CASE REPORT

The Use of Autologous Fat Transplantation to Remedy the Iatrogenic Lipo-atrophic Effect of Tissue Expanders

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Introduction: Tissue expanders have become a popular modality in plastic and cosmetic surgery. Many victims of burns and severe trauma, premalignant lesions, congenital malformations, unwanted or regretted tattoos over large areas, women undergoing postmastectomy breast reconstruction, or men with extensive male-pattern alopecia may seek treatments that use tissue-expansion techniques. Tissue expansion has been an excellent tool for expanding normal skin to provide good quality, cosmetically appealing, full-thickness skin coverage of defective areas. However, like most treatment modalities, tissue expanders have some undesired pitfalls, sequelae, and complications associated with their use. We used autologous fat transplantation to remedy asymmetrical arm circumference after skin expansion on one arm and report our results in this case report.

Case Report and Procedure: The patient is a 16-year-old female who presented with a congenital hairy nevus measuring 6.5 × 5.5 cm in the middle part of the posterolateral aspect of her left arm. Treatment included the use of tissue expanders, followed by excision of the nevus to treat the area. After the treatment, the patient complained that her left arm had become thinner than the right. Circumference of both arms measured at symmetrical points revealed a variance of 3 cm. Autologous fat transplant surgery, with a slight overcorrection that was expected to reduce over time, was offered as a solution.

Results: Postoperative follow up revealed sound healing of the wound. Her left arm circumference decreased over the following 6 weeks postoperatively (the overcorrection). The final result was symmetrical arms, both visually and numerically.

Conclusions: Autologous fat transplantation can be used as an adjunct to tissue expansion to fill the lipo-atrophic defects that may result from tissue expansion.

Tissue expansion was first pioneered by Charles G. Neuman, MD, in the 1950s and later further developed by Chadomir Radovan, MD, who introduced the Radovan Tissue Expander in the late 1970s. Tissue expanders have become a popular modality in plastic and cosmetic surgery. Many victims of burns and severe trauma that result in extensive split-thickness skin grafting and/or scarring later seek surgery to enhance their appearance, particularly in visible areas. Patients with premalignant lesions, congenital malformations, unwanted or regretted tattoos over large areas, women undergoing postmastectomy breast reconstruction, or men with extensive male-pattern alopecia may seek treatments that use tissue-expansion techniques.

At the present time, tissue expansion occupies a respectable place in plastic and aesthetic surgery. When full-thickness skin coverage is desired and the “demand” is bigger than the “supply,” tissue expanders serve as an indispensable tool to achieve good quality, cosmetically acceptable, full-thickness skin coverage for a given defect. However, like any other treatment modality, tissue expanders have some undesired pitfalls, sequelae, and complications. Tissue expanders are placed subcutaneously and inflated periodically with fluid. Over a period of time (usually many weeks), tissue expanders exert pressure on the underlying tissues, most commonly the adipose tissue, leading to lipo-atrophy. The contour problems that result from the chronic pressure on the adipose tissue under the expanders are unavoidable but repairable. We used autologous fat transplantation to remedy...
asymmetrical arm circumference after skin expansion on one arm and report our results in this case report.

**Case Report and Procedure**

A 16-year-old female presented with a congenital hairy nevus measuring 6.5 × 5.5 cm in the middle part of the posterolateral aspect of her left arm (Figure 1). It was noted that the patient was physically small for her age, weighing merely 38 kg. Her arm circumference at the middle part of the nevus was 21 cm. Similar measurement obtained from the other side confirmed pretreatment symmetry. Under IV sedation and local anesthetic, 2 crescent-shaped, 50-mL volume tissue expanders (Laboratories Eurosilicone, Zi La Peyrolière, France) were inserted subcutaneously via 2 2.5-cm vertical incisions, superior and inferior to the lesion.

Ten days postoperatively, the patient underwent serial expansions. She tolerated the expansions well. The expanders accommodated more than their stated volume. An average of 7.83 mL of gentian-violet-stained, sterile, normal saline was injected twice weekly into the lateral expander and 7.33 mL into the medial expander. Allowing for anticipated leakage that may take place, a total of 86.13 mL was injected into the lateral expander and 80.63 mL into the medial expander during 11 visits. The criterion used to decide the amount of saline injected was patient’s tolerance. After the sixth visit, she started to tolerate less volume on the medial side (Figure 2). Again under IV sedation and local anesthesia, an elliptical excision of the nevus with 5-mm margins was carried out. Capsulectomy of the superficial wall of the capsule was performed. The flaps raised after the capsulectomy covered the defect with ease. It was noted that the adipose tissue underlying the expanders had atrophied dramatically. The wound was closed without tension. 4/0 subcutaneous polydioxanone (PDS) (Johnson & Johnson, Somerville, New Jersey) and 4/0 subcuticular Ethicon (Johnson & Johnson, Somerville, New Jersey) sutures were used.

Postoperative recovery was excellent. The wound healed soundly. Biopsy confirmed the clinical diagnosis. However, a few months postoperatively, the patient complained of two problems. The middle part of her left arm was thinner than the right, and the scar had stretched. Measurements were taken. The circumference of her left arm was 18 cm as compared to the 21 cm of the right side, at symmetrical points. The scar had stretched to 2 mm in certain areas and to 3 mm in others. Some parts of the scar were linear (Figure 3). A joint decision was made by the author, the patient, and the patient’s mother to improve the contour and diameter by fat transplantation and to revise the stretched scar at a later stage once the contour problem was resolved.
Under IV sedation and tumescent technique, fat was harvested from both of the patient’s buttocks using a Coleman Harvesting Cannula (Byron Medical/Mentor, New York, NY) and 10-mL Luer-Lock syringes (Byron Medical/Mentor, New York, NY). The fat was centrifuged over 1 minute. The separated fluid and supernatant oil were discarded. A total of 140 mL of free fat was obtained. Ninety mL of fat was injected into the premarked depressed areas via 2 stab wounds using the Coleman Injection Cannula (Byron Medical/Mentor, New York, NY). Repeated strokes were used to deliver small parcels of fat. Overcorrection was deliberately achieved to allow for the potential resorption of fat. Fifty mL of extra fat was frozen at -18°C in a domestic freezer.

Results
Over the following 4 months, the patient remained asymptomatic. The circumferences of both arms were measured during each visit (weekly). Once the initial swelling subsided, the difference between the 2 arms’ circumferences remained static at 1 cm, as compared to the 3 cm preoperatively. The patient underwent another procedure to revise her scar and top off the transplanted fat. The old scar was excised and flaps undermined up to 4 cm on each side. It was interesting to note that the transplanted fat looked different from other adipose tissue in the area, seeming to have richer vascularity. The wound was closed with 4/0 subcutaneous vicryl (Johnson & Johnson) and 5/0 subcuticular PDS (Johnson & Johnson). The frozen fat was thawed at room temperature. Forty-five mL of fat was injected into premarked areas via separate stab wounds. Slight overcorrection was achieved. A small amount of fat leaked through the wound. This was stopped by a few interrupted 4/0 Ethicon (Johnson & Johnson) sutures. Steristrips (3M Health Care, St. Paul, Minn) were applied for added wound security.

Discussion
The patient regularly attended her follow-up appointments. She was asymptomatic apart from irritation of a small area of skin as a result of the steristrips (3M Health Care). Interrupted stitches were removed on the fifth postoperative day. Steristrips (3M Health Care) were changed twice weekly for 2 weeks. She was followed up over a 6-month period. Her left arm circumference decreased over the following 6 weeks postoperatively (the overcorrection). The final result was symmetrical arms, both visually and numerically. Her arms remained symmetrical till the date of writing this report (Figure 4). The scar has matured and remained linear to date.

Conclusions
We are aware of the debate about the survival of transplanted fat and its longevity. However, in our hands, we found that a large proportion of the transplanted adipose tissue established vascularity and became well integrated with the surrounding tissue of the recipient areas. This case demonstrates that autologous fat transplantation can serve as an adjunct to tissue expanders to fill lipo-atrophic defects that are a result of pressure atrophy of the underlying tissue and thereby restore contour and symmetry to the areas treated with tissue expanders.

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References

Figure 4. Frontal view of left arm 12 months after second fat transplantation. Contour and diameter restored to preoperative condition. Right arm is shown for comparison.