

The complications of tissue expansion in breast reconstruction: a review of 75 cases

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Summary—Seventy-five consecutive cases of breast reconstruction using tissue expansion are reviewed and the complications encountered are discussed. We conclude that, with careful patient selection, tissue expansion offers a simple, safe and reliable method of breast reconstruction.

Following its description in 1982 by Radovan, and further reports by Argenta *et al.* (1983), tissue expansion has become a popular method of post-mastectomy breast reconstruction. It has been the method of choice in the Leeds and Bradford Units since the beginning of 1984 and, to date, over 75 women have been considered suitable for this procedure. Inevitably, with any new procedure there may be difficulties, and we felt that it would be worthwhile reviewing our experience with particular reference to such problems that we have encountered.

Methods

The technique used throughout the series has essentially been the same with only minor individual variations. Sub-pectoral placement of the expander and subsequent implant has been employed in all cases. Sufficient saline is injected peroperatively to fill the dead space created by the dissection and allow tension-free wound closure. Expansion has generally been commenced 2 weeks after operation and has been carried out at weekly intervals, although later in the series it has been started as early as the first postoperative day. The aim has been to expand by between 100 and 200 cc more than the projected size of the final prosthesis. The reasons for this are two-fold, firstly, in an attempt to reduce the incidence of subsequent capsular contracture, and secondly, to generate a natural ptosis to the reconstruction. The interval between completion of expansion and placement of the final prosthesis has usually been between 2 and 3 months, to allow for some maturation of the peri-expander fibrous capsule.

Results

The series consists of 75 consecutive cases (Table 1). Of these, 13 had expanders placed immediately

Table 1 Patients

	Unilateral	Bilateral
Immediate reconstruction	6 (2 sub-cutaneous)	7 (all sub-cutaneous)
Delayed reconstruction	52	10
Total	75 Patients	

following mastectomy and 62 underwent late reconstruction. Nine of the 13 patients having immediate reconstruction had subcutaneous mastectomies with nipple preservation, 7 of which were bilateral. The remaining 4 immediate reconstructions had simple unilateral mastectomies. Ten patients in the late reconstructive group had bilateral deformities and the remainder unilateral. In total, 92 breasts were reconstructed. Ten patients in the late reconstructive group had received radiotherapy following mastectomy.

Significant complications of the procedure were encountered in 37 patients, but total failure occurred in only 4 patients. Two patients were discovered to have nodal metastases during the course of reconstruction, and one other patient has died of disseminated carcinomatosis following the completion of the reconstruction.

The cases will be considered in three groups (Table 2): simple mastectomies without radio-

Table 2 Patient groups

Simple mastectomy	66 breasts
Simple mastectomy with radiotherapy	10 breasts
Subcutaneous mastectomy	16 breasts
Total	92 breasts

therapy; mastectomies with radiotherapy; subcutaneous mastectomies with immediate tissue expander insertion.

One complication common to all three groups was expander leakage or rupture, which occurred in 15 patients (Table 3).

In two patients the expanders ruptured. In one patient this occurred midway through the expansion, and following replacement, expansion proceeded uneventfully. In the other patient, rupture occurred 10 days prior to her admission for insertion of the final prosthesis, and sufficient expansion had been achieved for this to take place.

Nine patients experienced leakage due to weakness of the joints between the connection tube and either expander or injection dome (Fig. 1), and required replacement of the defective expander.

One patient had a slow leak back through a defective injection dome which was sufficient for

the actual volume to be half that expected when the expander was removed. However, there was enough expansion for placement of the final implant, although the less-than-expected volume resulted in the first choice prosthesis being too large.

It is to be hoped that improvements in the manufacture of these devices will reduce the incidence of these complications.

Three patients had leaks attributable to surgical mishaps on insertion of the expanders.

Simple mastectomies—no radiotherapy (56 patients, 66 breasts)

In this first group, problems occurring during expansion were noted in six patients (Table 4).

One patient early in the series developed a small patch of skin necrosis in the infero-lateral portion of the expanded skin (Fig. 2), which was probably

Table 3 Expander leaks and ruptures

Sudden deflation—expander rupture	2
Slow leak—construction defect	10
Slow leak—surgical error	3
Total	15

Table 4 Simple mastectomy—complications during expansion

Skin necrosis	1
Infection	1
Peri-expander capsular contracture	4
Total	6

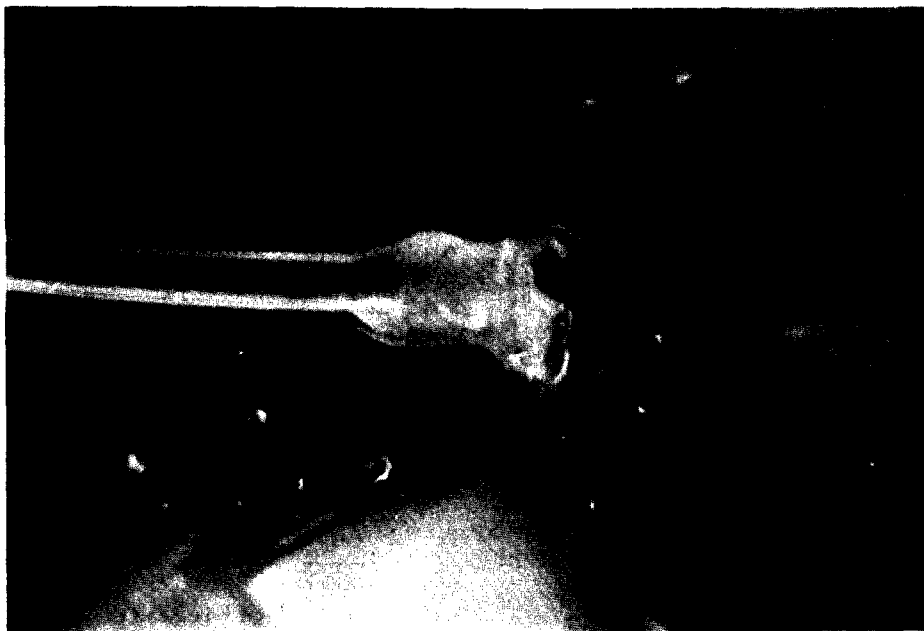


Fig. 1

Figure 1—Disruption of the connection tube-expander junction.



Fig. 2

Figure 2—Skin necrosis due to over expansion.

due to over-expansion. Fortunately, it was possible to excise this when placing the final prosthesis.

Infection developed in one patient after the final injection, and poor aseptic technique was felt to be responsible for this. The expander had to be removed and replaced after an interval.

Four patients experienced slow and painful expansion that was attributed to tight peri-expander capsules. Three of these had open capsulotomies, following which rapid progress to full expansion and subsequent final prosthesis was achieved. It is interesting to note that in two of these cases there appeared to be marked dishing of the ribs. One patient who required only modest expansion because of a small contralateral breast nevertheless progressed slowly and painfully to 380 cc. The planned prosthesis of 180 cc, when inserted, failed to provide any appreciable breast contour. Examination of the pocket revealed a depression in the ribs which measured 3 cm at its centre. As a

consequence, a larger prosthesis had to be used. A CAT scan (Fig. 3) shows the degree of rib deformation produced by the tissue expander.

Problems following the insertion of the final prosthesis were noted in five patients (Table 5).

One patient early in the series had the expander placed too high on the chest wall and the subsequent implant remained high despite attempts to enlarge the pocket interiorly (Fig. 4). This serves to emphasise the importance of precise placement of the expander at the initial operation, as subsequent correction is very difficult. It is our practice to place the lower edge of the tissue expander some 2 cm below the level of the infra-mammary fold of the opposite breast, to counteract the tendency of the implant to ride high subsequently.

Three patients thus far have had a sufficient degree of capsular contracture around the final prosthesis to warrant open capsulotomy. The follow-up on the later patients in this series is too short to draw any conclusions as to the incidence of capsular contracture but the initial results are encouraging.

One patient undergoing immediate reconstruction received a course of adjuvant chemotherapy. Although the expansion proceeded uneventfully, the wound dehiscd following placement of the final prosthesis, which was lost.

Mastectomies with radiotherapy (10 patients, 10 breasts)

Ten patients in the late reconstructive group had received a course of radiotherapy to the chest wall following their mastectomies. The time interval between radiotherapy and expansion varied between 3 months and 12 years. Of these 10 patients, only 3 have progressed without complication (Table 6).

Four patients had difficult expansions involving multiple injections of smaller amounts of saline than usual. One of these subsequently developed an infection around her final prosthesis which had to be removed and replaced at a later date.

Table 5 Simple mastectomy—complications after final prosthesis

Capsular contracture	3
Wound dehiscence	1
Malposition	1
Total	5

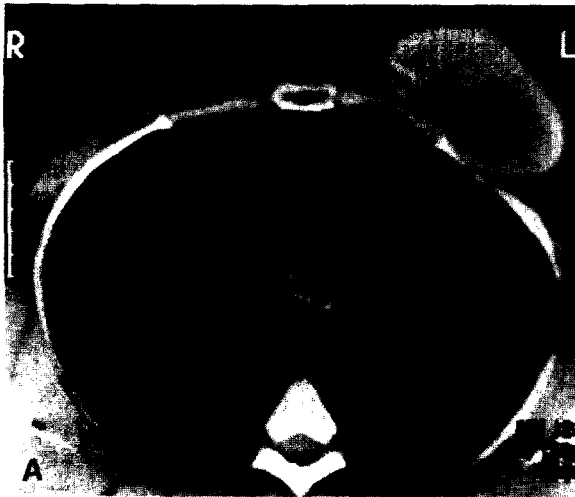


Fig. 3

Figure 3—CAT scan showing the degree of rib deformation produced by tissue expansion.



Fig. 4

Figure 4—Tissue expander placed too high on chest wall.

In one patient expansion was painful and failed to progress at all despite open capsulotomy, and was abandoned.

Two patients suffered skin necrosis and breakdown, necessitating removal of the expander (Fig. 5). Both these patients had florid post-irradiation skin changes, and the subsequent area of skin breakdown took several weeks to heal.

Subcutaneous mastectomies

(9 patients, 16 breasts)

The procedure in these patients has been to place the expanders in the sub-pectoral plane following the completion of the mastectomy, and to commence inflation between 1 and 2 weeks postoperatively. Complications have been noted in 4 patients (Table 7).

One patient developed partial nipple necrosis which was treated conservatively. Nevertheless, the final result was satisfactory.

One patient developed a seroma on one side that became infected, necessitating the removal of the

Table 6 Simple mastectomy with radiotherapy—complications

Slow expansion	4
Infection of final prosthesis	1
No expansion	1
Skin necrosis	2
Total	8



Fig. 5

Figure 5—Skin necrosis following expansion of irradiated skin.

Table 7 Subcutaneous mastectomy—complications

Partial nipple necrosis	1
Wound dehiscence	1
Infection	1
Dislocation of final prosthesis	1
Total	4

expander. This was replaced after an interval with no further complications.

Wound dehiscence occurred in one patient, probably as a result of over-expansion before adequate wound healing. This was resutured, but the expander cavity subsequently became infected and the expander had to be removed and replaced at a later date.

One patient experienced dislocation of the final prosthesis laterally and this required secondary adjustment of the pocket.

Discussion

Although the overall complication rate in this series attributable to the tissue expansion technique is

high at 40% (37/92 breasts), the rate of major complications (skin necrosis, wound breakdown, infection) is low at 10% (9/92 breasts). Complete failure of the procedure occurred in 4 patients.

There is a sub-group of patients in this series, simple mastectomies without radiotherapy, in whom the complication rate is low, the overall peri-expansion complication rate being 9%. The only failure in this group can be attributable to adjuvant chemotherapy.

In contrast, those patients who had received radiotherapy showed an overall complication rate of 70%, with a failure rate of 30%. In the light of this it is questionable whether patients who have received radiotherapy are suitable candidates for this procedure. Further work is in progress to try and correlate radiotherapy dosage and fields with feasibility of expansion, but at present it would certainly seem contra-indicated in those patients with florid post-radiation skin changes. Successful reconstruction in this group requires importation of healthy skin in the first instance. It is possible that a procedure such as a latissimus dorsi flap in conjunction with a tissue expander may be useful

in this respect. We have used such a procedure in 2 cases with good results.

It is important to recognise a group of patients who have not received radiotherapy but who nevertheless progress slowly, and possibly painfully, with expansion. There is no such thing as a physiologically immovable object, and one can assume that if the skin does not expand then the ribs may well become depressed, as the CAT scan shows (Fig. 3). The presence of a tight peri-expander fibrous capsule is thought to be at least partly responsible for this, and we feel that open capsulotomy in these patients may well relieve this problem, as our experience with three such patients seems to show. It may be that early onset of expansion, before the capsule has fully developed, may prevent this problem from occurring.

Subcutaneous mastectomy with immediate or delayed placement of a breast prosthesis has a high complication rate and frequently gives unsatisfactory results (Schlenker *et al.*, 1978; Slade, 1984). The use of tissue expansion in subcutaneous mastectomy has been recommended by Hyland (1985) and our initial experience has been encouraging, in particular with regard to the relatively low

incidence of complications. Problems of skin necrosis can be avoided by delaying expansion until the skin flaps have settled and, by expanding to a sufficient size, excessive wrinkling of the skin can be stretched out (Fig. 6).

As a result of our experience so far, certain changes in the technique have taken place. Firstly, expansion is now commenced earlier in the post-operative phase while the patient is still in hospital and is continued at least at weekly intervals to keep the capsule under constant stress. More frequent expansion than this is probably feasible but is usually not convenient for the patient. Secondly, we have tended towards larger expanders (600–850 cc) and over-expansion by 200 cc or more as this seems to be effective in generating ptosis and a natural infra-mammary fold (Fig. 7).

While an objective qualitative assessment of the patients is not within the scope of this review, we have generally been impressed with the results achieved, in particular the results following bilateral mastectomies where symmetrical reconstruction is readily achieved (Fig. 8). We feel that with careful patient selection, tissue expansion offers a simple and reliable method of breast reconstruction.

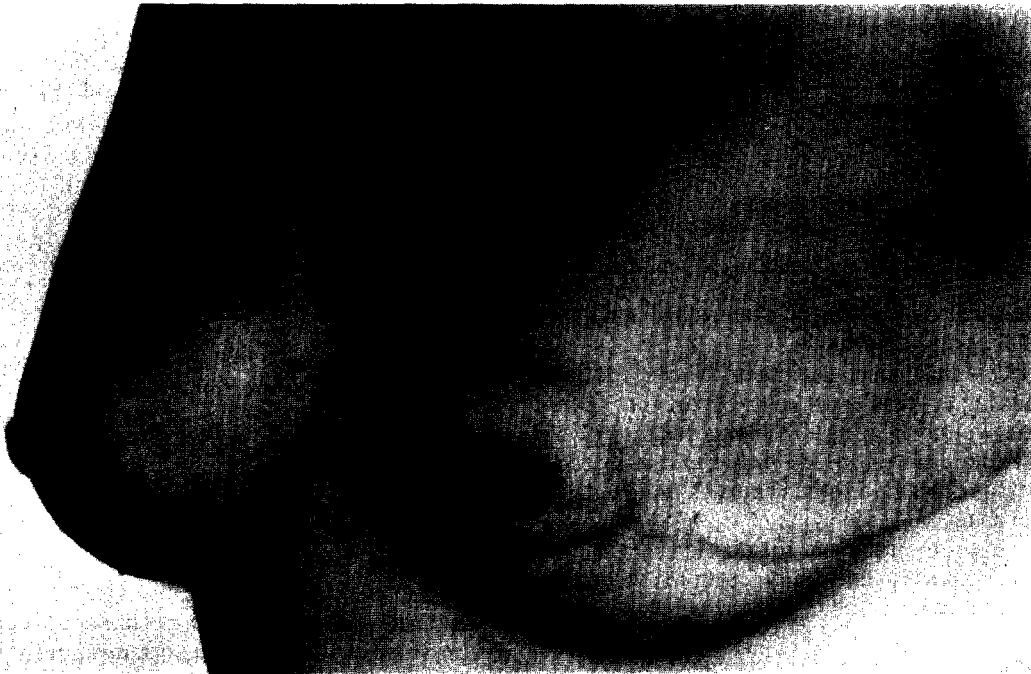


Fig. 6

Figure 6—Final result of subcutaneous mastectomy using tissue expansion.



Fig. 7

Figure 7—Infra-mammary fold and ptosis generated by over expansion.

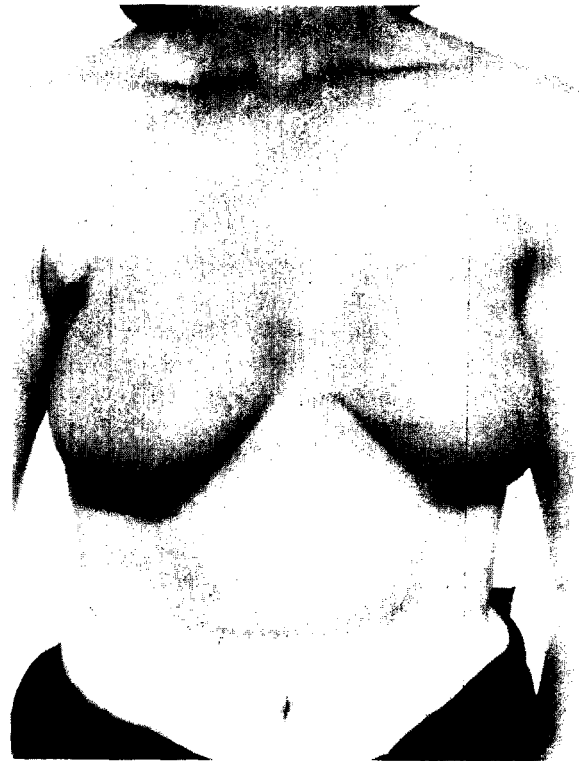


Fig. 8

Figure 8—Result of reconstruction using tissue expansion in a bilateral deformity.

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Paper received 7 April 1987.

Accepted 5 June 1987.