated below the planned preoperative volume. The possibility of gradually increasing the volume of the implant was utilized in two patients who, for social reasons, wished to undergo less noticeable augmentation; in these patients, the implants had an initial volume of 70 ml (50 ml gel+20 ml saline) and were expanded to 250 ml in seven and twelve months respectively.

Patients who completed the inflation/deflation program showed very natural looking, slightly ptotic breasts: thanks to over-expansion, a large loose pocket is obtained, and in the standing position, saline collects in the inferior quadrants, thus maintaining expansion in this area and avoiding upper bulging (Fig. 1). Up to now, six patients developing capsular contracture and/or experiencing some discomfort were treated by single or multiple overinflations and deflations with evident objective and significant subjective improvement. No patient in this group requested port removal.

Corrective surgery

Eighteen patients, 9 with breast asymmetry, tubular breast(s) (7 patients) or Poland's syndrome (2 patients) are included in this group. Filling ports were placed deep in the axilla. Patients with asymmetry underwent bilateral or unilateral augmentation (with contralateral reduction when needed) using the same technique as in the aesthetic surgery group.

Postoperative volume adjustments appeared to be extremely useful in achieving precise volume symmetry, a goal which is often difficult to obtain and impossible to maintain with standard implants. A further advantage observed in unilateral augmentations is the ability to match the ptosis of the contralateral, unoperated breast: multiple over-expansions and deflations produced ptosis of the augmented breast even in patients with deficient breast tissues (Fig. 2).

Tubular breasts were corrected by spreading the constricted breast base by means of deep radial incisions through a periareolar approach. When needed, ptosis was corrected with a vertical mastopexy. A submuscular PEI was implanted and expanded 30% above the final expected volume. Further expansion up to 70% above the final planned volume was obtained postoperatively, and

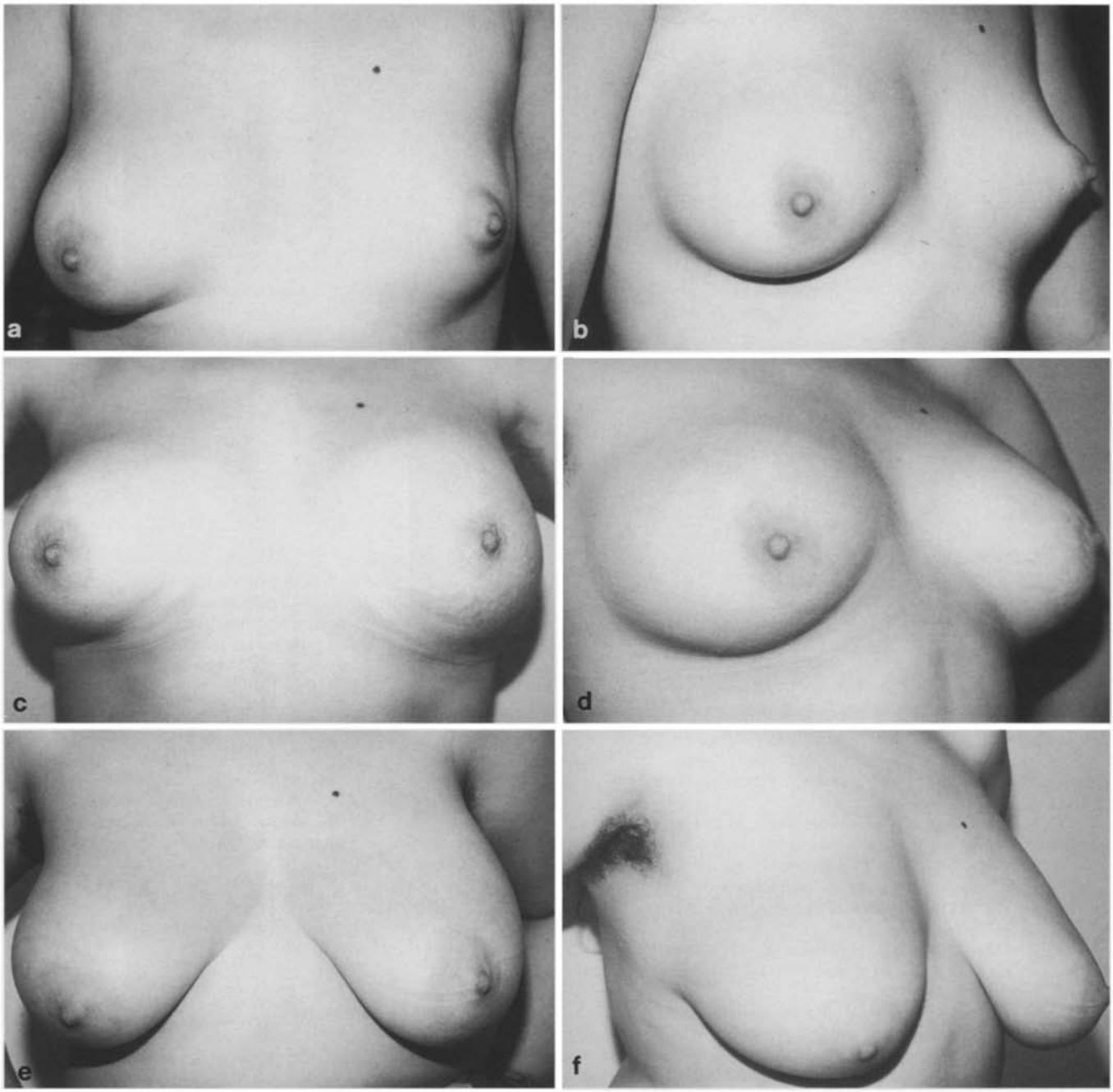

Fig. 2. a, b Frontal and lateral views of a 23-year-old patient with severe left breast hypoplasia. **c, d** Postoperative views following transaxillary submuscular unilateral placement of a 200+100 ml PEI. **e, f** Three years after the operation, multiple over-expansions and deflations allowed to maintain symmetry in spite of contralateral significant ptosis without further surgery

it was maintained for three to seven months. This appeared to be effective in maintaining the breast base unfolded, thus preventing recurrence of the tubular shape. However, periareolar scars were stretched and enlarged by expansion (Fig. 3).

Patients with Poland's syndrome underwent anterior transposition of the whole latissimus dorsi muscle through a 5 to 7 cm dorsal incision, anterior transfer of the tendon of the latissimus through a small axillary incision and submuscular placement of the PEI through a periareolar incision [8].

While with standard prostheses breast construction should be undertaken only after complete development of the contralateral breast, the use of PEI allows one to carry out the procedure as soon as the patient's psychological state requires. Four patients in this group underwent minor over-expansions in order to counteract initial capsular contracture. One patient in this group required repositioning of the filling port.

Reconstructive surgery

Eighty-seven patients are included in this group, who underwent breast reconstruction immediately following modified radical mastectomy (34 patients), or subcutaneous mastectomy (8 patients) or delayed reconstruction after modified radical mastectomy (29 pa-

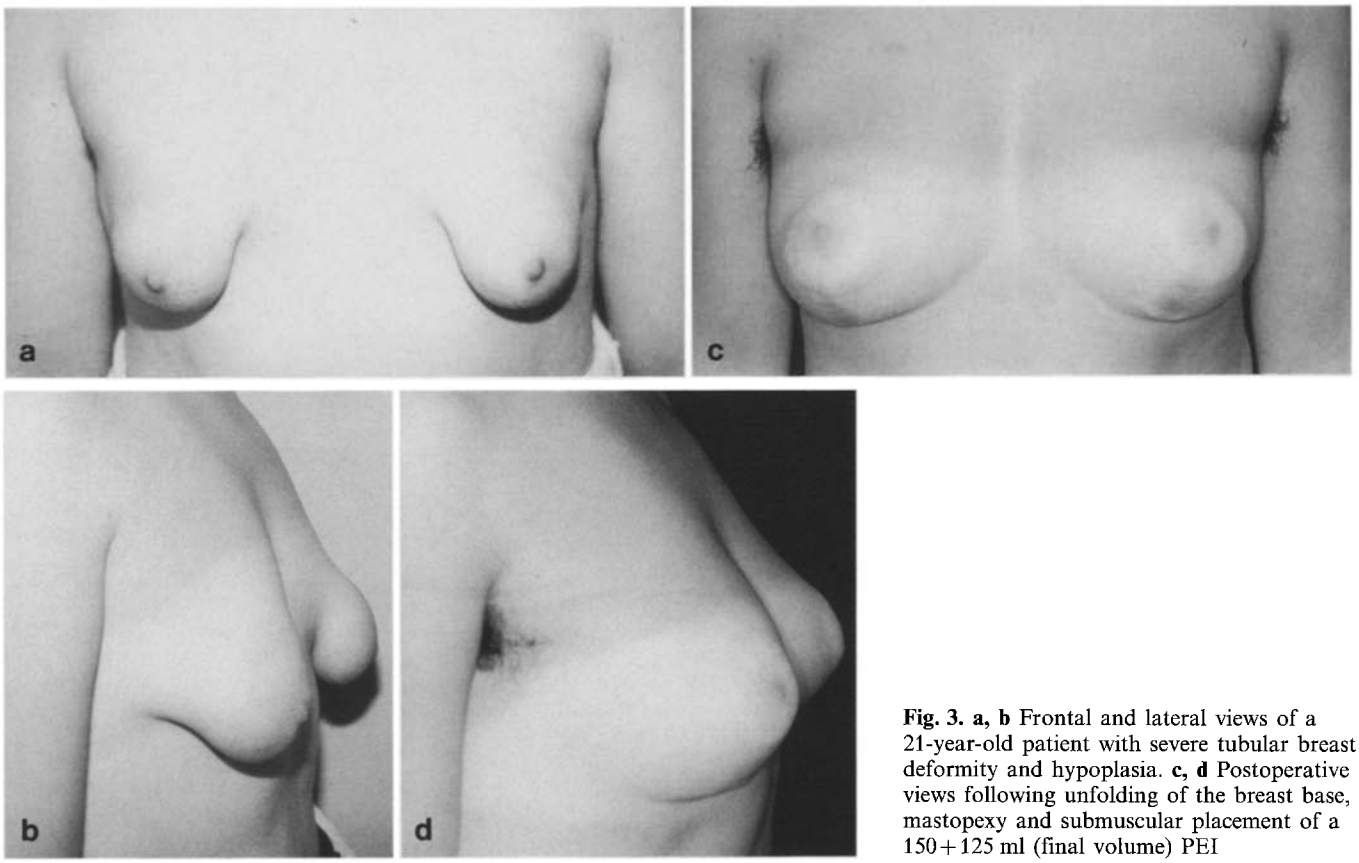

Fig. 3. a, b Frontal and lateral views of a 21-year-old patient with severe tubular breast deformity and hypoplasia. **c, d** Postoperative views following unfolding of the breast base, mastopexy and submuscular placement of a 150+125 ml (final volume) PEI

tients), radical mastectomy (7 patients), or quadrantectomy (9 patients).

Filling ports were placed in the axilla except in immediate postmastectomy reconstructions, because of the risk of axillary seroma and contamination: in such patients the dome was placed lower on the lateral chest wall. All implants were positioned in a complete submuscular pocket except one which was placed beneath a TRAM flap.

In patients with a radical mastectomy, a latissimus dorsi muscle flap was used for flap coverage [9]. No patient had a latissimus dorsi musculocutaneous flap.

All postmastectomy patients underwent over-expansion up to 80% above the final expected volume; however, expansions and deflations were carried out according to the individual patient's characteristics and requirements; standardized inflation/deflation protocols cannot, therefore, be proposed (Fig. 4).

Five implants had to be removed because of infection and extrusion. Sixteen patients needed major, unplanned, secondary procedures (e.g. implant repositioning, replacement with a TRAM flat, capsulotomy, creation of an inframammary fold, contralateral mammaplasty, etc.). Most of these patients were in the immediate postmastectomy reconstruction subgroup. The need for secondary procedures was significantly lower than that previously observed using standard implants.

In the eight patients undergoing subcutaneous mastectomy, the PEI was overexpanded intraoperatively in order to slightly stretch the overlying skin envelope, which was reduced only in patients with large breasts. This approach is effective in reducing the risk of hematoma and skin wrinkling, but the implant should immediately be deflated if vascular skin problems are suspected. Over-expansion was maintained for a minimum of two months.

In post-quadrantectomy patients, PEI were used in order to correct a Type II b defect in the upper quadrants or Type III deformities [5]. The implants were placed submuscularly through an axillary incision or through the lateral portion of the quadrantectomy incision. Slow expansion effectively stretched and filled the overlying depressed scarred and irradiated skin in Type II b defects and expanded to the desired volume retracted breasts in Type III deformity (Fig. 5).

Twelve patients in this group developed capsular contracture and underwent repeated overinflations and deflations which provided at least temporary relief. Four patients required repositioning or removal of the filling dome.

Discussion and conclusion

Our experience using the PEI in patients undergoing different types of breast surgery has been reported. Volume adjustments, creation of ptosis, and spreading of the tubular breast base are evident advantages. Other applications of the inflation/deflation procedure in less frequent situations are possible; for example, compensation of breast volume changes during pregnancy and inflation following lactation.

Reduced incidence of capsular contracture should theoretically be expected as a consequence of multiple overexpansions and deflations, which stretch collagen fibers and the capsule. The PEI provides a unique atraumatic modality for treatment of developing contractures. In our experience, overexpansions and deflations provided relief of symptoms and objective improvement in all patients. Even though the result can be temporary, the procedure can be repeated, and it is very well accepted by patients.

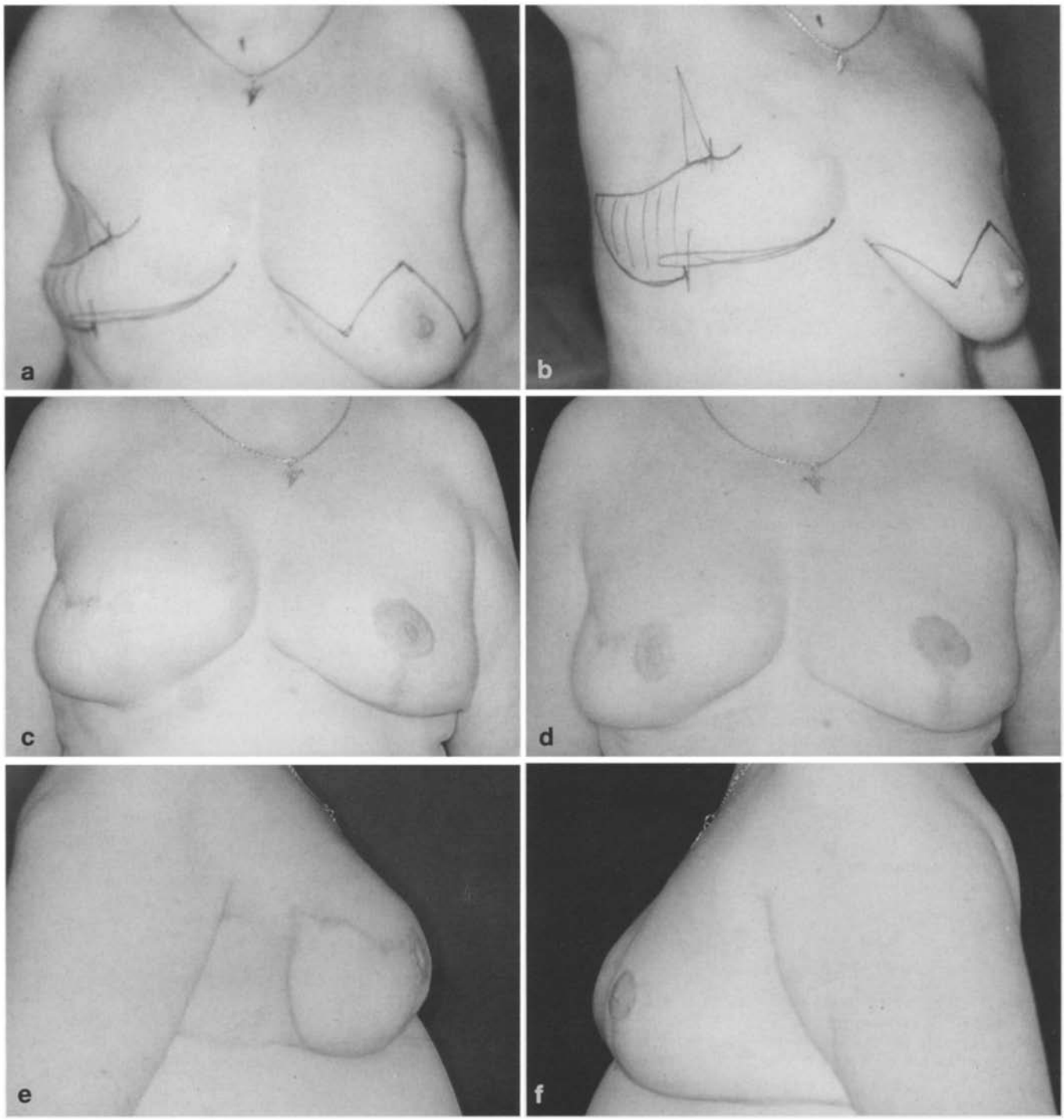

Fig. 4. a, b Preoperative views of a 53-year-old patient after modified radical mastectomy. Multiple abdominal scars precluded the use of a TRAM flap. **c** Postoperative early view during overexpansion, after transposition of a Holmstrom flap, submuscular PEI placement and contralateral reduction. **d** Frontal view following PEI deflation and reconstruction of the nipple areola complex. **e, f** Lateral views showing satisfactory symmetry and ptosis

Finally, psychological advantages of the PEI in aesthetic surgery should be underlined. The patients are involved in and take an active part in the decisions concerning the inflation/deflation program. This appeared to be extremely important in reducing the chances of dissatisfaction.

Even though the price of PEI is much higher than that of standard prostheses, the great majority of patients choose this type of implant when the benefits are explained. Moreover, patients who are reluctant to undergo breast augmentation using standard implants since they "fear" the new body image, often accept the opera-

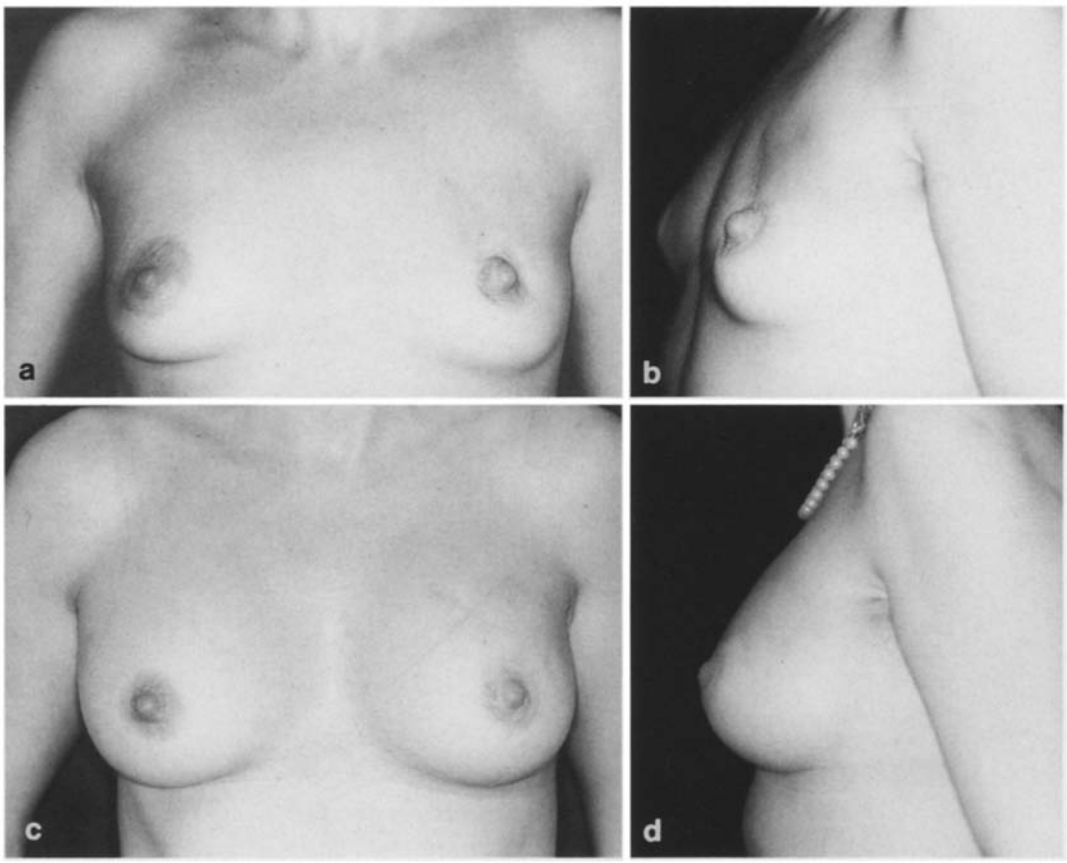

Fig. 5. a, b Frontal and lateral views of a 42-year-old patient with Type IIb post-quadrantectomy defect. **c, d** Postoperative view after bilateral transaxillary submuscular PEI placement

tion with enthusiasm when the possibility of postoperative volume adjustments is explained.

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