

# Forehead Flap Ballooning for Scar Revision

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## Abstract

Nowadays, cutaneous expansion is used progressively in reconstructive surgery for treating the variety of problems such as burns alopecia scar revision in children and adults. With the use of tissue expansion technique, the reconstruction of many acquired and congenital defects has been made possible. Tissue expanders are principally based on the mechanical and the biological creep in which mechanical creep is the morphological changes occurring in cellular level in response to applied stress and biological creep is the resultant expansion of skin surface. There is an excellent closure of extensive soft tissue defects without additional scars in donor area with tissue expanders as compared with other methods of plastic surgery the case report highlights the excellent results of tissue expander in an esthetically compromised patient due to hypotrophic scar on the forehead. This is a novel technique as it was performed under local anesthesia without the use of any sedation in a regular clinical setup.

**Keywords:** Hypotrophic scar revision, reconstruction, tissue expander

## INTRODUCTION

In cosmetic and reconstructive surgery, face and neck reconstruction is considered as one of the most important and most difficult surgeries to perform.<sup>[1]</sup> The major problem faced by a surgeon in these cases is the lack of similar skin with anatomical and functional features of facial skin.<sup>[1]</sup> The classical example of the physiological tissue expansion commonly observed is the laxity of the abdominal wall during pregnancy. The other example of the tissue expansion can be seen in the skin overlying the tumor.<sup>[2]</sup>

The first person to expand the skin for reconstructive purposes was Neuman, by placing the inflatable balloon subcutaneously.<sup>[3]</sup>

The lack of adequate soft tissues required for reconstruction also restricts surgical treatment. Tissue expansion has become a strategy to solve these shortcomings in soft tissue over the past 25 years.<sup>[4]</sup> This method has the remarkable ability to generate skin that fits almost absolutely perfectly the color, texture, and sensation required for reconstruction in a specific area. Compared to other plastic surgery techniques, tissue expansion enhances the closure of large soft-tissue defects in donor areas without additional scars.<sup>[5]</sup>

The artificial silicone implants are placed in the tissue planes below the skin and are periodically inflated, exerting a constant

pressure on the skin which makes it to expand. Tissue expanders are principally based on the mechanical and the biological creep in which mechanical creep is the morphological changes occurring at cellular level in response to applied stress and biological creep is the resultant expansion of skin surface.<sup>[6,7]</sup> The mechanical and biological creep should be identical to acquire an optimum growth.<sup>[8]</sup> The periodic inflation of the implant is done until the desired dimension of tissue is achieved. In this whole process, there is concurrent thinning of the dermis with thickening of epidermis, and the alignment of collagen fibrins occurs till complete remodeling.<sup>[9]</sup> This procedure has the phenomenal ability of regeneration of skin with perfect match of color, texture, and sensation necessary for reconstruction. There is an excellent closure of extensive soft-tissue defects without additional scars in the donor area with tissue expanders as compared with other methods of plastic surgery.<sup>[5]</sup>

Due to temporary inconvenience and cosmetic deformity caused by the procedure of tissue expansion, patient education,

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acceptance and compliance are essential.<sup>[10]</sup> This procedure is commonly indicated for the correction of posttraumatic or postoperative alopecia, treatment of baldness, expansion of forehead skin before total nasal reconstruction, expansion of postauricular skin before reconstruction of external ear, scar revision, and burns excision.<sup>[3]</sup>

## CASE REPORT

A 38-year-old man reported to our hospital with the chief complaint of a scar on the forehead [Figure 1]. On taking the history, the patient revealed that he sustained a bullet injury 6 years back on his face, leading to the destruction of facial structures, including hard and soft tissues. The patient was then immediately carried to a local hospital where primary management was done. After 6 months, the patient underwent nasal reconstruction surgery due to severely compromised facial aesthetics. For reconstruction of the nose, a forehead flap was taken, leading to the hypotrophic scar. On examination, the patient presented with a hypotrophic scar on the left side of forehead. The scar was 10 cm above the left eyebrow. Due to receding hairline, the scar was clearly visible. The size of

the scar was 4.5 cm × 2.5 cm approximately and had a sunken appearance.

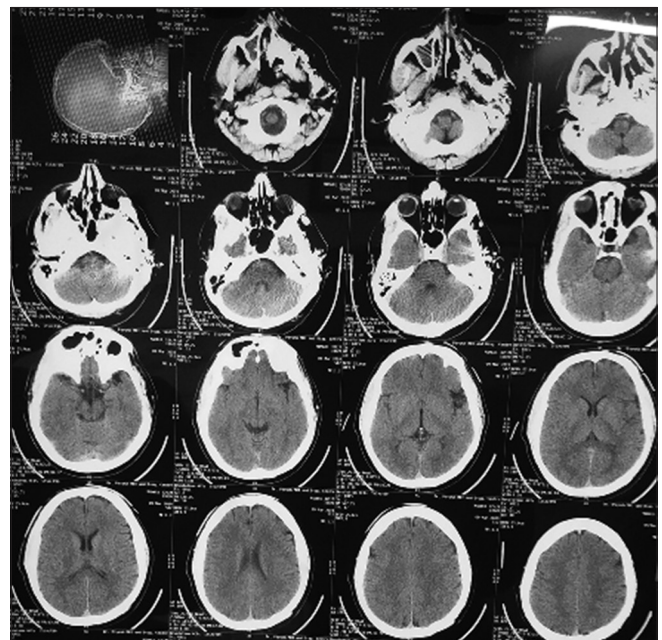
A CT scan was obtained of the head and neck region to rule out any bony defect at the forehead site along with routine blood test [Figure 2].

## Surgical procedure

The patient was draped and painted under aseptic condition. The procedure was carried out under local anesthesia, 10 cm long incision was made on the previous scar line, and then dissection was carried out on both sides of the incision in the subgaleal plane, and simultaneously, pockets were created on either side of incision. A 50 ml tissue expander was used in this case. The port of the expander was placed in the subgaleal layer in the pocket created on the left side lateral to the scar,



**Figure 1:** Preoperative hypotrophic scar on forehead



**Figure 2:** Preoperative computed tomography scan showing normal findings



**Figure 3:** Tissue expander *in situ*



**Figure 4:** Fifth week postexpansion showing ballooning of forehead flap



**Figure 5:** Second stage surgery, removal of tissue expander



**Figure 6:** Excision of the hypertrophic scar



**Figure 7:** Primary closure using 3-0 vicryl, 6-0 prolene and staples, respectively. Negative suction drain placed for 48 h and removed postoperatively



**Figure 8:** Follow-up post 1 week



**Figure 9:** Follow-up after 6 months

and the expander part was inserted anteroinferiorly to the scar in the subgaleal plane on the right side of the incision line, and closure was done in two layers with 3-0 vicryl and 6-0 prolene [Figure 3]. The placement of the expander was anteroinferior to the cicatrix as to rectify the old linear scar present inferior to the cicatrix measuring 8 cm. After 10 days, sutures were removed, and inflation was done with a

no 24 scalp vein set along with 10 ml syringe [Figure 4]. The patient was recalled after every week for consequently 4 weeks. At every visit, the expander was inflated with 8 ml normal saline until volume reached up to 32 ml. The expander along with the port was removed 2 weeks' postexpansion [Figure 5]. The hypertrophic scar was excised [Figure 6], and primary closure was done with 3-0 vicryl 6-0 prolene and staples, respectively [Figure 7]. Staples were used to hold both the ends together as there occurs a phenomenon of tissue stretch-back according to which the expanded tissue stretched over a long period contracted immediately after the tension is released. This can result into a wide stretched scar, a secondary distortion of adjacent mobile structure or hypertrophicity of the scar and suture removal was done after 15 days [Figure 8].

## RESULTS

The patient was regularly followed up for 6 months after the procedure [Figure 9]. The preceding hypertrophic scar on the patient's forehead completely disappeared post 6 months' follow-up. This procedure showed excellent results since both the hypertrophic scar and the previous incision scar were completely extinct.

## DISCUSSION

Nowadays, cutaneous expansion is used progressively in reconstructive surgery for treating a variety of problems such as burns alopecia scar revision in children and adults. With the use of this technique, the reconstruction of many acquired and congenital defects has been made possible.<sup>[11]</sup>

In tissue expanders, various shapes available are standard round, rectangular, and crescent.<sup>[12]</sup>

In the maxillofacial region, the volumetric range of the expander lies between 1 and 250 ml.<sup>[3]</sup>

Tissue expansion is an effective method for treating multiple extensive postburn scar deformities, which makes it possible to increase the amount of normal tissue available for reconstruction with a similar color and texture to that of the area of defect.<sup>[1]</sup>

The restored texture and color of the flap should be in good assimilation with the recipient region with respect to the use of tissue expanders. In this study, the assimilation with the surrounding skin of the color of the flap, consistency, and thickness was satisfactory.<sup>[13]</sup>

It is very important to choose the size, shape, and position of the tissue expander and injection port location. Motamed *et al.* used rectangular tissue expanders, stating that flap design possibilities could be expanded using these expanders.<sup>[1]</sup>

Taking a study done by Van Rappard *et al.*, into consideration, the round expander was selected. He stated two methods of selection of round expanders, one was based on diameter, and another method was based on the circumference of the balloon portion of expander in our case, the diameter of the base of the expander was 2.5 times as large as the defect.<sup>[2]</sup>

As the expansion procedure progresses, there is an increase in the number and caliber of the random and axial pattern vessel present within the flap which leads to the increase in blood flow to the extended flaps, ultimately leading to very negligible chances of ischemic necrosis of the flap.<sup>[3]</sup>

No deforming secondary defects, no distant flaps, best color match, texture, hair-bearing, better vascularity, best survival of the reconstruction are some of the advantages of tissue expansion.<sup>[14]</sup>

The disadvantages of the tissue expander are discomfort, deformity during inflation.<sup>[15]</sup>

This procedure is not appropriate for all lesions, including large lesions which cannot be resected by onetime expansion, lesions without adequate surrounding normal skin tissue to insert an expander, and lesions with a propensity to metastasize implantation. In our case report, the method of tissue expansion was most suitable as the lesion was small-sized which was not possible to excise or suture directly in one stage or serial excision procedures.<sup>[13]</sup>

## CONCLUSION

Successful scalp reconstruction requires careful preoperative preparation and reliable intraoperative results. Detailed knowledge of scalp anatomy, skin biomechanics, hair physiology, and the range of local tissue rearrangements available enables excellent esthetic reconstruction.

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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### Conflicts of interest

There are no conflicts of interest.

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