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# The role of recruited minced skin grafting in improving the quality of healing at the donor site of split-thickness skin graft—A comparative study

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## ABSTRACT

**Introduction:** The donor area of split thickness skin graft harvest usually takes 2–3 weeks to heal. A few studies have shown that application of minced skin grafting helps to reduce this time. The objective of this comparative study was to find the role of recruited minced skin grafting on the overall quality of healing at the split thickness skin graft donor area.

**Materials and methods:** The study included 30 patients undergoing split thickness skin graft for acute traumatic wounds. We selected two donor areas of nearly equal size on medial and lateral side of either thigh in each case. They were randomly allocated to control area and study area using an envelope technique. Minced graft was applied over the study area. Same dressing and post operative care were done for both the areas.

**Results:** In our study we found average time for complete epithelialization at control area was 28.17+/-5.590days whereas it was 21.93+/-2.420days in the study area. The earlier epithelialisation time of study area compared to control area was significant on statistical analysis. **Vancouver scar scale (VSS)** comparison at third month and one year follow up showed significant difference of scores (1 versus 0) as the scars were hypopigmented at control area and comparatively better pigmented at study area. We found visual analogue score for Pain and pruritus to be better for study area at the end of first, second and third month.

**Conclusion:** In this study we conclude that, recruited minced skin grafting to the donor site of split skin graft leads to better quality of healing in terms of early epithelialisation, better quality of scar, better pigmentation, less pain and pruritus, thus leading to improved quality of healing.

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## 1. Introduction

Split skin grafting is one of the basic techniques used frequently by plastic surgeons to cover various traumatic or

surgical wounds. The harvest of skin graft from any site in the body always leaves a wound over the donor area, which most of the time heals uneventfully by re-epithelialisation from skin appendages. The first study in literature about minced skin grafting at the donor site is by Simizu et al. and

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they had studied the pigmentation, color, and skin texture of the donor area after minced skin grafting and found out a favourable outcome [1]. In another retrospective study Miyanaga et al. found that the minced skin graft leads to earlier epithelialization at the donor site [2]. No further studies are available in literature regarding minced skin grafting. In our study we prospectively compared the effect of minced skin grating on donor site healing time, scar quality, pain and pruritus.

## 2. Methods

The prospective randomized comparative study was conducted at our institute over a period 1.5 year (January 2014-June 2015). The study included 30 patients undergoing split thickness skin graft for acute traumatic wounds. The study has been approved by institutional ethical committee. Patients were included in the study after informed voluntary written consent as per Helsinki's declaration. Patients aged less than 15 years, aged more than 70 years, with systemic illness like diabetes, history of collagen vascular disease, patients on steroid, patients with malignancy and patients with hypertrophic scarring or keloid tendency were excluded from the study. The split skin graft donor area in each patient was divided into two equal parts located on medial and lateral thigh. They were randomly allocated to study and control area by sequential closed envelop method. The Envelopes were opened only when the patients were on the table.

### 2.1. Surgical procedure

The donor area for harvest of split thickness skin graft was painted with Povidone Iodine. Pre-graft harvest lubrication of donor area was done with liquid paraffin. Skin graft was harvested using same Watson modified Humby's knife with fixed thickness settings for skin graft. (0.011-0.015 in.). All the cases were done by the same team of plastic surgeons. After harvesting split thickness skin graft hemostasis at donor site was achieved with the help of adrenaline solution-soaked gauze (1 in 4 lakh dilutions). The size of replica of study and control area was cut out of a sterile transparent PVC sheet and was used to measure the area. After applying the skin graft at recipient area, the excess graft at the margins of recipient area was trimmed and was used as the recruited minced skin graft. The minced skin graft was prepared with the help of a sharp curved tissue scissors (Fig. 1). The recruited pieces of split-thickness skin grafts were minced into tiny particles. The approximate particle size was less than 1mm in diameter macroscopically. The minced skin graft was kept moist with normal saline to prevent the desiccation. The pasty minced graft was then spread evenly over the donor site selected as study area (Fig. 2A). Then both the donor area was dressed with fusidic acid cream (20mg in 1gm) and non-adhesive absorbent dressing.

### 2.2. Postoperative dressing and follow up

We did the first dressing of the donor area on 14th day postoperatively. Patients having incomplete healing were dressed every alternate day with Fusidic acid cream and Vaseline



**Fig. 1 – Preparation of minced skin graft with scissors.**

gauze covered by secondary dressing till completion of epithelialization. Follow up comparative assessment of donor area was done at 1 month, 2 months, 3 months, and 1 year. Patients were advised to apply coconut oil over healed donor area twice daily. During each follow up the control and study area were assessed for completion of epithelialisation (at every dressing change), scarring (as per Vancouver scar scale at 2 months, 3 months and at 1 year), pain and pruritus (as per visual analogue scale at 1 month, 2 months, 3 months and at 1 year).

### 2.3. Statistical analysis

The time duration of complete epithelialization of study and control area, the Vancouver scar score and the visual analogue scale for pain and pruritus were recorded and compared using SPSS-20 software for Windows (IBM, USA, 2011). A Value of  $<0.05$  was considered significant.

## 3. Results

### 3.1. Patient characteristics

In our study mean age of patient population was 36.36 years youngest being 15 years and oldest 60 years. The study population constituted 83% (25) males and 17% (5) females.

### 3.2. Donor area

In our group of 30 patient's, split thickness skin graft donor area was on right thigh in 23 cases and left thigh in 7 cases. The donor area on either thigh were two equal sized zones and they were randomly grouped into control or study area by sequential closed envelope method. The average measured area of control group was  $54.35\text{cm}^2 \pm 4.72$  and it was  $53.33\text{cm}^2 \pm 3.93$  in study group. The mean area was comparable ( $P=0.12$ ).

### 3.3. Time to complete epithelialisation

In our study we found average complete epithelialisation time for the control area was  $28.17 \pm 5.590$  days whereas in the study area it was  $21.93 \pm 2.420$  days (Fig. 2B). The earlier



**Fig. 2 – Study area (medial side) and Control area (lateral side) of split skin graft donor site on right thigh. (a) Minced graft applied over medial thigh. (b) Study area (medial side) and control area (lateral side) completely healed after 1 month post operatively. (c) Study area (medial side) and control area (lateral side) at 2 months post operatively, the study area shows healed minced graft. (d) Study area showing less erythema and better pigmentation at 3 months post operatively. (e) Study area nearly matching pigmentation of surrounding normal skin at 1 year post operatively.**

healing time of the study area compared to control area was significant on statistical analysis with a P value of  $<0.001$ .

### 3.4. Vancouver scar scale (VSS)

We recorded score for control and study area as per Vancouver scar scale at 2-month, 3 months and 1 year follow up. The parameters included pigmentation, vascularity, pliability and height of scar (Fig. 2G-E). The comparative VSS score was comparable at 2 months ( $P=1$ ) (Fig. 2C) however at third month and one year follow up, the VSS score showed significant difference, 1 versus 0 ( $P$  value  $<0.001$ ) i.e the scars were hypopigmented at control area and comparatively better pigmented at study area (Figs. 2D,E and 3).

### 3.5. Visual analogue scale

We assessed the pain and pruritus using visual analogue scale (Fig. 4). The numerical rating of scale was 0–10 with 0 being no pain or pruritus and 10 being worst possible pain or pruritus. All

patients were assessed at 1st, 2nd, 3rd month and one year postoperative follow up for study and control area respectively.

Pain and pruritus were significantly lower at the study area at the end of first, second and third month ( $P<0.01$ ). At the end of one year there was no pain and pruritus in both the areas as both have completely healed ( $P=0.12$ ) (Fig 5).

## 4. Discussion

The conventional healing pattern of split thickness skin graft donor site includes morbidity of pain, itching and dressing for three weeks. At times it may be associated with an unfavorable scar scarring, dyspigmentation, persistent erythema, and poor skin texture. Various preventive and therapeutic measures had been utilized to reduce such morbidity [3,4]. These included use of different types of specialized dressing materials, pressure garments, silicone gel sheeting etc. [5–11].

Harashina and Iso first introduced minced skin grafting in 1985 for the treatment of leukoderma [12]. They indicated that



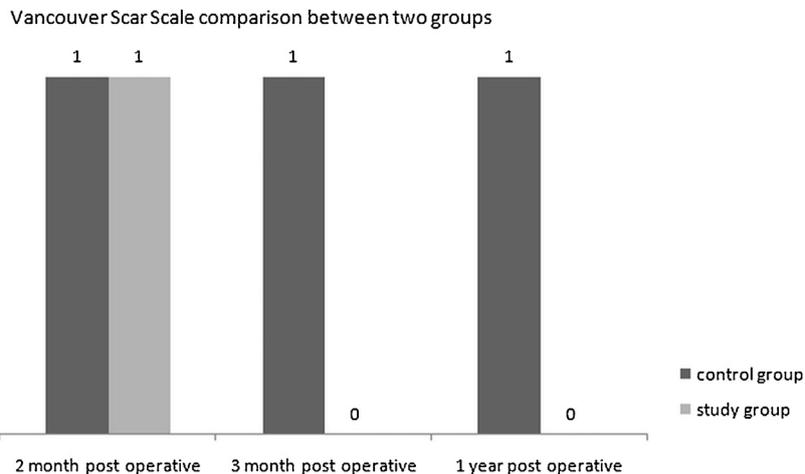
**Fig. 3 – (a) Minced graft applied over lateral thigh. (b) Study area (lateral side) and control area (medial side) at one month. (c) Study area (lateral side) and control area (medial side) at six months. (d) Study area (lateral side) and control area (medial side) at one year.**

the minced skin graft was superior to the punch graft because the final scars were even and smooth. A similar method was used in the treatment of leg ulcers to induce re-epithelialization [13]. The Meek technique appears similar to the present method but is different in that it is basically stamp grafts and leaves a conspicuous patchy appearance [14]. After a split thickness skin graft harvest the donor area heals by activation, migration and proliferation of keratinocytes from the normal surrounding epithelium and adnexal structures like sebaceous glands in the dermis of the donor area. A split thickness graft contains part of dermis, adnexal structures which contains stem cells. By mincing and spreading the split thickness graft evenly at the donor site. It provides keratinocytes, melanocytes and stem cells in the environment of growth factors. The combination of all of them promotes the epithelialisation at the donor area.

In our study, the healing at the donor site where minced graft was applied, occurred at 21.93+/-2.42 days where the

healing time for the control area was 28.17+/-5.590 days. This was statistically significant with a P value <0.001. Since both the control and study area were in the same patient no confounding factors are present. We assume this faster epithelialisation is due to the delivery of keratinocytes and stem cells by the minced graft in the growth factor rich milieu of donor area. It is similar to the interaction of autologous platelet gel with the adnexal remnant in the donor area [15].

The comparative evaluation of VSS score is a unique part of our study as it has not been reported in other studies [1,2]. We recorded score for control and study area using VSS at 2 months, 3 months and 1year follow up (Fig. 3). The parameters included were pigmentation, vascularity, pliability and height of scar. The comparison of VSS score at third month and 1year follow up showed significant difference. Average score was 1 in control group and 0 in study group (P < 0.001). The difference of VSS score between study and control area was mainly due to better pigmentation at



**Fig. 4 – Vancouver scar scale comparison between two groups.**

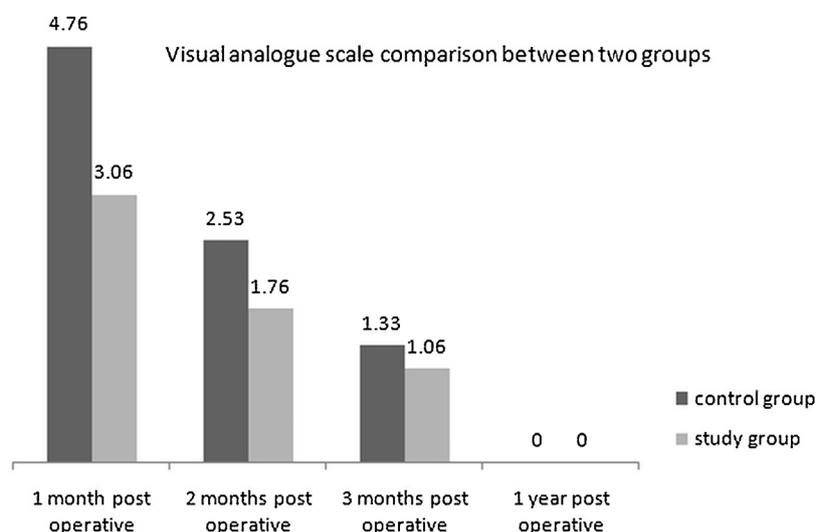


Fig. 5 – Comparison of visual analogue scale for pain and pruritus.

study area. This could be because of transfer and proliferation of melanocytes through the minced graft at the study area.

Functional problems like pain and pruritus at the donor site was evaluated with the help of visual analogue scale (Fig. 4). The score for pain and pruritus were significantly less at the study site at the end of first, second and third month ( $P < 0.01$ ).

Recently keratinocyte suspension sprays containing fibrin, thrombin and other skin cells have been utilized for resurfacing of large raw areas [16,17]. The initial results appear to be promising in some cases, but the technique is expensive and may need further trials. However, the micro minced grafting has many advantages.

- 1) It can be prepared instantly from the left-over skin graft, we do not need any special equipment for the same
- 2) It has dermal layer which provides adherence and aids in graft take
- 3) It has complete subset of cells from basal layer of skin and stem cells from skin appendages which will help in complete regeneration of skin layers.

We feel micro-minced skin grafting has potential to resurface large burn wounds when used as sandwich graft along with allograft.

## 5. Conclusions

In this comparative study we conclude that recruited minced skin grafting to the donor site of split thickness skin graft leads to better quality of healing in terms of epithelialisation and pigmentation. It leads to decreased pain, pruritus and scarring. Thus, minced skin grafting can be used as a technique to improved quality of healing at donor area of split thickness skin graft.

## Declaration of interests

None.

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Nil.

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