



## Investigating the Effect of Use of Dressing Separator Layer of Partial-thickness Skin Graft Donor Site Compared to Routine Method

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### ABSTRACT

Partial-thickness skin graft is of high prevalence in reconstructive and plastic surgeries. The lack of a standard method for dressing the donor site has made the management method of this site as one of the less satisfactory aspects of the partial-thickness skin graft surgery, and even in some cases, it can lead to improper treatment, dry ulcers, prolonged healing (reconstruction) time, and deep scars. The present study was conducted at 15 Khordad Hospital in order to identify and determine the best and most appropriate (suitable) method from among the methods used in this medical center. This randomized clinical trial was conducted on 40 patients undergoing split-thickness skin graft surgery at 15 Khordad Hospital, Tehran, Iran. Considering the determined objectives in the present study as well as investigation of these 13 variables, it can be claimed that dressing the split-thickness skin graft donor site with separator layer is the preferable technique due to its better outcomes including shorter ulcer healing time and less pain and discomfort in 48 hours and 10 days after removal of the graft.

**Keywords:** Skin graft, plastic surgeries, reconstruction, Iran

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### INTRODUCTION

Partial-thickness skin graft is of high prevalence in reconstructive and plastic surgeries. The lack of a standard method for dressing the donor site has made the management method of this site as one of the less satisfactory aspects of the partial-thickness skin graft surgery, and even in some cases, it can lead to improper treatment, dry ulcers, prolonged healing (reconstruction) time, and deep scars [1]. Partial-thickness skin graft is applied not only by plastic surgeons, but also by general surgeons. The post-grafting stage is always painful for patients, and the discomfort or pain at the graft donor site sometimes becomes more prominent and important than the graft site's complications; however, the pain at the donor site is one of the primary concerns of the patients during the postoperative period. The major points that should be taken into consideration include reduced infection,

minimized treatment costs, as well as faster healing time of the partial-thickness donor site. The split-thickness graft donor site can be treated by various techniques, in all of which the spontaneous epithelialization is created. Treatment of the split-thickness graft donor site has been discussed over the years, whereas no standard method has been determined for treatment of these ulcers so far. Various types of the donor site dressing have been described to date, the main purpose of which is to achieve faster improvement of the donor site. Along with the closed and open techniques, various chemical drugs, antibiotics, and antiseptics such as silver nitrate, sulfamylon, penicillin, and fatty gauzes have been used; besides, synthetic materials such as gel, Opsite foam, and cellulose have been used to treat the donor site as well [2]. In certain cases, allograft or xenograft is

used for treating and coating the partial-thickness donor site [3, 4].

The open method, in which no dressing is put on the donor site, is the lowest-cost technique. However, according to some writers, the quality of reconstruction in the closed dressing method is better than the open method, because the closed dressing method protects the donor site against dehydration, mechanical trauma, and external contamination. Duration of the full reconstruction of the graft donor site is important but not vital, and dressing the donor site is useful due to reducing the pain and providing comfort for the patient, especially while walking.

However, for a small group of patients, including those with extensive burns who require a second removal of skin from the donor site, rapid reconstruction of the graft donor site is of great importance. Different dressings can be classified and compared based on healing time, regenerated skin quality, patient's pain and discomfort scale (intensity), and incidence rate of secretion and infection. Therefore, various dressing methods should be compared based on these four factors in order to find the preferable dressing method.

Nevertheless, these methods have not been yet compared with each other properly, and thus there are still different opinions about the split-thickness donor site dressing methods among surgeons. The present study aimed to find and prove the best method from among different treatment methods in this regard, which is economically reasonable and cost-effective as well; since, some of the aforementioned methods, which claim to have significant therapeutic outcomes, impose extraordinarily considerable costs on the patient as well as the treatment staff. At different medical centers in Iran, several dressing methods are still used, and there is a disagreement on the best and most suitable technique. On this basis, the present study was conducted at 15 Khordad Hospital in order to identify and determine the best and most appropriate (suitable) method from among the methods used in this medical center.

## MATERIALS AND METHODS

### Patients

The present randomized clinical trial was conducted on the patients undergoing split-thickness skin graft surgery at 15 Khordad Hospital, Tehran, Iran. For this purpose, 40 patients were randomly selected and then divided into two groups. The patients' informed consent for participation in the study was obtained. In order to create identical conditions for all patients, the split-thickness skin graft was removed from the external anterior part of the thigh with the same dermatome and equal thickness. The graft donor site was dressed through either the routine method or the separator layer method.

**Routine method:** A layer of Vaseline-soaked gauze coated with 10 layers of dry gauze.

**Separator layer method:** A thin layer of delicate mesh impregnated with gentamicin along with a permeable (porous) nylon separator layer coated with 10 layers of dry gauze.

The patients were regularly evaluated every day in terms of secretion, incidence of infection, and progress of ulcer healing (reconstruction). To compare the pain level of the patients, a 10-point scale ranging from 0 (no pain) to 10 (maximum pain) was used. The healing time was re-recorded at full completion of epithelialization.

### Study design

A one-week period was considered for performing the baseline measurements on the patients, a one-week period for the patients' hospitalization duration, and a one-month period for following up the patients and investigating the therapeutic outcomes of both studied methods.

During the study, the patients received their conventional treatments as well. A written consent for participating in the research project was obtained from each patient after providing sufficient explanations by the physician. In this study, the patients were selected in successive series, so, the patients admitted to 15 Khordad Hospital, who needed partial-thickness skin graft for any reason, were assigned to two groups in successive series. In the intervention group, the graft donor site was first coated with a single-layer gauze impregnated with gentamicin, on which a simple sterile nylon layer with several 1-cm cuts on it was put. Then,

a few layers of dry gauze were put, followed finally by bandage. In the control group, where dressing was performed via routine method, first, several Vaseline-soaked gauzes were put in a single layer, and then a few layers of dry gauze were put, followed finally by bandage.

The patient's pain was asked and recorded 48 hours, 1 week, and 2 weeks after the surgery using a 10-degree scale. In case of clinical suspicion for infection, a quantitative ulcer culture was used. The healing (reconstruction) time was judged based on the clinical examinations. All of this information was recorded along with the personal information (characteristics) in a special form for each patient.

#### Data analysis methods

Data analysis was performed using SPSS statistical package version 17.0 (SPSS Inc., Chicago, IL, USA). Besides providing the descriptive statistics, the t-test and chi-2 test, and if necessary, Fisher's exact test as well as Mann-Whitney test were used as well.

### RESULTS

In the present study, 13 variables were investigated in two groups of the patients undergoing routine and separator layer dressing methods. These variables include:

#### Job

In both groups, the patients were classified in three job categories, namely worker, self-employed, and employee. The statistical investigations showed no significant job difference among the two groups.

#### Gender

In both groups, the patients were divided into two groups of male and female patients, but the statistical studies showed no significant differences in both groups.

#### Educational level:

In both groups, the patients were divided into 3 categories:

- A) Illiterate
- B) Elementary, high school, diploma
- C) Academic degrees

The two groups exhibited no significant differences in terms of educational level.

#### Underlying disease requiring split-thickness coating graft

The patients referring to 15 Khordad Hospital, who needed skin graft, were divided into three categories in both groups:

- A) Patients undergoing scar resection and reconstruction with split-thickness skin graft due to the scars at the burn site
- B) Patients undergoing reconstruction with split-thickness skin graft with or without reconstruction with flap due to trauma and skin loss
- C) Patients undergoing reconstruction of the tumor resection site with split-thickness skin graft due to resection of skin tumors

There was no significant difference in terms of the type of underlying disease requiring skin graft in both groups.

#### Special drugs

In each group, all patients were treated by cefazolin + gentamicin antibiotic therapy, and there was no difference in the two groups in this regard.

#### Duration of disease

Duration of disease for patients with chronic burn and tumor was defined as the period of time from resection of the burn scar and tumor to full epithelialization of the split-thickness skin graft donor site. However, in traumatic patients, it was defined as the period of time from onset of the damage to full epithelialization of the donor site. Based on the statistical investigations of the duration of disease among the first group, in which the donor site was dressed with the separator layer, the disease duration was 14.71 days, whereas it was 16.48 days in the second group receiving the routine dressing method (Fig. 1).

#### Associated diseases

In both groups, the hypertension and diabetes diseases were examined. The reason for selecting these two diseases was that they could be diagnosed via clinical examinations and routine biochemical tests, and also they were likely to have possible effects on reconstruction and healing of the donor site.

There was no significant difference among the two groups in terms of the associated diseases.

#### Extent of split-thickness graft removal area

The extent (size or dimensions) of the graft removal area varied from 50 cm<sup>2</sup> to 300 cm<sup>2</sup>. The two groups showed no significant difference

in terms of the extent of the split-thickness graft donor site.

#### Ulcer healing time

The ulcer's healing time was examined since the time of removal of the split-thickness skin graft up to full epithelialization of the graft donor site, which indicated that the duration of the epithelialization in the first group dressed with the separator layer was shorter.

This duration was 8.05 days in the first group and 9.29 days in the second group dressed via routine dressing method, and such difference was considered statistically significant in accordance with the nonparametric test (Fig. 2).

#### Incidence of infection

The infection in both groups was investigated using the clinical findings, including warmth, redness, swelling (inflation), and unpleasant-smell discharge, as the initial diagnostic findings, and performing the culture and antibiogram (antibiotic sensitivity) in case of positive initial findings. In spite of occurrence of a single case of infection in the first group, the statistical investigations via t-test and nonparametric test methods indicated no significant difference in the two groups.

#### Duration of hospitalization

Duration of hospitalization, or length of stay, in the two groups varied from 4 to 12 days, but there was no statistically significant difference in the two groups.

#### Incidence of pain and discomfort during the first 48 hours at the time of dressing change

After the first 48 hours, the graft donor site dressing was changed in both groups of the patients. Changing the dressing was associated with lightening of the dressing. In the first group, in which there was a separator layer between the gauze stuck to the ulcer and other gauzes that should be removed, the patients felt less pain. The pain intensity was examined using a standard 10-degree scaling; accordingly, the average pain intensity during the first 48 hours and at the time of dressing change among the patients in the first and second groups was equal to 3.19 and 6.57 degrees, respectively, the difference of which was significant in accordance with the nonparametric test (Fig. 3).

#### Pain in 10 days after removal of graft

In order to investigate the pain intensity during 10 days after removal of the skin from the donor site, the standard 10-degree scaling was used; accordingly, the average pain intensity among the patients in the first group with separator layer and the second group was equal to 2.57 and 4.68 degrees, respectively, the difference of which was significant according to the nonparametric test (Fig. 4).

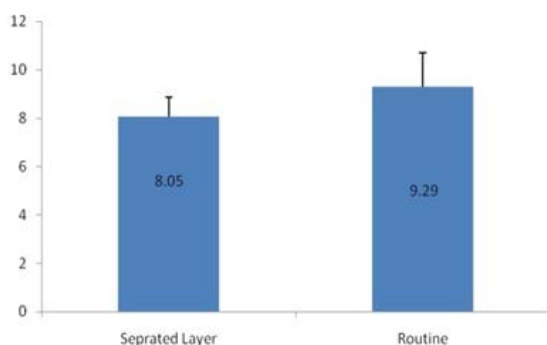
Tables 1 represents the duration of disease, healing time, and pain scale 2 and 10 days after the surgery. As can be seen, the average pain scale in 2 and 10 days after the surgery as well as the duration of disease and ulcer healing time in the group receiving the separator layer were lower.

**Table 1.** Mean and standard deviation of reconstruction time, ulcer healing time, and average pain in 2 and 10 days after surgery

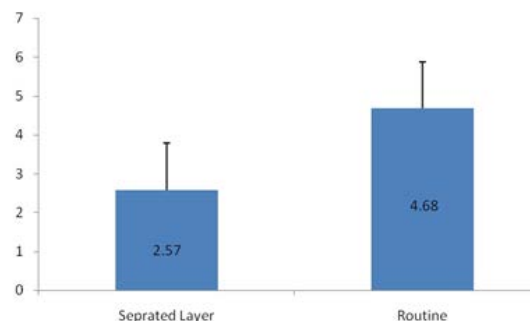
| Group |                | Duration | Healling Time | Pain Scale2 | Pain Scale10 |
|-------|----------------|----------|---------------|-------------|--------------|
| SL    | Mean           | 14.71    | 8.05          | 3.19        | 2.57         |
|       | N              | 21       | 21            | 21          | 21           |
|       | Std. Deviation | 2.591    | .805          | 1.692       | 1.121        |
|       | Minimum        | 10       | 7             | 1           | 1            |
|       | Maximum        | 19       | 10            | 7           | 5            |
| RO    | Mean           | 16.48    | 9.29          | 6.57        | 4.48         |
|       | N              | 21       | 21            | 21          | 21           |
|       | Std. Deviation | 2.892    | 1.419         | 2.226       | 1.209        |
|       | Minimum        | 10       | 7             | 3           | 3            |
|       | Maximum        | 20       | 12            | 10          | 6            |
| Total | Mean           | 15.60    | 8.67          | 4.88        | 3.52         |
|       | N              | 42       | 42            | 42          | 42           |
|       | Std. Deviation | 2.855    | 1.300         | 2.596       | 1.502        |
|       | Minimum        | 10       | 7             | 1           | 1            |
|       | Maximum        | 20       | 12            | 10          | 6            |

Sl: The group receiving the separator layer.

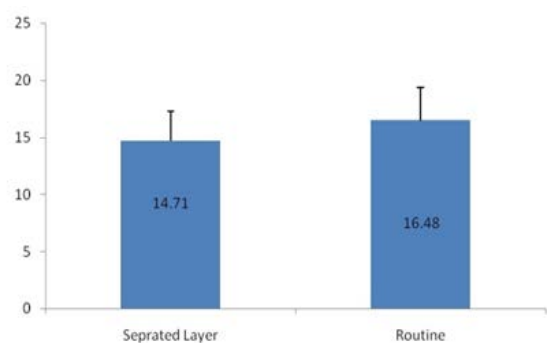
Ro: The group receiving the routine dressing



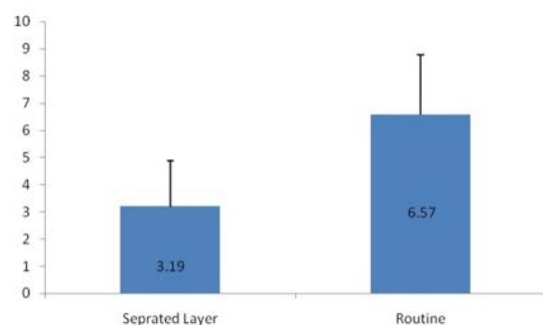
**Figure 1.** Comparing average duration of disease in two groups.



**Figure 4.** Comparing postoperative 10-day average pain in two groups



**Figure 2.** Comparing average ulcer healing times in two groups



**Figure 3.** Comparing average pain intensity 48 hours after surgery in two groups

#### DISCUSSION AND CONCLUSION

Considering the determined objectives in the present study as well as investigation of these 13 variables, it can be claimed that dressing the split-thickness skin graft donor site with separator layer is the preferable technique due to its better outcomes including shorter ulcer healing time and less pain and discomfort in 48 hours and 10 days after removal of the graft. In the review of literature, factors such as dressing cost, ease of use, epithelialization time, infection rate, and post-operative scar rate caused by different methods of split-thickness skin graft donor site dressing were investigated.

For example, in a study conducted by [6] on 6 different methods of graft donor site dressing, factors such as cost and time of epithelization, ease of use of dressing, and infection rate were investigated; accordingly, it was concluded that the Xero form method was lower-cost, had easier use, and caused less infection compared to other methods, but it had longer epithelialization time than Duederm method.

In another study by [5], it was stated that pain in the graft donor site was probably the most important postoperative complication of the patients undergoing split-thickness skin graft. Therefore, in one of the two groups of patients, the cutaneous flap skin was used, which caused a feeling of senselessness after standing up, while in the other group, the anterior skin of thigh was used as the donor sites. Accordingly, it was concluded that the patients receiving the cutaneous flap skin as the donor site felt lower

level of postoperative pain and discomfort during the first 8 days.

In the present study, with regard to the approximately identical distribution of age, job, gender, educational level, and underlying diseases among the two groups, the superior method for graft donor site dressing can be proposed and expressed with greater certainty. Among the patients receiving the donor site dressing with separator layer, the intensity of postoperative pain and discomfort during 48 hours and 10 days after the surgery was lower, which could be justified by the type of dressing. Once the separator layer is located between the single-layer gauze stuck to the ulcer and other gauzes, it would be very easy to separate other gauzes and lighten the gauzes while changing the dressing; whereas, in case of using the routine method that lacks such separator layer, due to adherence of the upper gauze layers to the bottom layers, the separating the gauzes would cause pain and discomfort for the patients.

The ulcer reconstruction (healing) time and duration of disease among the patients receiving the donor site dressing with separator layer were less than those among the patients receiving the routine dressing. This finding can also be justified by the use of the nylon separator layer, so that in case of the lack of this layer and adhesion of the upper gauzes to the bottom ones and to the ulcer while changing and lightening the dressing, due to the separation of the epithelium stuck to the gauzes, would result in delayed improvement and healing compared to the case that the separator layer prevents adhesion of the upper gauzes to the ulcer's epithelium.

As mentioned earlier, an important factor that had been investigated in previous studies was the factor of dressing cost. In the method using a nylon separator layer, an additional substance that is used is a sterile nylon layer, which is not much costly; so that, even the sterile nylon used for suction tube's coating can be used for this purpose as well. This method is easily applicable.

#### Suggestions

- 1) In the present study, despite a report on a single case of infection, the statistical nonparametric tests indicated no

significant difference in both groups. It is even likely that studying further cases and using statistical methods such as t-test can reveal further differences in terms of incidence of infection. So it is proposed to conduct further studies in this regard considering more cases.

- 2) In the present study, the ulcer healing time, which is one of the major factors, was investigated via clinical examinations. In order for a more accurate and documented investigation, this alternative can be performed by punch biopsy along with histological investigation of the sample by a pathologist. Thus, it is proposed to conduct further studies using more precise methods including examination of tissue samples.
- 3) In the present study, the patients were followed up for 2 weeks after being discharged. However, through a longer follow-up of up to 12 weeks, other important factors such as the graft donor site's ulcer scars, which is important in terms of cosmetics and function, can be investigated. Therefore, it is recommended to conduct further studies with longer follow-up periods.

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