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Minced skin grafting for promoting epithelialization of the donor site after split-thickness skin grafting

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ABSTRACT

It is important to minimize time to healing in the donor site after split-thickness skin grafting (STSG). It has been shown that minced skin grafting improves the appearance of the STSG donor site. The objective of this study was to investigate whether mincing the leftover harvested skin and grafting it back onto the donor site during minced grafting (MG) reduces healing time of the donor site.

Normal healing time of the donor site after STSG is 10-20 days; therefore, healing time more than a month is abnormal. Out of the 96 patients (MG: controls=48:48) initially selected for this study, 7 patients (1 in the MG group and 6 in the control group) with abnormal wound healing (healing time >1 month) were excluded because their healing times were too long (from 1.5 to 6 months). All donor sites were on the lateral thigh. A part of the skin was minced and uniformly spread on the entire surface of the donor site. A calcium alginate dressing was applied and covered with a protective gauze dressing. Patients in the control group were treated identically, except that MG was not performed.

MG of the STSG donor site reduced the average time to healing by approximately 4 days (9.1 vs. 13.2). This effect was independent from the size of the donor site and MG/STSG mass ratio.

This procedure, which makes use of skin leftovers after skin grafting, should be performed prior to applying wound covering material as a means of reducing time to healing and level of patient's discomfort.

1. Introduction

Split-thickness skin grafting (STSG) is an important medical treatment in plastic and skin surgery. The ideal treatment for the donor site after STSG should minimize time to healing and patient discomfort, and provide a satisfactory cosmetic outcome. Reducing the healing time also reduces financial and mental burdens and accelerates the patient's return to a normal social life. Shimizu et al. demonstrated that recruited minced skin grafting improves the appearance of the donor site skin after STSG [1]. However, the effect of minced grafting (MG) on re-epithelialization has not been described. We investigated whether this method reduces the healing time of the donor site.

2. Methods

We performed a retrospective review of data from the clinical database of the Kouseiren Takaoka Hospital, Japan. Patients who had undergone STSG between January 2010 and March

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2014 were identified, and their medical records were carefully analyzed. During the review, the principles outlined in the Declaration of Helsinki were followed. Individuals with incomplete data were excluded. A total of 96 patients were included in this retrospective study, of which 48 patients (MG group) were treated with minced grafting between July 2012 and March 2014, and 48 patients (control group) were treated with other methods between January 2010 and June 2012. This study was approved by the institutional ethics board. Before the surgery, we informed the patient regarding alternative donor sites and possible complications, including contamination from recipient site, discoloring, and hypertrophic scar at the donor site. All patients provided informed consent.

2.1. Surgical procedure

All STSGs were taken from the lateral thigh with an electric dermatome (Zimmer® Air, Warsaw, IN) at a depth of 0.25–0.30 mm, including the entire epidermis and a part of the dermis. Hemostasis was achieved by covering the donor site with gauze soaked in physiological saline solution. Split-thickness skin left after grafting was washed with saline and used for MG. This skin was minced with scissors into tiny particles on the flat side of a disposable carrier for a skin graft mesher or the bottom side of a Petri dish until it was pasty. Based on macroscopic evaluation, the approximate particle diameter was <0.5 mm. The small pasty graft mass composed of a large number of minced graft particles and a small amount of saline solution was uniformly spread on the entire surface of the donor site with Adson forceps or small dressing forceps (Fig. 1). At this time, the mass should be as flat as possible. A calcium alginate dressing (Kaltostat®, ConvaTec Ltd.) was applied on the donor site and covered with a secondary protective gauze dressing. Patients in the control group were treated in the same way, except that MG was not performed.

The gauze dressing was exchanged daily, whereas the alginate dressing was not removed until complete healing was achieved, unless there was evidence of leakage, bleeding, infection, or pain. The alginate dressing could be removed easily once epithelialization was completed. Full epithelialization was defined as continuous coverage with epidermis.

Fig. 1 – Minced skin grafting.
Some of the skin left after split-thickness grafting was minced into tiny particles with scissors until it was pasty. This small, pasty graft mass was uniformly distributed in a flat layer over the entire surface of the donor site.

2.2. Evaluation

Healing times were compared between the MG and control groups. To evaluate the dependence of time to healing on the size of harvested STSG, the MG and control groups were each divided into 4 subgroups with different STSG areas: <25 cm^2, 25–100 cm^2, 100–200 cm^2, and >200 cm^2. Healing times were compared between corresponding subgroups of the MG and control groups. To evaluate the dependence of time to healing on mass ratio of MG to total harvested STSG, 28 patients from the MG group treated between May 2011 and May 2012 were divided into 2 subgroups according to the ratio of MG to total harvested STSG (<20% and >20%) by measuring the mass of harvested STSG and MG. Healing times were compared between these 2 groups.

2.3. Statistical analysis

Statistical analysis was performed using SPSS (IBM, USA, 2011). Statistical evaluation was performed with the t-test. Significance was defined as $P<0.05$. All authors conducted the evaluation and the corresponding author conducted the analysis.

3. Results

3.1. Patient characteristics

The characteristics of the patients are shown in Table 1. There was no difference in patient characteristics between the 2 groups regarding the patient's age, gender, etiology, and other medical history. Normal healing time of the donor site after STSG is 10-20 days [2]; therefore, healing time more than a month is abnormal. There were 7 patients with abnormal wound healing (healing time >1 month), and the difference in the abnormal healing rate between the 2 groups was statistically significant ($P<0.05$). All excluded individuals had hypoalbuminemia, and 6 of them also had diabetes mellitus. Out of the 96 patients initially selected for this study, 7 patients (1 in the MG group and 6 in the control group) with abnormal wound healing were excluded because their healing times were too long (from 1.5 to 6 months). The data of the 89 remaining patients were used for analysis. All the MGs survived, and all the donor sites healed without any postoperative complications including contamination from recipient site, discoloring, and hypertrophic scar.

3.2. Comparison of healing times between the MG and control groups

There were 47 patients in the MG group and 42 in the control group. The median time to complete healing of the donor sites in the MG group was 9 days, with an average value of 9.1 ±2.3 days (range, 6-17 days), whereas in the control group the corresponding values were 13 days (median), 13.1 ± 2.4 days (average), and 9–19 days (range). The difference in the healing