Mini punch graft for chronic leg ulcers, case series

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Abstract

Chronic leg ulcer can caused morbidity and decreased quality of life. Previous study reported leg ulcer affect up to 3% of adult population worldwide Mini punch graft is one of therapeutic options of chronic leg ulcer. This surgical method aimed to include epidermal and dermal tissue with an absence of terminal hair follicles. Previous study mentioned that this procedure stimulated healing in many cases of chronic leg ulcers with total reepithelialization.In this article, the application of multiple mini punch grafts onto two case of extensive leg ulcers caused by burn injury and diabetic ulcer are reported. Split thickness skin graft with mini punch graft require skin donor from inguinal area. The donor were placed onto the ulcer. After several weeks, the ulcer area that had been mini punch grafted show reepethelialization.

Introduction

Chronic leg ulcer is a serious health problem in many country because of the high prevalence and high cost to health care system.[1-3] Chronic leg ulcer caused by diabetes mellitus is characterized by impaired wound healing. It can caused by decreased angiogenesis also decreased fibroblast and keratinocyte proliferation and migration.[4] Healing process of skin wounds through several phases. Stem cell of epidermal and dermal plays important role in wound repair.[5] The best source of epidermal stem cell is located in the basal layer, sebaceous glands and around the hair follicle. Punch graft is a method to stimulate granulation of the ulcer bed and migration wound edges.[6] The utilization of mini punch grafts on burn injury and diabetic ulcer never been reported before. Thus, the following article will report two case of chronic ulcer treated with mini punch graft.

Case Report

1st case. A 55-year-old female suffer from chronic leg ulcers caused by diabetes mellitus that initially affected the right leg to dorsal aspect of right pedis. For 3 months, patient underwent wound care at the endocrine divison at Sardjito Hospital, but the ulcer has not shown improvement. The patient felt that the ulcer become larger and not painful.

The patient's physical examination shows vital signs within normal limits. Skin examination shows extensive ulcer on the right lower leg to dorsal aspect of the right pedis with granulation tissue base and hypopigmented edges.

The working diagnosis in this patient is chronic ulcer caused by diabetic mellitus. Laboratory examination shows normal limits. Management of this patient is a mini punch graft method from the normal skin donor of the left inguinal area. A month after the surgery, the reepithelialization and the edge tissue migration to the central area are observed (Figures 1 and 2).

Second case, 57-year-old male patients were referred from an internal medicine clinic with a diagnosis of diabetes ulcers for further treatment. Patients routinely control at the internal medicine clinic for 6 months and receive insulin therapy. Patients complain of painless wound since 1 month before admission dermatovenerology clinic and the wound growing wider. Patients previously had undergone wound care at an internal medicine clinic. Patients were given oral antibiotics and necrotomy for several days.

Physical examination showed ulcer on left cruris to the left dorsum pedis with granulation tissue base with hypergranulation area size 2 cm in diameter dorsum pedis (Figure 3). There is a deformity on digiti 4 and 5 left pedis. The skin on all four extremities is xerotic. The working diagnosis is diabetic ulcers. Laboratory examination showed anemia and hyperglycemia. Patient was treated using a mini-punch grafting method with a donor from the right inguinal skin. Full reepithelialization observed on third month after mini punch graft (Figure 4). Hyperpigmentation in the central of the ulceration and erotion at some area of the ulceration still can be found. Antibiotics topical given to the erotion area (Figures 3 and 4).

The first step of multiple mini punch grafts (MMPG) is skin donor harvesting. After informed consent, we perform apply povidone iodine 10% to the donor area from the inginal skin and placing sterile linen onto operation area. This area was injected with tumescent anesthetic (1: 300.000 epinephrine plus 0,2% lidocaine in sterile normal saline). The donor skin was perforated using motorized power punch (Marathon-4® Saeyang Microtech Co.Ltd., South Korea) with sterile probe of 1,0 mm punch with 1 mm distance each perforation. This step will cut a piece of skin in dermal-fat level and placed them to immersed gauges with sterile normal saline.

The second step of MMPG was preparation of the recipient site. The ulcer bed was washed and immersed with sterile normal saline. The last step was implanting mini grafts into the ulcer area. This step was performed piece by piece with blepharoplasty skin's forceps. After all ulcer area covered by donor skin, the Aquagel® (a water soluble gel) is placed above the resipient area and covered it with Sofratule® (netting gauze) and non occlusive dressing. The gentamicin cream topical are applied to the donor area.

After 2 weeks of grafting, we open the dressing of resipient area until the netting

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gauze layer and wash this area with sterile normal saline. Application of topical silver sulfadiazine (Burnazin®) and the occlusive dressing is preferred at this time. Three weeks after the day of MMPG was performed, punched tissue island can be seen that they were tightly attached onto ulcer bed. The ulcer edge tissue migration to the central area also showed at this time. The end result can be observed after 8 weeks after the MMPG operation. More than 80% of epithelialization was observed on the recipient area. The hyperpigmentation also can be seen especially on the donor area.

Discussion

Skin ulcer or wound heal through complex phase. The early stage involves homeostasis and inflammation, the intermediate stage involves keratinocyte and fibroblast proliferation and migration together with angiogenesis and matrix deposition, and the late stage involves remodelling and re-epithelialization.[7]

Epidermal and dermal stem cell plays important role in wound repair. Hair follicle is a reservoir of several types of stem cell.[7] The best source of epidermal stem cell is located in the basal layer, sebaceous glands and around the hair follicle.[6] Langton *et al* reported delayed reepithelialization on cutaneous wound in the absence of murine tail hair follicle.[8] The hormone Leptine that secreted by dermal papilla cells has long been known for its role in wound healing.

Chronic leg ulcer with several etiology has suggested new approaches to the management with new types of wound dressings, compression bandages, topical and systemic agents and surgical modalities.[9] MPPG is a grafting method with full thickness skin. Stem cell contained hair follicle that had been planted to chronic ulcer will propragating stem cells to release growth factors.[6] Growth factors as a biologic mediators will promote cellular activity.[9] Previous study reported wound healing triggered by hair follicular grafting method for therapeutic choice in burns or surgical defect. There is several method of skin grafting including pinch grafts, split thickness grafts, full thickness punch grafts.[5]

The ideal donor area is scalp and also nonhair-bearing area because there is a lot of reservoir of growth factor. The graft from hair-bearing area will not influence the hair growth of donor area because the microenvironment of an injured wound bed sends molecular cues to provide cells for repairing the wound and not for hair shaft production.[10]

Delayed wound healing in diabetes is

Figure 1. Ulcer condition 3 weeks after mini punch graft.

Figure 2. Ulcer condition 2 months after mini punch graft. Note the reepithelialization.

Figure 3. Ulcer condition before mini punch graft.

Figure 4. Ulcer condition 3 months after mini puch graft.

characterized by reduced bone marrow-derived endothelial progenitor cell (EPC) recruitment, decreased angiogenesis, and decreased fibroblast and keratinocyte proliferation and migration because of cellular senescence.[11] Perform MMPG in diabetic ulcer or other etiology of chronic leg ulcer will promote stem cells to release growth factors.

Improvement after grafting that can be seen including the appearance of granular tissue, wound border reactivation, and a lesser exudation. The increased in vascularization and innervations of the wound bed is promoted by migration of perifollicular dermal sheath and hair follicle cause an increased granulation tissue formation.[10] Two cases of chronic leg ulcer in this report shows excellent final result of reepithelialization and increased granulation tissue formation on different ulcer etiology.

Conclusions

This case report provides further evidence that autologues transplantation of punch graft is a minimally invasive procedure. This method is a high cost procedure but it shows a succesfull result as an effective therapeutic tool for chronic leg ulcer. Further studies need to be performed to investigate the utility of mini punch grafts in other types of chronic ulcer condition.

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