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Does Scraping of Granulation Tissue on Raw Area Affects Results of Skin Grafting: A study

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ABSTRACT

Context: Chronic granulating post traumatic wounds are covered with skin grafts after scraping of granulation tissue. But scraping is associated with increased blood and protein loss, and time required for haemostasis. We, therefore, conducted a study to determine if scraping can be avoided.

Aims: Comparison of results of Graft take and blood loss in chronic granulated wounds treated with and without scraping of granulation tissue.

Materials and Methods: Over 3 years, 50 patients, with healthy granulating post traumatic wounds and 4 to 10-week duration, were included. Wounds were divided into two halves, with one-half grafted after scraping (Group A) and other without scraping (Group B). Intraoperative blood loss was calculated. Dressings were done at postoperative days 2, 5, 7, and 10. Graft take, complete wound-healing time, and regrafting requirement were assessed.

Statistical Analysis: Unpaired *t* test for quantitative variables.

Results: Mean graft take (87.21 ± 9.48 Group A; 86.58 ± 11.18 Group B) was similar in both groups. Average intraoperative blood loss was significantly lesser (Group A 54.58 ± 6.5 mL/100 cm^2; Group B 10.2 ± 1.5 mL/100 cm^2), and duration of complete wound healing was increased without scraping (14.66 ± 2.79 days Group A; 15.73 ± 3.13 days Group B). There was no requirement of regrafting in both groups.

Conclusion: Scraping of wound bed is avoidable in selected patients, although at expense of marginally faster healing. Leaving the healthy granulation tissue intact does not affect overall graft take and is associated with decreased blood loss.

INTRODUCTION

Road side accident is a formidable public health problem, and chronic wounds especially are a cause of increased morbidity among trauma survivors. Early excision with primary or delayed closure is the treatment of choice in deep wounds However, this is not always possible, as in developing countries with lack of adequate trauma care facilities in remote areas, it is not uncommon for patients to present with chronic wounds for definitive treatment. In such cases, where deep wounds have been previously managed conservatively, there is a requirement of skin grafting, which is done after the wound bed covered with granulation tissue, usually 3 to 6 weeks post trauma. [1] The granulation tissue can be either removed or left intact prior to grafting of the wound. The preparation of wound bed is done to make it well-vascularized and to remove any exudates. This will provide a favourable medium for graft take and healing of wounds.[2] During debridement, bacterial colonies housed in biofilms and dead, necrotic cells are removed, thus effectively converting chronic wounds into acute wounds. In addition, excessive extracellular matrix and inflammatory enzymes are also eliminated.[3] But debridement of the wound comes with its own pitfalls of increased blood loss, oozing of tissue fluids, need for haemostasis, and added insult to the patient.[4],[5] Application of grafts directly on the granulation tissue or the nonscraping technique has been previously described.[6],[7],[8] It not only avoids physiological disturbances associated with debridement but can also save operation time and exposure to prolonged anaesthesia.

We conducted a study at our hospital to compare the primary outcomes of grafting (graft take and time to complete wound healing) and secondarily evaluate the intraoperative blood loss during surgery, and requirement of regrafting in cases of chronic granulating wound undergoing skin grafting, with or without scraping of the granulation tissue.

MATERIALS AND METHODS

From July 2014 to June 2017, 50 patients of age group 10 to 60 years, presenting late with post traumatic granulating wounds and duration of 3 to 12 weeks were included in the study. Patients with wound swab culture positive for β haemolytic streptococcus; comorbid conditions such as diabetes, hypertension, anaemia, malnutrition, bleeding diathesis, and on corticosteroid and chemotherapy were excluded from the study. Written informed consent was taken from all patients. A complete blood count, bleeding and clotting time, wound swab culture, and sensitivity were recorded for each patient preoperatively.

In patients with a single wound, half of the wound was scraped and assigned to Group A, and the remaining half with intact granulation tissue was assigned to Group B [Figure - 1]. In patients with multiple wounds, those on left side were assigned to Group A with scraping of the granulation tissue and those on the right were included in Group B [[Figure - 2] a and [Figure - 2]b]. In both the groups, a SSG was applied to cover the wounds.

Figure 1: Division of post traumatic granulating wound on right upper limb into two halves. Inclusion of distal half in Group A, with scraping of granulation tissue and proximal half in Group B, leaving the granulation tissue intact.

Figure 2: (a) Post traumatic wound on the right foot of a patient after scraping of the granulation tissue (Group A). (b) Post burn wound on the left foot of a patient with the granulation tissue left intact (Group B).

Surgical technique

All patients were operated under general / spinal anesthesia as per requirements of part. Wounds were cleaned with 5% iodine formulation followed by saline wash. The study was done by dividing the wound area into two equal halves, each of which was designated to either group. Complete scraping of granulation tissue was done with scrappers in wounds belonging to Group A. The granulation tissue was left intact in wounds of Group B.

Haemostasis was achieved by application of compression bandage over adrenalin-soaked gauze and Hydrogen peroxide gauge pieces for a period of 8 to 10 min. This time was utilized to harvest a split-thickness skin graft from the donor site. The wound bed was then reinspected, and electro cautery were utilized to secure any remnant bleeding. Intraoperative blood loss was determined as the weight difference of the wet gauzes used in cleaning and achieving active haemostasis pre- and postoperatively. Utmost care was taken to avoid soiling of blood-soaked pads with granulation tissue. Preoperative weight of gauzes used in this procedure was determined by weight difference between total wet gauzes taken preoperatively and remaining wet gauzes postoperatively in a bowl. All these weight measurements were done on same standard weighing machine. In both groups, similarly meshed and non-meshed SSG were applied to the recipient site and secured by staples or sutures, and splint was given to provide immobilization.

Postoperative care and follow-up

Graft take was monitored on postoperative days 2[Figure - 3a], 5, 7 [[Figure - 3b], and 10 [[Figure - 3c]. Dressings were done thereafter as required. Final outcome was decided by graft take as observed on tenth day. Time required for patient to be free from dressing and complete wound healing was calculated in both groups. Requirement of regrafting was also noted in both groups.

Figure 3: (a)Graft take as seen on third post-operative day. (b) Graft take as seen on seventh post-operative day. (c) Graft take as seen on tenth post-operative day.

Statistical analysis

Categorical variables were presented in number and percentage (%), and continuous variables were presented as mean ± standard deviation and median. Normality of data was tested by Kolmogorov–Smirnov test. Quantitative variables were compared using unpaired *t* test between the two groups. Qualitative variables were compared using Chi-square test. A *P* value of less than 0.05 was considered statistically significant. The data were entered in MS Excel spread sheet and analysis was done using Statistical Package for Social Sciences (SPSS) version 21.0, SPSS Inc., and Chicago, IL, USA.

RESULTS

There were 29(58%) males and 21(42%) females included in the study and the mean age of patients was 27.3 years. Twenty two patients had a single post traumatic raw area, which was divided in two parts (Groups A and B), and 28 patients had multiple raw areas over different parts of body, in whom one raw area on each side was designated to either group. Mean area grafted was comparable in both the groups (161.67 ± 53.92 cm^2 in Group A and 163.48 ± 49.48 cm^2 in Group B, *P* value 0.73). Comparative distribution of wound area grafted is shown in. Although the graft take was comparable in both the groups, there was significantly decreased blood loss and increased duration of complete wound healing in Group B as compared to Group A. There was no requirement of regrafting in both the groups.

DISCUSSION

Skin grafting in acute and chronic trauma wounds has been studied extensively in an effort to identify variables that influence graft take and wound healing.[5],[9],[10],[11] In our study, we objectively evaluated the effects of scraping of granulation tissue on skin grafting and compared it with those in which graft was applied directly without scraping.

Debridement after trauma results in wounds covered by granulation tissue, which contains a network of blood vessels, extracellular connective tissue, and inflammatory cells. It has an excellent blood supply but also contains debris and bacteria in the form of biofilm on its surface. Healthy granulation tissue fit for surgery skin grafting is characterized by pink to red in colour, finely granular appearance, moist, epithelialized margins, minimal discharge, does not bleed easily on touch, and free from β-haemolytic streptococci organisms.[12] Granulating wounds are usually managed by application of SSG, which provides coverage and minimizes scarring, contracture, and its sequelae. Although most surgeons scrape the granulation tissue before grafting, some others consider it unnecessary. Brown *et al*. in their study on thick split-thickness grafts, did not remove the granulation tissue if it was nonedematous and healthy. However, if the granulations were long standing and fibrous, they were removed before applying the graft.[13]

No significant difference was shown in the microbiological profile, take of graft, and aesthetic appearance of the grafts between scraping and no scraping, in a study carried out by Dhar *et al*.[5] The mean graft uptake percentage in their study with removal of granulation tissue was $83.74 \pm 16.74\%$, and without granulation removal was $84.23 \pm 18.90\%$ showing no statistically significant difference. Our study also did not reveal any significant difference in the graft take between the two groups. No removal of the granulation tissue did not have an adverse effect on the graft take, and this can be attributed to the rich vascular network that is contained within it. Also the reduced oozing from wound bed when the granulation tissue is left intact conserves the proteins that are required for building body reserves in such patients. This could also help in graft take as nutritional status has been found to be an important factor in graft healing.[14]

Time taken for complete wound healing is an important factor affecting patient satisfaction as it determines the period for which the patient will be encumbered with dressings. There is limited literature defining the actual length of time it takes for the wound to heal completely following skin grafting.[15],[16] A study conducted to identify the factors that affect the time to complete wound healing, found that most wounds, after primary excision and skin grafting, healed within 2 weeks, and the time to complete wound healing was not influenced by age, gender, total body surface area burned, presence of infection, or graft type. It also concluded that if detailed attention is given to avert complications like formation of hematoma or seroma, it might decrease the time taken for wounds to heal completely.[16] In our analysis of grafting of chronic wounds, we found that the mean duration of complete wound healing was significantly delayed in wounds in which the granulation tissue was not scraped. This can be attributed to the fact that there are numerous other elements that can delay wound healing like shear, which were not taken into consideration in our study. Also, presence of hyper granulation in the nonscraping group could have led to the increased time for healing as reported by Jewell *et al*.[16]

Quantification of blood loss with two methods, gravimetric and colorimetric, has been compared previously, and the gravimetric method has been proven to be a simple, objective, and accurate technique of calculating intraoperative blood loss.[17] In our study, we estimated the intraoperative blood loss using the gravimetric method. Studies evaluating blood loss during primary excision of wounds and skin grafting have shown significant amount of losses ranging from 5.9 to 9.2% of the patient's estimated total blood volume for each percentage area of wound excised.[18] However, there are insufficient data quantifying blood loss in patients undergoing grafting of chronic wounds with debridement of the granulation tissue. We found an average blood loss of 54.58 mL/100 cm^2 of granulation tissue debrided in the scraping group, which was significantly more than in the nonscraping group. Although Dhar *et al*.[5] did not exactly quantify the blood loss, they did report more blood loss with excision of granulation tissue as compared to nonexcision, when grafting chronic wounds. Significant blood loss results from surgical removal of granulation tissue, which is a significant burden on the suboptimal health condition of the burn patient. More secure hemostasis and lesser oozing of tissue fluids were also noticed in the nonscraping group.

Morbidities due to extensive debridement cannot be ignored if massive areas of wound are degranulated. If inappropriately managed, it can lead to severe blood loss, loss of tissue fluids, dyselectrolytemias, and hypothermia. This study was, however, underpowered to assess the same as the study population had only 13 sites (21.66%) with surface area more than 200 cm^2. Moreover, as chronic granulation tissue contains fibroblasts, chronic inflammatory cells, and bacteria, debridement can reduce scar formation in the long run. Evaluation of long-term outcomes and scar quality was, however, not a part of our study protocol. Further validation studies evaluating immediate and long-term outcome in patients with large surface areas of wounds are thus recommended.

CONCLUSION

Our study showed that grafting a nonscraped bed, does not affect the overall graft take and is associated with lesser intraoperative blood loss, decreased oozing of tissue fluids, and reduced need for time-intensive hemostasis as compared to when wounds are scraped. This reduction in the perioperative risk to the patient outweighs the advantage of marginally faster healing seen in wounds that were scraped. We, therefore, conclude that scraping of wound bed is avoidable in selected cases when wounds with healthy granulation tissue are grafted.

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