Treatment Of Hypertrophic Granulation Of Donor Site Wound After Skin Graft Harvesting In A Orthopedics Patient: A Case Report

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Abstract

Wounds are commonly encountered by orthopedic patients. In patients with extensive wounds, a skin graft may be used for reconstruction. Donor site complications are not uncommon, for example, pain, scars, and infection. But there was little evidence discussing the complications of hypertrophic granulation at the donor site in orthopaedics patient. We present a case of hypertrophic granulation of donor site after skin graft harvesting and the potential treatment option for the hypertrophic granulation tissue.

INTRODUCTION

Wound healing is achieved through programmed phases of hemostasis, inflammation, proliferation, and remodeling [1]. These stages are highly programmed. The formation of granulation tissue is a normal part of the healing process and occurs in the proliferative phase. It occurs on days 3–5 post-injury. Capillaries, fibroblasts, macrophages, and collagen fibers played major roles in this phase.

Normal granulation tissue looks vascular and moist. Hypertrophic granulation, on the other hand, is abnormal and develops beyond the surface of the wound. It can impede the epithelization of the wound [2]. Clinically, it appeared soft, friable, and shiny. The exact mechanism of hypertrophic granulation is not well understood. It was believed predisposed factors are healing by secondary intention [3], excessive moisture, infection or high bacterial burden [4], reaction to foreign bodies (e.g., around stoma or catheter sites), friction, medications (e.g., retinoids), and use of occlusive dressing [5].

Hypertrophic granulation is commonly encountered in burns, chronic wounds, and stoma sites. Once hypertrophic granulation appears, it may cause functional disturbances in the patient. Various treatment strategies for hypertrophic granulation have been reported; they include non-occlusive dressing, hypertonic saline silver-nitrate cauterization, debridement, and laser ablation. These treatment methods did not produce consistent results [2]. Topical steroids are also an option for the treatment of hypertrophic granulation. Theoretically, topical steroids work by suppressing the inflammatory response, acting as angiogenesis inhibition, and decreasing the amount of edema, resulting in the stabilization of membranes.

Wounds are commonly encountered by orthopedic patients. In patients with extensive wounds, a skin graft may be used for reconstruction. Patients often report more discomfort at the donor site than at the recipient site, thus management of the donor site after harvesting a skin graft is an important issue [6]. Donor site complications are not uncommon, for example, pain, scars, and infection. But there was little evidence discussing the complications of hypertrophic granulation at the donor site. It is not a common complication but can cause significant pain and functional disturbance to the patient.

CASE HISTORY

This case report describes a 29-year-old male who suffered from a left wrist crush injury. His past medical history was unremarkable. He was injured on duty, with his left wrist trapped between the metal wheel and belt. He developed a deglove injury to his left wrist. There was a 19cm x 4.5 cm wound over the left wrist, extending from the dorsal side of

the radial forearm to the first web space. The wound was contaminated by an oily substance and metallic fragments (figure 1) . The patient was taken to the operating room, where he underwent wound exploration and debridement.

The patient underwent another surgical intervention after 11 days of the initial surgery. Debridement and skin grafts were performed. A split-thickness skin graft (size) was taken from the left thigh with dermatomes. The donor site wound was dressed with wet to dry dressing and paraffin gauze dressing, and the dressing was kept intact for one week.

In the first follow-up in 10/9/2021, two weeks after operation, both the recipient site and the donor site wound looked well. There was some stiffness in the left hand and fingers. The recipient site was gradually improving (figure 2). However, patient complained that there was delayed healing of the donor site wound and that hypertrophic granulation was gradually developing after three months of surgery. A wound swab of the donor site was taken, and only commensals were cultured. He had regular follow-up in the wound nurse clinic with dressing material. Silver nitrate was regularly applied and Iruxol Mono (Clostridiopeptidase A) ointment was used in wound dressing but showed no improvement.

TREATMENT METHOD

There was no improvement after one year of conservative treatment with silver nitrate. There was hypertrophic granulation over donor site wound (figure 3). After thorough discussion with the patient, topical steroid Betamethasone Valerate ointment (0.1% daily) and neomycin sulfate cream (0.5%, 15 g) were prescribed for him. Topical steroid with neomycin was applied to the wound with paraffin gauze dressing. The dressing was changed weekly and each time topical steroid and neomycin were reapplied with paraffin gauze. The total treatment duration was four weeks.

At the initial of treatment, informed consent was obtained from the patient to use his information for this case report. During treatment, there was ongoing communication with the patient's physician regarding the plan of care. There was clinical photo documentation for the response (figure 4-6). The response was good, and the hypertrophic granulation tissue of the wound was resolved, resulting in healthy skin growth. In the latest follow-up, 24 months after the initial surgery, the hypertrophic granulation tissue was peeled off, and the patient did not complain of wound pain. He was able to return to work without a functional deficit.

DISCUSSION

This case report described a potential complication of hypertrophic granulation in a donor site wound.

Hypertrophic granulation is well documented in patients with burns, chronic wounds, and stoma sites. For example, the estimated incidence of hypertrophic granulations in burn patients is 10–15% [7], while in long-term enteral feeding patients, the incidence can be up to 25–68% [8]. However, the incidence after cutaneous surgery is unknown [9]. It was believed it was not a common complication of the donor site of a skin graft. The potential problems of hypertrophic granulation include pain, scarring, and secondary infection. As in hypertrophic granulation tissue, there is a lack of epithelial barrier and it is prone to bacterial colonization [10], thus increasing the infection risk.

Although the pathophysiology of hypertrophic granulation is not fully understood, It has been proposed that uncontrolled angiogenesis may be related. It was because both hypertrophic granulation and angiogenesis involved the proliferation and migration of endothelial cells, which are the cells that line the inner surface of blood vessels. Endothelial cells secrete growth factors, such as basic fibroblast growth factor (FGF-2) and vascular endothelial growth factor (VEGF), which stimulate angiogenesis and the formation of granulation tissue [11, 12]. Thus, excessive or uncontrolled angiogenesis may lead to hypertrophic granulation.

Multiple associations with hypertrophic granulation have been reported. They are chronic inflammation, external friction, infection, and foreign-body irritation [4, 13]. Dressing methods and materials may contribute to hypertrophic granulation. Occlusive dressings are dressings that create a barrier between the wound and the external environment, preventing moisture loss and promoting wound healing. Occlusive dressing may increase the accumulation of growth factors [14], thus increasing the chance of hypertrophic granulation. Moreover, some occlusive dressings, such as hydrocolloids, may also stimulate the production of growth factors and new blood vessels [15] , leading to overgranulation.

PREVENTION OF OVER HYPERTROPHIC

GRANULATION

To prevent hypertrophic granulation, it is important to address the underlying causes and maintain a balanced wound environment. It included monitoring and treating secondary infections and securing foreign bodies to prevent friction and prolonged inflammation [4]. Choosing an appropriate dressing that can absorb excess exudate and protect the wound from trauma and infection Multiple studies have shown light wound compression and gauze-based dressings can help prevent hypertrophic granulation tissue [16, 17]. Withholding dressings has been thought to cause tissue desiccation and cell death; this may prolong wound healing. But this can also be an approach to treating hypertrophic granulation.

TREATMENTS OF HYPERTROPHIC GRANULATION

There is no established gold standard for the treatment of hypertrophic granulation. Various methods have been proposed. Firstly, a thorough evaluation and infection had to be ruled out. Traditionally, silver nitrate has often been used as a first-line treatment. In refractory cases, topical or intralesional (IL) corticosteroids, surgical debridement, polyurethane foam (PUF) or antimicrobial compression dressings, and laser therapy are also reported.

Silver nitrate was often used for treatment of hypertrophic granulation among dermatologists and wound care specialists [18]. Treatment involves topical application through silver nitrate-coated sticks until graying of the wound bed is observed. Few clinicians report this as a last-resort method due to its ability to cause tissue necrosis [18]. Treatment in the dermatologic community usually involves a smaller body surface area; burn literature endorses silver nitrate only for wounds with less than 20% body surface area. Silver nitrate can potentiate the inflammatory response by inducing tissue necrosis [17,19, 20], while excessive necrosis can further perpetuate the mechanism behind hypertrophic granulation and destruction of surrounding healthy tissue, leading to a damaging cycle.

A topical steroid was applied to our patient. Multiple studies have documented the application of topical steroids in the treatment of non-burn wounds [21,22,23]. It was believed that steroids could arrest the inflammatory response contributing to hypertrophic granulation [5, 22]. The topical steroid suppresses the immune pathway in keratinocytes, and this effects inflammatory cell maturation, viability, and immune functions [24,25]. Others suggest that steroids can decrease the number of fibroblasts, thus preventing inflammatory effects [26, 27]. Traditionally, clinicians are reluctant to use topical steroids on wounds as there is concern about immunosuppression and the impartment of wound healing and infection. However, in a randomized controlled trial done in burn and reconstructive center, healing was achieved in 68.8% of patients using topical steroids. Exudate was reduced and overgranulation suppressed in all patients.

In our patient, silver nitrate was used for half a year and showed no improvement. Topical steroid Betamethasone Valerate ointment 0.1% daily was applied, the hypertrophic granulation of donor site was improved. Several advantages of topical steroids over silver nitrate are proposed. A study comparing the use of silver nitrate sticks and topical steroids found that the median length and width of the wounds were decreased by more with the steroid treatment than with the silver nitrate treatment. Steroid treatment may be faster at healing hypertrophic granulation wounds than silver nitrate treatment [28]. In addition, cauterization of the hypertrophic tissue with silver nitrate can help control the overgrowth, but it may also cause pain, bleeding, and staining of the skin.

However, topical steroids should be used with caution. It might increase the chance of infection by suppressing the immune system and altering the skin flora. It can also cause skin atrophy, telangiectasia, striae [29,30], acne, and hyperpigmentation [31]. Although uncommon, we also need to be aware that systemic complications include adrenal suppression, hyperglycemia [31], osteoporosis, and Cushing's syndrome.

In hypertrophic granulation tissue, silver nitrate may still be the first line of treatment. In refractory patients, topical hydrocortisone may be applied to the wound. However, further research is required to confirm the results and effects of topical steroids. The treatment method should be tailor-made, easy to follow, and cost-effective.

CONCLUSION

Hypertrophic granulation is a rare but not easily treated complication in donor site wounds. Risk factors of hypertrophic granulation included healing by secondary intention, excessive moisture, infection or high bacterial burden, reaction to foreign bodies, friction, medication and use of occlusive dressing. Topical steroid may play an important role in the treatment of hypertrophic granulation in

patients with refractory course.

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