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Case Report

Small-slice thin-thickness skin harvesting in a net pattern for patients with skin vulnerability

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ABSTRACT

Introduction: A number of issues, such as delayed epithelialization and ulcer outbreak, may occur after epithelialization, especially in patients with skin vulnerability. This case report examines whether our method involving small-slice thin-thickness skin harvesting in a net pattern can enhance stable epithelialization at skin graft donor sites without complications, even in patients with skin vulnerability.

Patients and methods: The study population consisted of five patients with skin vulnerability. The causes of injury were trauma and peripheral arterial disease (PAD). The study population included no patients with burn injuries. We applied a new skin harvesting method in these patients from July 2011 to December 2016. Thin-thickness skin grafts as small slices were harvested from the lateral thigh using a small freehand dermatome. Intact skin gaps between the harvested areas were preserved in a net pattern. The donor site was monitored continuously.

Results: The mean size of the donor site was 122.9 cm², and that of the recipient site was 206.9 cm². The mean period until epithelialization was 13.2 days with a range of 11–15 days without ulcer outbreak. Hypertrophic scars and pigmentation occurred in one patient each. There were no other complications in this case report.

Conclusion: Small-slice thin-thickness skin harvesting in a net pattern is a very simple and useful skin harvesting method for dealing with thin, loose, and fragile skin. This method can be adapted to some burn patients with skin vulnerability because it can reduce the complications at the donor site and it allows harvesting multiple times at the same site.

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1. Introduction

Split-thickness skin grafting is a primary reconstructive technique for patients with burns, traumatic injuries, and chronic wounds [1,2]. Although in many cases, the skin graft donor site heals by epithelialization in 10–20 days [3,4], split-thickness skin graft donor sites sometimes become a second wound, which may take more time to heal than the skin graft site itself [2,5]. Even after epithelialization, ulcers sometimes occur on the skin graft donor site. Various types of management are available for rapid healing of the donor site, but as yet no standard therapeutic method is available [1,6]. Furthermore, delay of epithelialization and ulcer outbreak after epithelialization may occur, especially in patients with skin vulnerability [5,7,8].

Vulnerable skin has a strong tendency for bruising because of the lack of elasticity and thickness [9]. The appearance of the skin is shiny, translucent, and telangiectatic (Fig. 1) [10]. Patients with skin vulnerability include the elderly, infants, immunosuppressed patients, those with malnutrition, those with connective tissue disorder and steroid-dependent patients [9,10]. Skin can be determined to be vulnerable by its appearance and the patient's past history. Patients with skin vulnerability have a number of risks for delay of epithelialization and other complications at the skin graft donor site. One reason is that skin harvesting is especially difficult in those patients and it is possible that skin may be harvested deeper than planned [11]. Therefore, it is necessary to consider the skin type and past therapeutic history of patients before harvesting skin.

We have developed a new skin harvesting technique for patients with skin vulnerability, i.e., the small-slice thin-thickness skin harvesting method in a net pattern, to achieve non-delayed and stable epithelialization. This method involves manually harvesting skin using a small freehand dermatome to obtain small and thin slices of harvested skin. We investigated

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Fig. 1. Thin, loose, and fragile skin caused by aging. The appearance of the skin is shiny, translucent and telangiectatic.



Fig. 2. Small-slice thin-thickness skin harvesting in a net pattern.

whether this method can enhance non-delayed and stable epithelialization at the skin graft donor site.

2. Patients and methods

The study population consisted of five patients undergoing six operations between July 2011 and December 2016. We selected patients at risk of skin vulnerability (Table 1), and performed small-slice thin-thickness skin harvesting in a net pattern. The causes of injury were trauma and peripheral arterial disease (PAD). After the operation, we examined the number of days required to complete epithelialization at the donor sites. After epithelialization, we continuously observed the donor sites and monitored the occurrence of ulcer outbreaks and other complications. Patients were followed up for at least 4 months. At the end of the follow-up period, patient satisfaction regarding the donor site and recipient site was assessed according to the following satisfaction scale: 1, poor; 2, fair; 3, good; 4, very good; 5, excellent.

Ethical approval was obtained from the ethics committee of Shinshu University Hospital.

2.1. Technique

Thin-thickness skin grafts were harvested from the lateral thigh using a small freehand dermatome. To preserve intact skin in a net pattern, we harvested skin as small slices with normal skin gaps between the harvested areas. Each slice was about 2–3 cm² and 5/1000–8/1000 inches thick (Fig. 2).

After harvesting skin, the donor site was covered with gauze sponges impregnated with 1:100,000 epinephrine:saline solution to control bleeding until dressing. We used non-adherent silicone mesh (Mepitel One®; Mölnycke) as the primary dressing over which was placed gauze sponges. In cases in which the amount of exudate from the donor site was excessive, the gauze sponges were changed without changing the primary dressing. On days 5–7 after harvesting skin, the dressing was changed to hydrocolloid-based dressing (DuoDERM CGF®; ConvaTec). We

examined the donor site and changed the dressing every 2 or 3 days until epithelialization.

3. Results

The mean age of the patients was 52.6 years with a range of 17–68 years. The mean size of the donor site was 122.9 cm² with a range of 21.9–339.7 cm². The mean size of the recipient site was 206.9 cm² with a range of 23.7–697.8 cm². The mean period until epithelialization at the donor sites was 13.2 days with a range of 11–15 days and there were no outbreaks of ulcers during the study period.

Although hypertrophic scarring was transiently seen in one patient, the scar disappeared after several months of follow-up. Pigmentation was seen in one patient. There were no other complications in these cases. The mean period of follow-up was 494 days with a range of 130–1741 days (Table 2).

The mean patient satisfaction scores for the donor and recipient sites were 4.33 and 3.17, respectively.

3.1. Case 1

A 17-year-old woman with Ehlers-Danlos syndrome sustained extensive subcutaneous hematoma in the left lower limb due to a traffic accident in a car. This hematoma caused large soft tissue necrosis. There were risks of complications at the skin graft donor site because Ehlers-Danlos syndrome causes skin hyperextensibility, abnormal wound healing, fragility of soft connective tissue, and widened atrophic scars (Fig. 3) [11,12]. We performed the small-slice thin-thickness skin harvesting method twice with the right thigh as the donor site to treat the large skin and soft tissue defect on the left leg (Fig. 3). We confirmed epithelialization at the donor site on day 11 after the first operation and on day 14 after the second operation. All skin slices took well and the original ulcer healed successfully. There were no complications, including outbreaks of ulcers, after each operation (Fig. 3).

Table 1
Patient characteristics.

Case	Age	Sex	Cause of injury	Risk of skin vulnerability	Chronic diseases
1	17	Female	Traumatic hematoma	Ehlers-Danlos syndrome	Ehlers-Danlos syndrome
2	55	Female	Traumatic hematoma	Long term steroid administration	MCTD, HD, CRF
3	68	Female	Foot ulcer caused by PAD	Aging, DM	DM, Cerebral infarction
4	66	Male	Foot ulcer caused by PAD	Aging, DM, HD	DM, HD
5	57	Female	Foot ulcer caused by PAD	Aging, DM, HD	DM, HD, Chronic renal failure

MCTD: Mixed connective tissue syndrome; CRF: Chronic renal failure; HD: Hemodialysis; PAD: Peripheral Arterial Disease; DM: Diabetes Mellitus.

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