

# Pixel Grafting: A Novel Skin Graft Expansion Technique

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## Abstract

Skin grafting is the transplantation of skin, a routinely performed procedure to cover the loss of skin. Skin is the largest organ of the body, which falls short of availability in extensive injuries, especially burns. In such a situation, pixel grafting, a novel expansion technique helps to cover a large area with less skin harvest. The objective of the study was to test fast, minimally invasive, easy to use minced split-thickness skin graft to cover large wounds and to reflect on the advantages of pixel graft. It is a pilot study of patients admitted with severe burns. We conclude that with this technique of pixel or minced grafting, large areas can be grafted with minimal donor-site requirement, and the techniques of preparation provide adequate size graft for pixel grafting.

**Keywords:** Large areas, pixel grafting, technique

**Key message:** Pixel graft expands the graft hundredfold, helping to provide coverage of the raw area with minimal donor-site morbidity. Preparing a pixel graft is an equipment-based technique; we describe a simple method for pixel graft harvest and discuss advantages of pixel graft.

## INTRODUCTION

Burns injuries constitute a major cause of skin injury, and the loss of which is reconstructed with a split-skin graft. Burn injury involving more than 20% of total body surface area is considered significant with complications due to loss of skin cover.<sup>[1]</sup> In such patients, harvesting graft will lead to additional skin loss, blood loss, and wound-related complications. Various techniques are available to increase the area of coverage with limited split-skin graft harvest, namely graft meshing, micrograft, Meek graft, punch graft, and pixel graft.<sup>[2]</sup>

The concept of pixel graft came into being with the hypothesis that smaller grafts increase the regenerative potential of the graft by creating many more pieces of the same original skin graft. The concept of small graft is old, used by Reverdin in 1869, in the form of pinch graft, and later, Meek described a technique for mincing a split-thickness skin graft into small pieces, allowing tenfold expansion. Meek's method never gained widespread clinical application as the skin graft pieces needed to be placed with the dermal side down to ensure survival, the

device for mincing the skin grafts was expensive, and the method was labor-intensive.<sup>[3]</sup>

To evaluate the method, we transplanted minced split-skin graft to burn injury sites.

In this paper, our preliminary clinical experience with the pixel grafting or minced grafting in a series of 10 severely burned patients is described,

## MATERIALS AND METHODS

This study was carried out by a single surgeon at tertiary care hospital as a pilot study of 10 patients admitted during January 2018 to April 2018, with thermal burn injury involving 30%–50% of body area with second- and third-degree burns, and in patients with post-burn raw area after the loss of split-skin graft post-tangential excision. The patients of age-group 18–40 years were included. Patients with comorbidities, pregnancy,

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**Table 1: Patient details**

S. no.	Age in years	Sex	Percentage of burns	Number of application of pixel graft	Duration for reepithelialization	Donor area used in a percentage of body area
1	23	Female	30	5	26 days	3
2	30	Female	42	8	35 days	4
3	27	Female	35	6	32 days	3
4	25	Male	40	10	42 days	5
6	38	Female	38	7	30 days	4
6	23	Female	35	7	32 days	4
7	36	Male	45	13	48 days	6
8	26	Male	32	8	24 days	5
9	28	Female	30	6	28 days	3
10	31	Female	35	8	35 days	5

**Figure 1:** Minced graft

inhalational injury, unstable patients, and those who did not give consent were excluded [Table 1].

The patients were resuscitated with Parkland formula; burn wound was covered with collagen sheet. They were operated between 3 and 5 days after burn injury; once the patients were hemodynamically stable. At each operating session, 10%–15% of second-degree deep and third-degree burn areas were excised, and minced grafting was done.

Thin split-thickness skin graft amounting to 1% of body surface area was harvested, the graft was minced with the help of fine scissors in multiple directions in a stainless steel bowl till the graft appears like a paste [Figure 1].

**Figure 2:** Minced graft over colleen sheet

The size of the shredded graft was found to be of various sizes with an average size of  $0.3 \times 0.3$  mm when examined under a microscope. The minced graft was sprayed over a wet collagen sheet of  $10 \times 10$  cm with a dermal spray device [Figure 2]; the same was placed over the raw area after wound bed preparation with graft sprayed side facing the wound [Figure 3]. Then the nonadhesive dressing was done. The orientation of minced graft was not necessary owing to the small size of the graft. The first dressing was changed after 3 days; collagen was left undisturbed unless soaked, and subsequent dressings were done on alternate days until the seventh day. The graft take was assessed on the seventh day. If graft loss was present, regrafting was



**Figure 3:** Application over the raw area

done with graft harvested from the same donor site if the donor area epithelialized. Parameters that were assessed were the rate of epithelialization of post-burns raw area, area of the donor site, and number of settings of pixel grafting. Wound reepithelialization was recorded on days 10, 15, and 20. Photoplanimetry of wound photograph was done at every dressing [Figure 4].

## RESULTS

The mean area grafted per procedure was 12.4% (range, 10%–15%). On an average, 80% graft take was present, the mean duration of reepithelialization was 30 days, with the mean donor site used was 4.2%. Hypergranulation of tissue was managed by the application of topical steroid and nonadhesive dressing. Islands of the breakdown of settled graft were noted in two cases, which were regrafted. Long-term results of pixel grafting in our cases are awaited.

## DISCUSSION

Traditionally meshed skin graft has been the treatment of the post-burn raw area. However, lack of autograft skin is always a problem after the initial surgery, which limits the excision of remaining eschar, thus inviting wound infection and septicemia, which may prove to be fatal. Our preliminary experience in the use of the pixel grafting technique in the severely burned patient suggests that it provides a reliable method to achieve wound healing with expanded autografts. The pixel grafting technique allows a greater expansion ratio as compared to the mesh graft, as has been reported by other researchers. The small autografts are well supported by the wet collagen sheet and can be easily applied in contrast to the difficult handling of higher expansion (1:6 or 1:9) mesh graft. The chances of the lifting of the small autograft island at the time of dressing are negligible as the wet collagen sheet sticks in place, and on the seventh day, collagen sheets will be lysed, and autograft islands have sufficiently grown into the tissues.<sup>[4-6]</sup>



**Figure 4:** Postoperative day: 2 weeks

Advantages of pixel graft are as follows:

1. The increased number of grafts with pixel grafting technique results in an increased number of islands of regeneration, which facilitates faster reepithelialization.
2. Pixel grafts survive by diffusion rather than by neovascularization, hence the survival of pixel grafts is higher than micrografts because of decreased diffusion distance for nutrients.
3. Even if the wound gets infected, the chance of loss of graft is usually localized only to that particular area.
4. Overlay allograft is not necessary as the epithelialization progresses rapidly from the edges of the autograft islands. This has earlier been verified even in the technique of intermingled auto- and homograft transplantation by other workers.<sup>[7,8]</sup>
5. The wound contraction and scar strength are comparable to micrograft.<sup>[9]</sup>

The disadvantages of pixel grafting that have been described in literature are poor cosmesis, lack of stability of graft and contracture.<sup>[8,9]</sup> The device used for pixel grafting is expensive and is labor-intensive. In our method, we have used only fine scissors to mince the graft.

In our study, we used collagen sheets to overcome the disadvantage of stability of graft and graft loss; postoperatively, the patients were advised silicon-based therapies for improvement in cosmesis, and contracture was not encountered in our study.

Our study showed that pixel graft can be used at early intervention with a simple technique to achieve coverage of large areas with minimal donor-site requirements. This is a pilot study with no control.

## CONCLUSION

Pixel grafting technique is a promising advancement in the field of wound healing, especially in burns. This would address the limitation of the availability of split-thickness skin graft with the possibility of a very large expansion

ratio. The technique elaborated gives minced graft, which can be easily used in smaller health-care centers. Our study establishes the premise of pixel grafting technique and shows its efficacy in the application to large raw areas.

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### Conflicts of interest

There are no conflicts of interest.

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