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## Alternative strategy to treat keloid and hypertrophic scar surgically

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### Abstract

**Background:** Hypertrophic scars and keloids are fibro-proliferative disorders that may arise after any deep cutaneous injury caused by trauma, burns, surgery, etc. Hypertrophic scars and keloids are cosmetically problematic, and in combination with functional problems such as contractures and subjective symptoms including pruritus, these significantly affect patients' quality of life. We describe pre-expanded flap for surgical treatment of keloid or hypertrophic scar. The aim of our study is to show the promising results of pre-expanded flaps in keloid and hypertrophic scar.

**Method:** Retrospective analysis of the data of patients with keloid or hypertrophic scar over chest having treatment in a tertiary centre between September 2019 to December 2021.

**Result:** Out of 12 patients 9 patients healed with ordinary scar and 3 developed partial scar site hypertrophies. 10 patients believed that the esthetic results were good while 2 patients felt just satisfied with the results.

**Conclusion:** Pre-expanded skin flap is an effective and safe surgical method for reconstruction after keloid/hypertrophic scar resection. It offers another useful and successful surgical choice for large keloid treatment. By our study it is concluded that pre-expanded flaps provide excellent result in treatment of keloid/hypertrophic scar in child and adolescent age group.

**Keywords:** Pre-expanded flap, keloid, hypertrophic scar, tissue expansion

### Introduction

A keloid is a benign growth caused by an overabundance of collagen deposits, characterized by overproduction of collagen and local fibroblast proliferation<sup>[1]</sup>. Keloids often complain of unwanted symptoms such as pruritus, pain, infection and aesthetic problems, these symptoms can be especially severe during the growth phase<sup>[2]</sup>. Tissue expansion is one of the available surgical approaches used in their treatment. Surgical excision is one of the major methods used in keloid treatment. In patients with large keloids, the wound is sometimes difficult to approximate after the keloid is resected. Skin grafts and skin flap transplantation are sometimes necessary. Intralesional excision combined with radiotherapy and other modalities like cryosurgery, 5-fluorouracil, interferon, lasers, verapamil may also be a good choice in some cases<sup>[3-5]</sup>. Chest keloid is common in clinical practice. The shape and size are often different among the patients. Some small keloids are round and oval these can be removed directly in one surgery while some are large and irregular. Such keloids are often difficult to treat surgically. Lack of skin tissue to cover the wound after resecting the keloid lesion remains to be one of the biggest problems in keloid surgical treatment.

### Materials and Methods

Analysis of the data of patients with keloid or hypertrophic scar over chest having treatment in SMS medical college and hospital Jaipur between September 2019 to December 2021 was done retrospectively. Total 12 patients were included in the study out of which 7 were males and 5 were females [Table 1]. The mean age of patients was around 15 years old (range 11-19 years of age) [Table 2]. We included patients of post burn hypertrophic scarring and keloid formation of above mentioned age group. Size of keloid was from 9cm x 6cm to 15cm x 10cm. All the patients included in this study had given proper written informed consent for the surgery.

All the surgeries were performed by same surgeon having more than 30 years of experience in plastic surgery. After proper planning of technique which we will be going to use for coverage i.e. advancement, transposition, rotation or combination of these, skin expanders were placed after keloid resection. In the first stage skin expanders from 100 to 250 ml rectangle in shape were placed beneath the layer of deep fascia besides keloids.

**Table 1:** Sex distribution

Total	12
Male	07
Female	05

**Table 2:** Age distribution

Age(year)	11-19
Mean Age(year)	15

In one patient having keloid associated with post burn contracture neck two expanders were implanted. After implantation of the skin expander sterile saline solution

around 30cc was injected intra-operatively then port was fixed over bony prominence. After 1 month of lag phase sterile saline solution around 10% of the total volume of the expander was injected once a week. Expansion is carried out for around 3-4 months. After achieving required size of expanded skin we planned second stage of surgery i.e. expander removal and flap coverage after a month of maturation phase. In second stage of surgery incisions were made in skin surrounding the keloid then keloid resection was done and absolute hemostasis was achieved. The intercostal perforators were preserved during surgical procedure. The skin expander was removed and then marking of flap was done according to the resultant wound after keloid resection. The flap was then fully elevated and coverage of wound was done either via flap advancement /transposition / rotation or combination of these. Negative suction drains were placed under the flap and donor site then closure was done in layers. Injection triamcinolone was injected intra-operatively to the margins of wound. The suction drains were removed after 2-4 days of surgery. Sutures were removed after 2weeks postoperatively. Compression garments were used for at least 6 months.



**Fig 1:** A 13year old female patient admitted with complain of keloid over chest for which single tissue expander was placed. After complete resection wound was covered by pre-expanded flap.



**Fig 2:** A 11 year old male child presented with complain of post burn contracture neck with hypertrophic scarring. Two expanders were placed besides the hypertrophic scar. Contracture release and resection of hypertrophic scar was done and wound was closed with the use of pre-expanded flap.

## Results

With 12 patients were included in the study surgeries were uneventful in all cases. In post operative period one patient developed blisters over skin overlying the expander which subsided by conservative management with antibiotic coverage. None of the patients reported any flap necrosis. Out of 12 patients 9 patients healed with ordinary scar and 3 developed partial scar site hypertrophy. 10 patients believed that the esthetic results were good while 2 patients felt just satisfied with the results. None of the patients were dissatisfied with the final aesthetic outcome.

## Discussion

The factors affecting keloid formation are age, site, family history, skin tension and immune function of body [4]. External factors can be trauma, surgery, infection or idiopathic. Due to more of skin tension and less mobility sternal area is the most common site of keloid formation [8]. Resection followed by radiotherapy is the most common treatment modality for chest keloids. Various surgical methods were reported for the wound reconstruction after resection like skin graft, local flaps and free flaps for large keloids [6]. As skin grafts are thinner than flaps therefore they are more prone to be affected by post-operative radiotherapy [6]. Microsurgical procedures are more complicated due to chances of flap failure, which can lead to disaster for the patient. So an alternative to these options is use of tissue expansion. Although the usage of pre-expanded flap for chest keloid is divided into two phases, which looks a bit complicated than complete resection with skin graft or local flap, but this surgery strategy has much more advantages, especially when we are dealing with keloid in child and adolescent age group. The thickness and appearance can be much similar between the donor and recipient site as the flap comes from the donor site besides the keloid [9]. In addition, compared to the thickness of skin grafts, pre-expanded flaps are much more resistant to radiotherapy, therefore less chances of necrosis are there. Local skin flap in chest is more difficult in female due to presence of breasts. Breast deformation can be prevented by use of tissue expansion technique. In the surgical part, tissue expander implantation (Stage 1 surgery) is a surgery with almost no difficulty and it is a process that causes very little trauma to patients, which makes it less morbid for both patients and surgeons. The expansion process is also a delaying process for the flap and due to this the blood supply of the flap is augmented [10]. That is the reason why no surgical failure of this surgical strategy is found in these reported cases. Tissue expansion has become an ordinary surgical method in clinical practice but the process is still complicated and following principles should be followed in order to achieve the best surgical outcomes.

1. Considerable preoperative design is must. Different patients have different size and shape of keloid. The shapes of the keloid are often irregular. The surgeon should plan carefully about the size of the expander, the mode of transportation of flap, the size of the expanded skin flap and the blood supply of the flap. Required skin flap size may be smaller than the keloid size because some normal skin can be used to cover small area after excision. Besides, with very large irregular keloid, many expanders will be needed.
2. Sufficient expansion. To generate enough skin tissue to cover the wound after keloid resection, the implanted

expander should be sufficiently expanded. Over expansion is sometimes needed.

3. Always convert irregular wound into regular wound. The keloids are often irregular in the chest and the wounds after keloid resection are also irregular. By converting the irregular shape of the wound into regular wound, the expanded skin flap can be easily designed.
4. Stable blood supply and venous drainage is important for skin flap survival.

## Conclusion

Pre-expanded skin flap is an effective and safe surgical method for reconstruction after keloid/hypertrophic scar resection. It offers another useful and successful surgical choice for large keloid treatment. By our study it is concluded that pre-expanded flaps provide excellent result in treatment of keloid/hypertrophic scar in child and adolescent age group.

**Conflicts of interest:** None

**Informed consent:** Informed consent was obtained from all patients included in the study, wherever applicable. Written informed consent has also been obtained from all individuals for use of their clinical photographs in this study.

**Ethical approval:** All procedures performed in the study involving human participants were in accordance with the ethical standards of the institution and /or national research committee and with the 1964 Helsinki declaration and its latter amendments or comparable ethical standards.

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