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Case Report

Reconstruction full-thickness defect of calcaneus post trauma using sural fascio-cutaneous flap: a case report

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ABSTRACT

Traffic accidents often cause degloving injuries to the extremities that can cause an avulsion of the skin. Injuries of the feet and lower legs require special management, specifically the calcaneus region, which is an anatomical challenge for reconstructive surgery. The sural flap is often used for calcaneus defect reconstruction. This method provides more volume compared to skin graft methods. We report the case of a 33-year-old woman who was injured in a motorcycle accident. The patient had a wound on the calcaneus about 8 cm×3 cm long, just below the medial malleolus. The wound is circular, leaving intact tissue as a pedicle with a plantar pedis measuring 3 cm×2×cm×1 cm. The patient underwent debridement with a sural flap. Follow-up post-surgery, the flap was viable, but other procedures (casting, in setting flap, and refinement flap) are still needed to achieve better outcomes and physiotherapy to restore function. Degloving injuries generally cause devascularization. In cases like this, debridement is used as the initial therapy to preserve the surrounding soft tissue and skin. The second treatment is to prevent contractures. Most surgeons recommend a skin graft in the first stage. We performed a flap that has a rapid reconstruction process and can prevent the risk of skin necrosis as a weight-bearing area. Due to the existence of a long, retractable vascular pedicle, the sural flap is a helpful treatment in the reconstruction of skin defects in the distal area of the lower extremity. Reconstruction using fasciocutaneous flap procedure, for the patient's lower extremity defect (calcaneal defect) was successful. In trauma cases that cause damage full full-thickness skin and soft tissue, it is advisable to perform a flap as one of the reconstructive surgery procedures to restore the best function and shape of the involved lower extremity.

Keywords: Full-thickness defect, Trauma, Sural flap, Case report

INTRODUCTION

Traffic accidents often cause degloving injuries to the extremities. The subcutaneous tissue and fascia are affected by compression and torsion forces, which can even cause the skin to pull away from the deep fascia.[1] This causes an avulsion of the skin. In addition, soft tissue injuries to the lower extremity are frequently accompanied by additional lesions and therefore require special management for their treatment. Debridement followed by closure is a common treatment method.[2] For reconstructive surgery, the calcaneus area presents an anatomical obstacle. It has limited distensibility and mobility, low blood supply, and lack of interposition of muscle tissue between vital structures and integuments.[3] Randomized flaps and grafts are not recommended for treating wounds in this area. Local flaps have only a limited amount of tissue that can be moved from adjacent areas and limited flap mobilization.[1] Local flaps are also contraindicated in cases of no peripheral pulses, diabetes, and peripheral vascular thrombosis. The free flap technique can provide excellent coverage, especially for

large soft tissue defects. It is a technically challenging technique, requiring a skilled microsurgery team, top-notch equipment, extended operating durations, and hefty prices. Compared with fasciocutaneous flaps, this procedure has less satisfactory results in terms of aesthetics and donor morbidity.[4]

The sural fasciocutaneous flap, also known as the sural distal flap, has established as one of the most prominent reconstructive surgical techniques for lesions of the foot, distal portion of the leg, and ankle. This method relies on retrograde flow from the sural artery, which is concomitant with the sural nerve and parva saphenous vein.[5] Additional benefits of this approach include increased mobility and adaptability. Important arteries and muscles may be preserved with this technique, which can also replicate the area's texture, thickness, color, and flexibility. Ischemia, along with partial or complete necrosis, are complications of this approach.[6]

CASE REPORT

The patient is a 33-year-old woman who had a traffic accident while riding a motorcycle. At the time of the accident, the patient's left leg was attached to the opponent's motorbike. The patient was then brought to the hospital in a fully conscious state. In the primary survey, there were no abnormalities in the airway, breathing, or circulation.

The secondary survey found a wound on the calcaneus about 8 cm long, just below the medial malleolus. The wound is circular in shape, leaving intact tissue with a plantar pedis measuring 3 cm×2 cm×1 cm. On evaluation, the wound was found to be in the form of a purplish flap, felt cold, the impression was not vital. Laboratory examinations were within normal limits.

Figure 1: In the calcaneus region, an 8 cm long wound was found just below the medial malleolus.

The patient underwent debridement, necrotomy, and reconstruction with a sural flap. In postoperative evaluation, the flap was viable. Other procedures (casting, insecting flap and revinement flap) are still required to achieve better outcome and physiotherapy to restore function.

Figure 2: Flap design and incision.

Figure 3: During surgery procedure.

Figure 4: Post-surgery evaluation.

DISCUSSION

Degloving injury is the most common injury experienced by traffic accident victims. In the case of degloving due to traffic accidents, it generally results in devascularization of the avulsed skin and subcutaneous

tissue.[2] In this case, the patient has soft tissue necrosis of the calcaneus due to open degloving trauma. The patient underwent debridement which left the calcaneal area defect with the base of the calcaneal wound. The initial treatment's primary objective is to preserve the muscles and tendons by maintaining the skin and surrounding soft tissue. This goal can be achieved through a debridement procedure.[7]

The second treatment is to prevent contractures in order to produce a functional and esthetic outcome. When the epidermis, dermis, and deep layers can be kept intact, the best outcomes will be achieved.[2] Most surgeons recommend a skin graft in the first stage. There are several types of grafts. However, to achieve the best results, the skin graft must be free of hematoma, infection, and graft movement.[7]

Donor site morbidity is a concern, whether in full-thickness or split-thickness skin grafts procedures. Full thickness skin grafts are only able to provide a limited number of donors. However, this method is able to produce a rapid reconstruction process and prevent the risk of flap necrosis thereby reducing the need for revision procedures.[1]

This causes a reduction in the period of hospitalization for the patient thereby preventing the patient's susceptibility to nosocomial infections. The results of the full-thickness skin graft procedure are also aesthetically pleasing. Until now, the full-thickness skin graft procedure is still the most practical method for avulsion injuries.[2,8]

The required flap should act as a "buffer layer" by being sufficiently safe, trophic, and able to cover the internal hardware occupying the death spaces.[9] These requirements are fulfilled by the sural fasciomusculocutaneous flap, which offers a simple one-stage procedure, the vascular reliability of the fasciocutaneous sural flap, and the pliancy of a muscular flap to the surfaces of the fixators, without risking the main vascular elements of the leg.[10,11]

This patient’s defect closure was reconstructed with a sural cutaneous flap. Due to the existence of a long, retractable vascular pedicle, the sural flap is a beneficial treatment in the reconstruction of skin defects in the distal area of the lower extremity.[12] These vascular pedicles have several advantages, namely the cleaning technique is fast, easy, and can repeatable.[13,14] Meanwhile, the advantages of the sural flap technique

include not involving major blood vessels because this technique only involves anastomotic tissue from arteries.[4,9] The benefit of adopting a cutaneous pedicle with this reverse sural fasciocutaneous flap is that the skin covering the pedicle minimizes any likelihood of pedicle torsion, which might result in flap failure. According to Dhamangaonkar and Patankar, flap survival was 89.21% in his series.[12] The mid and distal third of the tibia, the medial and posterior parts of the ankle, the heel, and the dorsum of the foot are all covered to some extent by the sural flap.[12] Partially necrosed tissue is still the major issue with the flap. Although we were able to completely repair 96.6 percent of all defects in our series using either the flap alone or in conjunction with a simple salvage procedure, 11.2 percent of 179 flaps had partial necrosis. Partial necrosis of the flap is caused by a variety of causes, including flap variables, patient factors, surgical technique, and operator experience. Age, sex, locations of defects, and partial necrosis did not significantly correlate with one another.[15]

According to Yang and Morris et al, anatomical and angiographic analysis, the flap's maximum potential region width was 7 cm. Theoretically, the lateral component of the flap would receive less arterial supply and venous drainage the broader the skin island was; if the width of the skin island surpassed a particular threshold, the risk of partial necrosis occurring in the flap would rise.[16]

The most concerning consequence is venous congestion with partial or total flap loss. Venous congestion appears to be caused by a hematoma compressing the pedicle or by a lack of flexibility in the skin covering the tunnel's roof.[13] Valvular incompetency is the cause of venous congestion, according to Nakajima et al.[17] Similar risk factors, however, may contribute to greater complication rates in lower extremity repair with free tissue transfer.

This issue may be resolved by elevating the leg, inserting a tiny intravenous catheter in the lesser saphenous vein's proximal stump, or via venous supercharging.[18] Some writers advise a reverse sural flap delay technique to avoid flap problems. Delaying the blood flow entails incising the lateral borders of the skin island or transecting the artery to reroute the blood flow.[19]

According to research by Severo et al, the patient who developed complete necrosis also had hypertension and type 2 insulin-dependent diabetes.[6] We suspect that his problems were caused by comorbidities, which is similar to the findings of Parrett et al, who discovered a link between complications and comorbidities such as diabetes, obesity, peripheral vascular disease, and smoking. However, the latter would be the primary isolated risk factor for this flap's complications.[20]

CONCLUSION

We have reported a 33-year-old woman with soft tissue necrosis of the calcaneus due to open degloving trauma. In this patient, we did debridement which left the calcaneal area defect with the base of the calcaneal bone. The defect closure was reconstructed with sural fascio-cutaneous flap. Reconstruction of the patient's calcaneal defect through this procedure was successfully achieved. Postoperatively, evaluate the final flap flow that the

patient has planned for cutting surgery and in setting the flap. In trauma cases that cause damage weight bearing area, it is advisable to perform sural fascio-cutaneous flap procedures to restore the function and shape of the involved area.

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