



Complications of nonbreast tissue expansion: 9 Years experience with 44 adult patients and 119 pediatric patients



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ABSTRACT

Background: Tissue expansion is a common reconstructive technique that has been associated with significant complications since its inception. However, the existing literature mostly focuses on complications associated with pediatric tissue expansion only or describes a combined population of adult and pediatric patients, including breast tissue expansion; despite the fact that each of these groups of patients has different characteristics that may affect tissue expansion.

Objective: In this study we present a critical review of our experience with complications of nonbreast tissue expansion in adult and pediatric patients and compare between these groups.

Methods: The charts of patients who underwent nonbreast tissue expansion at Hadassah Medical Center between January 2003 and July 2012 were reviewed. Data were collected including the age of the patient, anatomical site of the expansion, indication and complications.

Results: A total of 202 expansion procedures were performed on 119 pediatric patients (<16 years) and 56 expansion procedures on 44 adult patients. The overall complication rate was 18.2%, with 40 pediatric procedures having complications (19.8%) and 7 adult procedures (12.5%). The difference in complication rates between the two groups was not found to be statistically significant. There was no statistically significant difference in complication rate between the different anatomical areas of expansion in both adult and pediatric patients or between the indications for operation. Most (68%) of the cases with complications underwent subsequent successful reconstruction.

Conclusions: Despite the consistent high complication rate, tissue expansion can be used as a good reconstructive method in both adult and pediatric patients in all anatomic areas and for different indications.

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Tissue expansion is a well-recognized technique used for reconstruction of a wide variety of skin and soft tissue defects. Since first reported in 1957 [1], its application has allowed the plastic surgeon to achieve functional and aesthetic results previously unobtainable.

Tissue expansion does not, however, come without an array of associated risks, and complication rates as high as 40% in infants and children have been reported [2]. The risks for such complications have been described in numerous studies and have been categorized by patient age, wound type, surgeon experience, and socioeconomic class. Recent series report overall complication rates in the 13% to 20% range [3–5]. Despite the available literature regarding tissue expansion complications, it is difficult to interpret the data in an impartial manner, in part because the studies are retrospective and in part because different authors have different definitions of the term ‘complication’. In addition, most studies either focus on pediatric tissue expansion alone, or describe a combined population of pediatric and adult patients (including breast tissue expansion), even though each of these groups of patients

has different characteristics that may affect tissue expansion. We believe that it is necessary to study and evaluate each population separately, with tissue expansion for breast reconstruction in a completely separate category altogether.

In this study we present a critical review of our experience in nonbreast tissue expansion of adult and pediatric patients, and we compare the frequency and severity of complications at different anatomical sites along with their effect on the final reconstruction.

1. Patients and methods

The medical charts and operative reports of patients who underwent nonbreast tissue expansion at Hadassah Medical Center between January 2003 and July 2012 were reviewed. Forty-four adult and 119 pediatric patients underwent 56 and 202 procedures, respectively. The data collected included patient age, anatomical site of expansion, surgical indication, number of procedures performed, presence of any complication such as hematoma, exposure, infection, flap necrosis, and treatment regimen with either conservative management or premature expander removal. Complications were studied and analyzed using the

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Pearson chi-square test. Each procedure was treated as an independent observation in the statistical analysis even if the patient had more than one expander inserted at the same time or had already undergone several expansion cycles. However, in the analysis of the anatomical site of expansion, data from combined areas of expansion performed within the same cycle are included.

2. Technique

Rectangular expanders with a soft bottom and a remote injection port (Softspan™ Tissue Expander, Bauer Design, Special Surgical Products, Victor, MT, USA) were used in all body regions. All expanders with their accompanying remote ports were placed subcutaneously. The surgical incision through which the pocket was created was made parallel to the lesion or affected area. In cases of nevi, the incision was usually made at the interface between nevus and healthy skin. In other cases such as with scars, the incision was made about one centimeter away from the lesion and within healthy skin in order to avoid skin breakdown and eventual exposure of the expander. At the end of surgery we inflated the expander (20–30 cc of saline) through the port to check for any leaks or mechanical obstruction. A surgical drain was always left in place and subsequently removed when drainage volume was less than 20–30 cc per day.

Commencing 1–2 weeks postop, expansions were performed on a weekly basis in the clinic for a total of 10–12 weeks. The operating surgeon performed all subsequent expansions, adhering to a strict sterile technique. Inspection of skin color, capillary refill, and simple palpation of the expander were performed during inflations, and patient comfort was taken into consideration when deciding the amount of expansion. The time lapse between the final expansion and the second surgery varied, and it ranged between one week to one month depending on scheduling and operating room availability. The total volume of expansion was between 70 ml and 1000 ml.

After expansion was completed and the patient was ready for the second surgery, reconstruction via local expanded flaps was planned, with transposition flaps usually achieving more coverage than pure advancement flaps. In serial cases with more than one expansion cycle in the same anatomical area, scars from the previous surgery limited our flap design, and advancement flaps rather than transposition flaps were used.

3. Results

One hundred nineteen pediatric patients (younger than 16 years) underwent 202 expansion procedures and 44 adult patients (age 16 years and above) underwent 56 expansion procedures. The average number of expansion per patient was 2.36. The overall complication rate was 18.2%, with 40 pediatric procedures (19.8%) and 7 adult procedures (12.5%) having complications. Within the same surgical setting, the majority of cases (166) involved insertion of one expander, 80 cases involved insertion of 2 expanders, and 12 cases involved insertion of 3 expanders. The complication rate difference between the two groups was not found to be statistically significant (chi-square, $p = 0.21$). The major indication for expansion in adult patients was burn scar repair, and the major indication in pediatric patients was reconstruction after nevi excision (Table 1). The extremities were the most common sites in which complications were found post expansion (arms in adults and lower extremities in children, Table 2). Note, all expansions in the lower extremity were in the thigh. However, there was no statistically significant difference in the complication rate between the different anatomical areas of expansion in both adult and pediatric patients (chi-square, adults: $p = 0.063$, pediatric patients: $p = 0.085$) or in the indication for surgery (chi-square, adults: $p = 0.75$, pediatric patients: $p = 0.945$). Infection was the most common complication (9.9% of pediatric procedures and 8.9% of adult procedures). The different types of complications are presented in Table 3.

Table 1

Indications for operation among patients with complications.

Indication	Procedures, adult patients	Complications, adult procedures (%)	Procedures, pediatric patients	Complications, pediatric procedures (%)
Burn scar	25	3 (5.3%)	42	10 (4.9%)
MVA scar	5	0	9	2 (1%)
Vascular malformation	3	1 (1.8%)	9	2 (1%)
Tumor	3	1 (1.8%)	3	0
Scar	7	1 (1.8%)	1	0
Nevus	12	1 (1.8%)	135	26 (12.9%)
Alopecia	1	0	2	0
Combined	0	0	1	0
Total	56	7 (12.5%)	202	40 (19.8%)

Regarding timing of the complication in relation to the stage of the expansion, a mean of 6.27 weeks after tissue expander insertion (first procedure) was found in children (SD = 4.17) and a mean of 3.75 weeks was found in adults (SD = 2.87). Although in children there is a tendency for complications to appear later than adults during the expansion process, it was not found to be statistically significant ($p = 0.125$) perhaps because of the small number of patients, Data on the timing of complication were available for only 4 of the 7 adult procedures with complications.

Most of the cases with complications had successful reconstruction (68%) with either conservative treatment employed until enough expansion was achieved or with expander removal and flap reconstruction (which was usually done in cases that had complications toward the end of the expansion process) (Table 4). Most of the complicated pediatric cases were treated with expander removal and reconstruction (Figs. 1 and 2) while the complicated adult cases were mainly treated with either conservative treatment until enough expansion was achieved or expander removal without reconstruction. Of the 12 patients who had expander removal without reconstruction as a result of complication, 10 had subsequent tissue expander insertion a few months later, one did not return to the clinic and was lost to follow-up, and one had free tissue transfer for facial reconstruction.

4. Discussion

Reconstruction using tissue expansion presents many advantages over other reconstructive techniques, such as replacing a defect with local tissue that is similar in quality, color, texture, and thickness. Expansion allows for vascular delay, provides an elegant solution to lack of available tissue for reconstruction, and is associated with minimal scarring and low risk of infection. Although the literature presents wide acceptance of this reconstructive tool, the complication rate has remained relatively high over the years. An important finding is that the majority of complications can be managed conservatively until the expansion process is finished or almost finished, with the reconstructive goals still achieved [6–8].

Our complication rate was similar to those described in other recent published series [5,9–11]. Some debate exists over the relationship

Table 2

Complication rate according to anatomical site.

Anatomical site of expansion	Adult procedures (%)	Complications, adult procedures (%)	Pediatric procedures (%)	Complications, pediatric procedures (%)
Head and neck	25 (44.6%)	4 (7.1%)	76 (37.6%)	12 (6%)
Torso	16 (28.6%)	0	103 (51%)	19 (9.4%)
Legs	9 (16%)	1 (1.8%)	9 (4.45%)	3 (1.5%)
Arms	5 (9%)	1 (1.8%)	0 (0%)	0
Combined	1 (1.7%)	1 (1.8%)	14 (6.9%)	6 (2.9%)
Total	56 (100%)	7 (12.5%)	202 (100%)	40 (19.8%)

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