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Vacuum-Assisted Closure in the Management of Degloving Soft Tissue Injury: A Case Report

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ABSTRACT

We report the case of a patient with an extensive degloving injury to his right foot involving severe subcutaneous soft tissue disruption and contamination. The initial treatment consisted of debridement, which was kept to a minimum, copious irrigation, primary wound closure at a few sites, and coverage of the remaining skin defects with vacuum-assisted closure (VAC) dressings. After a few weeks of VAC therapy for wound bed preparation, definitive coverage with a meshed skin graft was possible. Additional plastic surgical procedures were not required. At the last follow-up visit, the patient had no complaints and was able to participate in normal social life without limitations. Wounds that are grossly contaminated or associated with extensive soft tissue defects often require a multistage approach before delayed primary wound closure or plastic surgical procedures can be performed. Vacuum therapy can be used for temporary soft tissue coverage and has been shown to improve bacterial clearance, to increase local blood flow, and to promote granulation tissue formation. In contrast, plastic surgical procedures initially achieve safe and stable wound closure; however, the absence of sensitivity can lead to secondary problems. This is of particular relevance if the graft recipient site is subject to heavy stress and the restoration of function is of paramount importance, such as in the present case. Vacuum therapy is an effective and safe treatment of degloving injuries. We achieved a very good functional outcome, which was particularly important in view of the high stresses and strains to which a foot is exposed.

Degloving injuries are a form of avulsion of soft tissue, in which the management of the extensive soft tissue damage presents a major challenge from the beginning of treatment. In particular, if the injury involves the exposure of bone, early coverage of the defect must be a goal of treatment to prevent secondary problems such as an osteogenic infection. Contamination of the wound with dirt and microorganisms or severe edematous swelling, however, can make early definitive wound closure impossible and require a multistage approach before delayed definitive wound closure can be performed (1). If a degloving injury involves an extremity, particular care must be taken to restore function, that is, to achieve a good functional outcome.

We present the case of an extensive degloving injury to the foot and discuss the use of vacuum therapy and alternative treatments in the context of the existing published data.

Case Report

A 68-year-old male was crossing a street when a bus rolled over his feet. When an emergency physician arrived at the scene of the accident, the patient had a Glasgow coma scale score of 15. His heart rate

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was 65 beats/min, and his blood pressure was extremely elevated to 220/140 mm Hg without known hypertension in his medical history. The suspected diagnoses included a third-degree open fracture of the right midfoot and forefoot, a fracture of the left midfoot, and hypertensive urgency. The patient was treated with analgesics and antihypertensive agents and was transported to our hospital, approximately 6 km away.

Findings on Admission (Resuscitation Room)

On admission, the Glasgow coma scale score was still 15. His blood pressure had been lowered to 180/120 mm Hg, and his heart rate was 66 beats/min.

A focused assessment with ultrasonography for trauma scan was performed immediately and did not demonstrate any abnormal findings. A clinical examination showed extensive soft tissue damage in the right foot and a hematoma in the left foot without evidence for associated compartment syndrome in either lower leg. Conventional radiographs of both lower limbs and feet were taken in 2 planes and revealed the absence of bone lesions (Figs. 1 and 2).

Once the diagnostic procedures in the resuscitation room were completed, attention was directed to the management of the extensive degloving injury, which was associated with severe subcutaneous soft tissue disruption and contamination. The elevated blood pressure discovered as a secondary finding was managed with medications during the course of treatment. In addition, the patient received simultaneous active and passive immunization against tetanus in the resuscitation room, and appropriate antibiotic therapy with levofloxacin was started.

Treatment and Course

The patient was immediately taken from the resuscitation room to the operating room for initial surgical management. A first thorough inspection of the wounded area revealed degloving, especially of the right medial forefoot, the medial malleolus, and the area above the Achilles tendon. The entire sole of the foot, including the heel, was torn off the plantar fascia and showed some areas at which only an extremely thin intact skin envelope was present. Apart from a minor hematoma, the muscles were unaffected. The dorsalis pedis and anterior tibial arteries were easily palpated. The injury was classified as an IO 3 skin lesion (skin breakage from outside in of >5 cm, increased contusion, devitalized edges) according to the Working Group for Osteosynthesis Questions (AO) classification system (Fig. 3). On the basis of these findings, debridement, which was kept to a minimum, and thorough irrigation were performed (Fig. 4). Primary wound closure was possible at a few sites. Vacuum-assisted closure dressings (V.A.C.™ ATS Therapy System; Kinetic Concepts, Inc., San Antonio, TX) were applied in a standard fashion to the 2 large remaining skin defects. One defect was located on the plantar aspect of the foot and extended to the hindfoot and the other involved the dorsal foot. For VAC therapy, a black polyurethane foam dressing (pore size, 400 to 600 μm) was used, and continuous negative pressure of 75 mm Hg was applied.

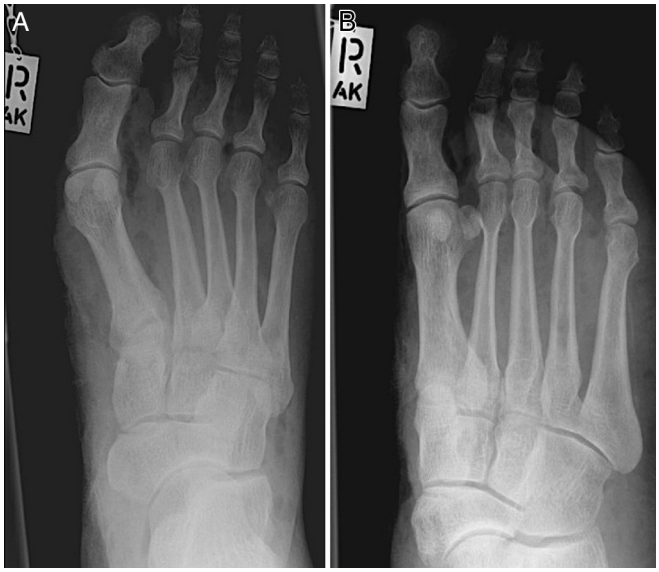

Fig. 1. (*A* and *B*) Initial radiographs of the right foot.

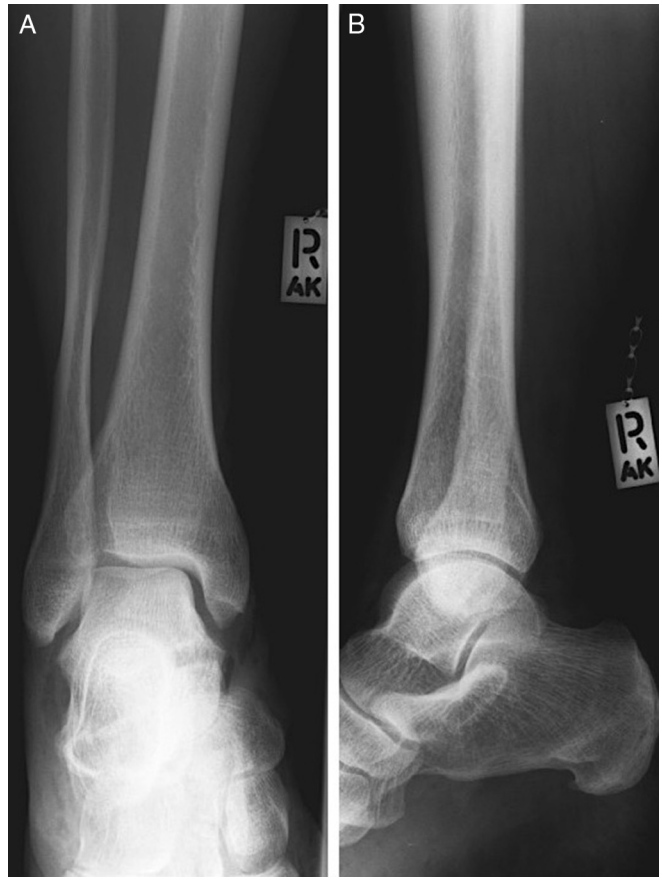

Fig. 2. (*A* and *B*) Initial radiographs of the right ankle.

After surgery, the patient was transferred to a general ward. Intravenous antibiotic therapy was continued, and the patient received oral and intravenous analgesics that acted in an additive manner. This treatment led to rapid stabilization of the patient's clinical condition. Continuous clinical examinations were performed to not miss the development of a compartment syndrome.

The patient's case was presented to the plastic and reconstructive surgery department in a telephone consultation, and all treatment options were discussed. After having been fully informed about the procedures involved, the patient expressed the wish to undergo further surgical treatment at our institution.

The VAC dressings were changed on days 2, 4, 6, and 8 after surgery, as planned. Some necrotic skin areas were detected at the wound edges. The necrotic tissue was removed, with particular care taken to preserve viable tissue. The affected areas were again covered