



Immediate and delayed breast reconstruction with permanent tissue expanders

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SUMMARY. Breast reconstruction has greatly advanced during the past decade, offering the surgeon and the patient a choice between autologous tissue transfer and silicone implants, as well as between immediate and delayed reconstruction. In this retrospective study we reviewed the results of immediate versus delayed reconstruction with a permanent tissue expander, a method which is simple, fast and gives good aesthetic results. 19 patients had immediate reconstruction and 25 patients had delayed reconstruction. Capsular contracture (Baker II, III, IV) was more common with delayed (7/25) than with immediate (3/19) reconstruction; however, the difference was not statistically significant ($p = 0.47$). The overall complication rates and the final aesthetic results were similar in the two groups.

Breast reconstruction is a field where there have been numerous advances during the past decade. The increased frequency of detection of smaller tumours and more conservative surgical treatment have changed the goals of breast reconstruction. Furthermore, reliable studies have shown that breast reconstruction does not interfere with postoperative adjuvant therapy if and when indicated.¹⁻⁶ For these reasons there is an increasing number of women who elect for immediate rather than delayed breast reconstruction.⁵ It is estimated that over the past three decades, approximately 2 million women in the USA have had silicone implants for aesthetic and reconstructive surgery.^{7, 8} In this series of 44 consecutive patients, we studied the results of immediate versus delayed reconstruction with a permanent tissue expander, a method which is simple, fast and gives good aesthetic results, imposing minimal stress on the patient.⁹⁻¹¹

Patients

We reviewed 44 patients (47 breasts) who had breast reconstruction with Becker-type, smooth walled, inflatable permanent tissue expanders in the subpectoral-subserratus position. All patients had a biopsy-proven diagnosis of breast cancer treated by modified radical or simple mastectomy. The average age of the patients was 44.25 years (range 36-61). The patients were in two groups (Table 1). Of the 44

patients (47 breasts) that underwent reconstruction, 19 patients (21 breasts) had immediate reconstruction (Group A) and 25 patients (26 breasts) delayed reconstruction (Group B).

We did not use expanders for patients who had already had or were scheduled to have radiation therapy, because of the high risk of complications. The statistical significance of differences between the procedures was determined by Fisher's exact test and by the Mantel-Haenszel test for linear association.

Surgical technique

Immediate reconstruction begins with elevation of the pectoralis major muscle, dissecting along its lateral border towards the rectus sheath in continuity. In cases where this is not possible, the lower pole of the implant remains subcutaneous. Laterally the implant is placed under the serratus muscle. The tube and port-valve are tunnelled subcutaneously in the lateral chest wall. Usually, the expander is injected with saline at the time of surgery. The volume of saline used is determined from the expandability of the skin flaps.

Delayed reconstruction again begins with dissection of the lateral border of the pectoralis major and proceeds inferiorly to elevate the flap along with part of the anterior rectus sheath. The port valve is again tunnelled subcutaneously and 50-100 cc of saline are injected at the time of surgery. All patients have suction drains and a course of antibiotics pre- and postoperatively.

Results

Patients were seen on a weekly basis for serial injections of saline, usually 1/10 of the original volume of the expander. The average number of injections

Table 1

Method of reconstruction	Tissue expander		Total Patients	Breasts
	Unilateral	Bilateral		
Immediate	17	2	19	21
Delayed	24	1	25	26
Total	41	3	44	47

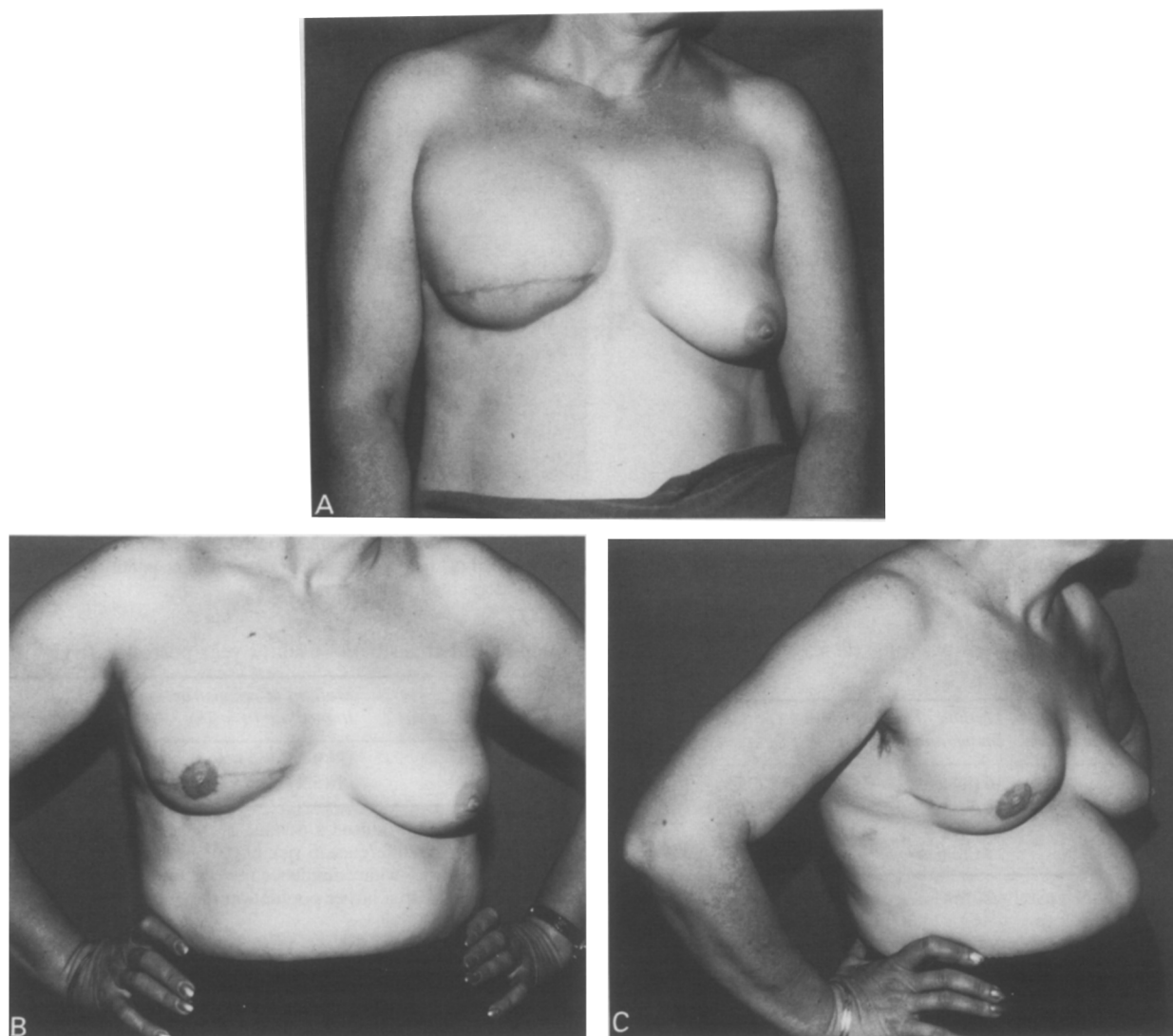


Fig. 1

Figure 1—Immediate breast reconstruction with a Becker-type smooth walled permanent tissue expander. (A) 45 days postoperatively: over-expansion—front view. (B) 1 year postoperative result—front view. (C) 1 year postoperative result—side view.

given was 10. We used one type of expander, the RDL-X Becker-type permanent inflatable smooth walled double lumen expander, made by Cox-Uphoff (USA). The average total volume injected was 285 cc (range 210–445), followed by an over-inflation of 100–150 % (Fig. 1A). After completion of the over-inflation, the expander was maintained for 8 weeks and then deflated to the planned optimal volume. At that time we performed the second stage of the procedure adjusting the other breast and reconstructing the nipple-areola complex (using the “German Cross” technique) (Fig. 1). In some cases we used over-expansion to match the unmodified contralateral breast or to achieve a good inframammary fold.

Complications

Complications occurring in both groups of patients related to problems in wound healing and difficulties directly related to the inflatable expanders. A total of 15 patients experienced 16 complications (Table 2).

Table 2 Complications

Complication	Reconstruction (patients)	
	Immediate (n = 19)	Delayed (n = 25)
Seroma	1	0
Skin necrosis	1*	0
exposure/extrusion		
Infection	1	0
Port-valve malfunction	0	1
(leakage-deflation)		
Capsular contracture	3 (15.8%)*	7 (28%)
(Baker II, III, IV)		
Expander malposition	1	1
Total complications	7 (36.8%)	9 (36%)
Total patients	6 (31.6%)	9 (36%)

A total of 15 patients developed 16 complications. Only one patient developed more than one complication (*).

Only one patient developed more than one complication: a patient from the immediate reconstruction group who underwent bilateral reconstruction developed capsular contracture on both her breasts and

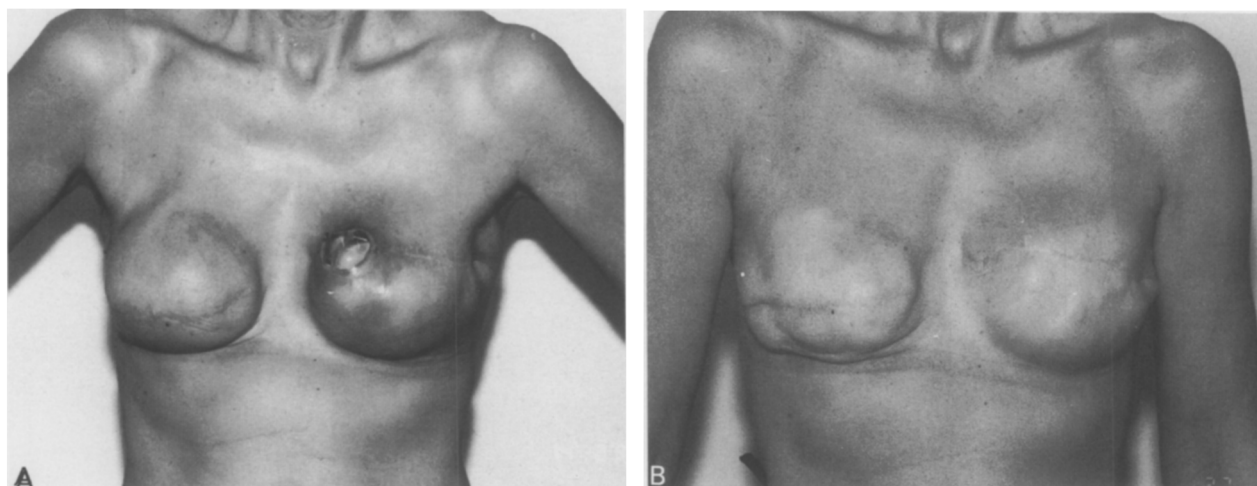


Fig. 2

Figure 2—Immediate bilateral breast reconstruction. (A) One year postoperatively. Bilateral capsular contracture (Baker III) with skin necrosis and implant exposure on the left side. Skin necrosis was treated by removal of the expander, debridement, placement of a textured gel filled silicone implant and primary closure. (B) Postoperative result 4 years after the final surgery.

Table 3 Capsular contracture (assessed 1 year postoperatively)

Baker classification	Method of reconstruction (patients)	
	Immediate (n = 19)	Delayed (n = 25)
Baker I	16 (84.2%)	18 (72%)
Baker II	2 (10.54%)	4 (16%)
Baker III	0	2 (8%)
Baker IV	1 (5.26%)	1 (4%)

The Mantel-Haenszel test for linear association produced a non-significant result ($p = 0.46$), which means that there is no difference in the severity of capsular contracture according to the Baker Classification between the two groups.

Table 4 Final aesthetic result (1 year postoperatively)

Baker classification	Method of reconstruction (patients)	
	Immediate (n = 19)	Delayed (n = 25)
Baker I	16 (84.2%)	18 (72%)
Baker II-IV	3 (15.8%)	7 (28%)

Fisher's exact test produced a p-value of 0.47 (not significant) with an estimated difference in risk of 0.12 between the two groups, with a very wide confidence interval (-0.12 to 0.36) suggesting that with a larger population the difference could be detectable.

skin necrosis on her left breast (Fig. 2A). In summary, in group A (immediate reconstruction) 6 out of 19 patients developed complications, while 9 out of 25 patients developed complications in group B (delayed reconstruction). The two groups essentially had the same rate of complications (31.6% versus 36% patients (Table 2).

Seroma, skin necrosis (Fig. 2A) and infection occurred in a few cases, while capsular contracture and malposition were the most troublesome complications.

Capsular contracture (Tables 2, 3, 4 and 5) was assessed in all patients approximately one year postoperatively by the senior author (ADM) on at least two separate occasions. Four patients (five breasts), one patient (two breasts—the patient developed bilateral capsular contracture) from group A (immediate

Table 5 Final aesthetic result (1 year postoperatively)

Baker classification	Method of reconstruction (patients)	
	Immediate (n = 19)	Delayed (n = 25)
Baker I + II	18 (94.73%)	22 (88%)
Baker III + IV	1 (5.27%)	3 (12%)

Fisher's exact test produced a p-value of 0.62 (not significant) with an estimated difference in risk of 0.08 between the two groups, with a very wide confidence interval (-0.09 to 0.26) suggesting that with a larger population the difference could be detectable.

reconstruction) and three patients from group B (delayed reconstruction), had surgery to correct capsular contractures. In two of the patients from the delayed reconstruction group who developed Baker III or IV capsular contracture the valve was still in place and we were able to do a secondary over-expansion and subsequent deflation, one year after the original surgery, which improved the appearance of the breast. The other patient from the delayed reconstruction group was operated upon one year after insertion of the expander and a capsulotomy was performed with replacement of the expander with a textured, saline-filled implant. For the patient from the immediate reconstruction group who developed bilateral capsular contracture and skin necrosis with exposure of the expander, we removed the expander and proceeded to debridement and primary closure after the placement of a textured gel-filled silicone implant, which healed very well (Fig. 2B).

Capsular contracture was almost twice as frequent in group B (delayed reconstruction) than Group A (7/25 v. 3/19 patients). However, the observed difference was not statistically significant ($p = 0.47$ using a two-tail Fisher's exact test) in this series of 44 patients.

Two patients (one in each group) had expander malposition (Table 2). One of these patients (group B) refused to have further surgery, while the other patient (group A) had surgery to reposition the expander.

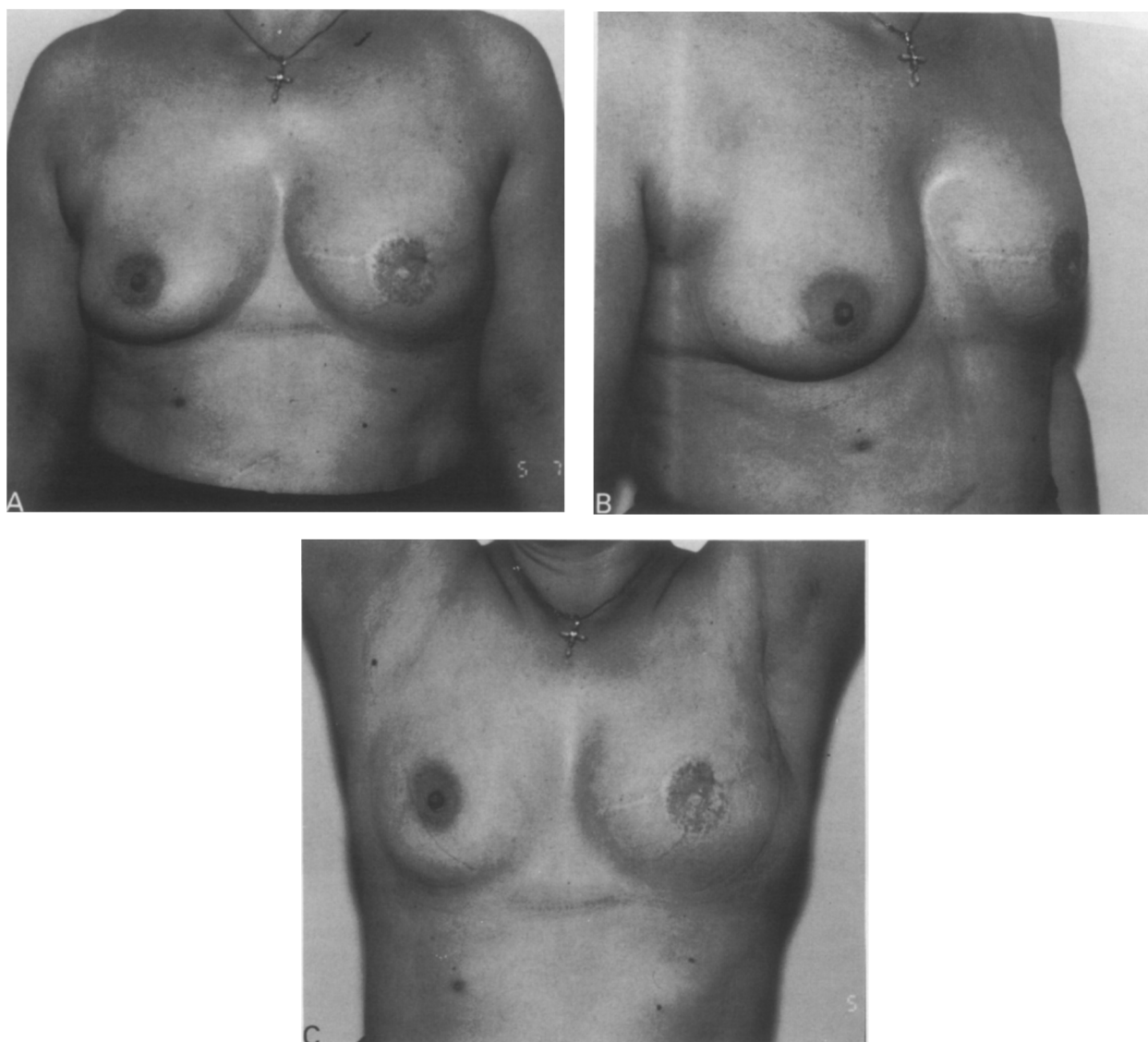


Fig. 3

Figure 3—18 months postoperative result after immediate breast reconstruction using a Becker-type smooth walled permanent tissue expander. (A) Front view. (B) Side view. (C) Raised arms.

In all, we carried out secondary surgery in four patients (five breasts) with capsular contracture and one patient with expander malposition.

No patients developed any rheumatic complaints.

The final aesthetic result in terms of Baker's classification is reported on Tables 4 and 5. The difference between the final results of immediate and delayed reconstruction is not statistically significant ($p = 0.47$ and 0.62 for Tables 4 and 5 respectively, using two-tail Fisher's exact test) (Figs 3, 4).

Discussion

Breast reconstruction with permanent inflatable expanders is widely acknowledged as a useful technique for the majority of breast cancer patients undergoing simple or modified radical mastectomy.¹¹⁻¹⁵ The safety of gel-filled silicone implants has recently been brought into question, despite their widespread

use for more than 20 years, and in 1992 they were banned in many European countries. Nevertheless, the results of two recently reported large cohort studies were reassuring, as the women who received a silicone implant had a significantly lower risk of distant metastasis and death due to breast cancer than in the matched controls who were not exposed to silicone implants.^{8, 16} In our country, reconstruction with silicone implants was the procedure of choice for breast reconstruction before the "silicone crisis" and autologous tissue transfer was used only for difficult and troublesome cases. Early proponents considered placement of an expander "a fairly simple procedure" and assumed that only two relatively minor operations would be required.¹³ Currently, with the new implant technology, breast reconstruction can be achieved in one simple procedure and 10-12 visits at the office for expander inflation.^{6, 14, 17, 18} Of course there can be additional procedures to obtain symmetry and nipple-areola reconstruction.¹⁹ The use of implants allows

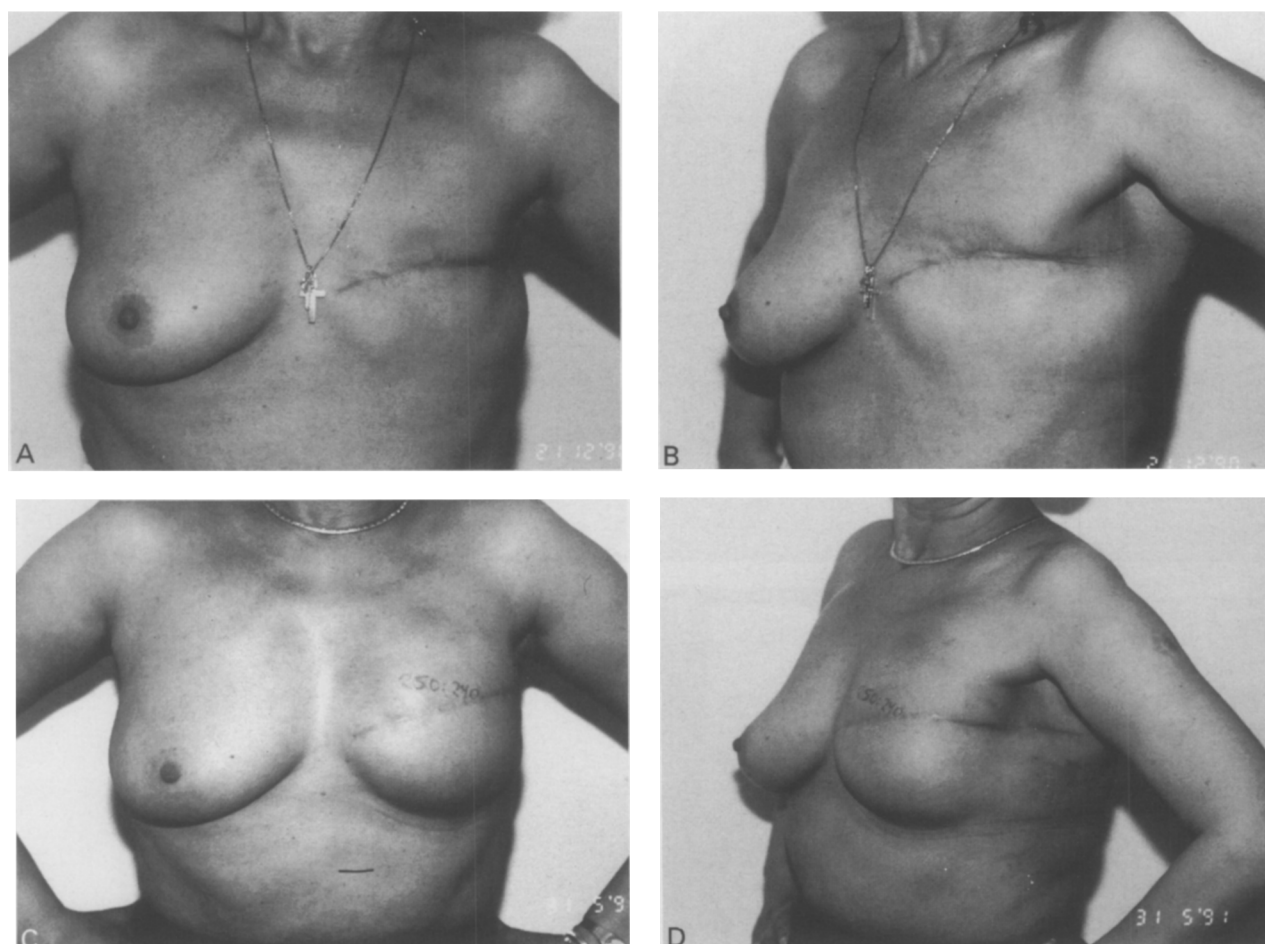


Fig. 4

Figure 4—Delayed reconstruction with a Becker-type smooth walled permanent tissue expander. (A) Preoperative—front view. (B) Preoperative—side view. (C) 6 months postoperative—front view. (D) 6 months postoperative—side view.

manipulation of numerous variables to achieve the best result and patient satisfaction. These variables include (a) timing of reconstruction, (b) size of the reconstructed breast and (c) placement of implants (subcutaneous or partial or complete muscle coverage).²⁰

This review of 44 patients (47 breasts) analyses the method of breast reconstruction with Becker-type smooth walled permanent inflatable expanders and the complication rates, dividing the patients into two groups, immediate and delayed reconstruction. The complication rates were similar in the two groups (31.6% versus 36% patients) although Miller and Falcone²¹ found a higher rate of complications in the immediate reconstruction group due to the antecedent mastectomy. The immediate reconstruction group had more early complications (seroma, skin necrosis, infection), while late complications (capsular contracture, malposition) occurred more often in the delayed reconstruction group. Recent studies appraising the new textured surface expanders suggest that we can now overcome the problem of capsular contracture which was the main disadvantage of tissue expander reconstruction.^{18, 22, 23}

On reviewing Table 2, the only difference between the two groups that looks as if it could be significant is

capsular contracture. We analysed this complication further in Tables 3, 4 and 5.

Table 3 shows the number of patients in each group having Baker I, II, III and IV contracture approximately one year after the initial surgery. Table 4 shows patients having Baker I capsular contracture versus those having Baker II, III, or IV, while in Table 5 we compare patients with Baker I and II capsular contracture versus patients with Baker III and IV.

The reason for these three different versions of analysis is to provide as much information as possible to assess the significance of the difference.

In Table 3, a Mantel-Haenszel test for linear association produced a p-value of 0.46 (not significant). In other words, the trend towards the development of more severe forms of capsular contracture is no different between the two groups.

In Table 4, we compared the patients having Baker I capsular contracture versus those having Baker II, III, or IV, because, although Baker II contracture is acceptable for the patient and does not produce any visible difference on the aesthetic result, nevertheless it is palpable. Fisher's exact test (2-tail) produced a p-value of 0.47 (not significant). The estimated difference in risk was 0.12 with a 95% confidence interval of -0.12 to 0.36 and the estimated relative risk is 1.78

with a 95% confidence interval of 0.53 to 6.0. In other words, if 100 000 patients had delayed reconstruction we would expect between 12 000 less to 36 000 more patients to develop capsular contracture than if 100 000 patients had immediate reconstruction. This means that in spite of the "not significant" result, there seems to be a difference which could be detectable if the number of patients was larger.

Similarly in Table 5 we compared patients having Baker I and II capsular contracture versus those having Baker III and IV capsular contracture. The reason for this comparison is because, although as stated above Baker II has minimal contracture which is palpable, the overall aesthetic result is not altered and the breast looks (but not feels) normal. Fisher's exact test (2-tail) produced a p-value of 0.62 (not significant). The estimated difference in risk was 0.08 with a 95% confidence interval of -0.09 to 0.26 and the estimated relative risk is 2.28 with a 95% confidence interval of 0.26 to 20.2. Again the statistics show that there is no difference, but the wide confidence intervals suggest that with a very large population there could be a detectable difference.

Recapitulating, there seems to be a greater likelihood that patients having delayed reconstruction will develop capsular contracture, yet this difference (if it actually exists) cannot be established statistically due to the small number of patients. With a much larger population this difference might be detected.

None of the patients developed any rheumatic complaints, a possible complication recently reported in several publications.⁷ Our maximum follow-up was 7 years, and the aesthetic results are considered excellent.

Immediate breast reconstruction is offered to women with stage II breast carcinoma and to those with benign or premalignant conditions.² The added surgical and oncological risks of immediate breast reconstruction have been analysed and considered to be minimal.²⁰ The patient does not have to live with the mastectomy defect for any time after surgery. Several long-term studies have documented the safety and the success of immediate breast reconstruction.^{1, 5, 17, 24-32} With this technique, the patient is able to have (a) an early restoration of the breast mound, (b) the satisfaction of breast reconstruction initiated at the same time as the ablative mastectomy procedure, and (c) reduced costs and hospitalisation with only a small increase in the initial operating time.²⁰ In our study we found that we had a lower incidence of psychological morbidity in the patients undergoing immediate reconstruction.^{5, 24, 27} Since its introduction, immediate breast reconstruction has gained an increasingly accepted status, especially in the well informed and prepared patient. Cooperation between the oncological surgeon and the plastic surgeon in this setting is of paramount importance.^{27, 32}

Delayed reconstruction, on the other hand, has its own advantages, including (a) operating on a mature wound, (b) deliberate patient decision making, and (c) in-depth discussions with the reconstructive surgeon regarding options.²⁰

Finally, it should be noted that not all patients are candidates for immediate breast reconstruction (obese

patients, patients with advanced carcinoma or undergoing adjuvant radiotherapy should be excluded.)³³ Consideration of the opposite breast may also affect reconstructive timing, since mirror image biopsy results may not be known for 1-2 days. Immediate reconstruction is being increasingly utilised but it still must be carefully evaluated in a case-by-case manner so as to be applied appropriately.²⁷

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