



LETTER TO THE EDITOR

[Translated article] Severe heel degloving associated with calcaneal and Achilles tendon section fracture in a 4-year-old boy: Orthoplastic approach, case report



Degloving severo del talón asociado a fractura del calcáneo y sección del tendón de Aquiles en un niño de 4 años: abordaje ortoplastico, reporte de caso

Dear Editor,

21% of paediatric fractures are of the lower limbs¹ and complex fractures of the feet are rare, and of these only 1% are open fractures.² Calcaneus fractures amount to only 0.005% of all paediatric age fractures, and they are considered to be extremely rare in comparison with the same fracture in adults.³

In the paediatric and adult populations lesions due to degloving of the fatty pad at heel level are a challenge for orthopaedic surgeons because of their important role in covering vital structures: bone, ligaments, tendons, vascular and nerve structures. A reverse flow sural flap is an excellent option for defects in the coverage of the foot and heel.⁴ Experience in treating a lesion of the fatty pad due to severe degloving associated with an exposed Gustilo-Anderson III-B calcaneus fracture and section of the Achilles tendon in a 4 year-old boy is described, with an orthoplastic approach using a reverse flow sural flap and reconstruction of the Achilles tendon, bone curettage of the calcaneus fracture and gradual correction due to equinus deformity.

Case description

A 4-year-old male patient with lower limb caused by a traffic accident, with exposed fracture of the calcaneus. Outside the hospital the patient was assessed by a plastic surgeon who performed multiple surgical washes plus debridement, after which it was decided to cover the skin defect with a

skin graft on the heel. In the late postoperative period there were signs of local infection, and a soft tissue culture was positive for pseudomonas, which was treated by antibiotic.

The patient was referred to our institution for treatment by the reconstructive surgery and bone lengthening department, with a functionally limited foot in varus equinus plus a bone and skin defect, with devitalized soft tissues with signs of local infection, diagnosed exposed Gustilo-Anderson III-B fractures leading to chronic Cierny-Mader III-A osteomyelitis (Fig. 1).

Surgical washing and debridement were carried out on arrival, draining the abscess. The calcaneus was found to be exposed, with loss of 25% of the bone of the same, with varus equinus deformity, skin grafts with a zone of phlogosis and edges of the skin with devitalized tissue. Bone and soft tissue sample cultures were taken with application of a negative pressure system and calf and foot immobilisation. The culture was negative after 48 h incubation. Surgical washes and debridement were performed every 72 h. As the soft tissues were found to be viable, magnetic resonance angiography with contrast was requested. This reported that the distal peroneal artery perforators were viable, so a reverse flow sural flap was selected, with correction of the post-traumatic equinus using an Ilizarov-type splint and lengthening of the Achilles tendon.

89 after the operation the external splint was removed, and subsequent radiographic imaging showed satisfactory correction of the deformity (Fig. 2).

Outpatient follow-up continued during 4 months after the removal of the material, with acceptable walking and sufficient scarring of the soft tissues, with no pain, functioning and without relapse of the chronic osteomyelitis. The patient has continued to show good progress to date.

Discussion

The heel pad has an important function in bearing weight, absorbing impacts and aiding proprioception, and it is subjected to more repetitive injuries and stress loads than any other part of the body. As it is one of the most specialised tissues in the body, it is a challenge for any reconstructive surgeon who tries to repair it and restore its functionality.⁵ It is even more of a challenge in paediatric patients, where the reconstruction of soft tissue defects in the distal legs, ankle and foot is always a delicate problem for treatment.

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Figure 1 Exposed Gustilo-Anderson III-B calcaneus fracture and chronic Cierny-Mader III-A osteomyelitis.



Figure 2 A reverse flow sural flap was created with correction of equinus deformity using an external Ilizarov-type splint, bone curettage of the calcaneus and lengthening of the Achilles tendon.

Many types of flaps can be used to reconstruct cutaneous defects, such as local, pediculated, crossed leg and free flaps, each one of which has its own respective characteristics and limitations.⁶

The reverse flow fasciocutaneous sural flap is based on the median superficial sural artery. This has numerous branches, so that the anastomoses will have 3–5 peroneal artery septocutaneous perforators, ensuring good circulation. The success rate of the flap increases when it includes

the arteries accompanying the lesser saphenous vein. The flap itself include the island of skin, the subcutaneous tissue and the fascias.⁷ There are no large series of cases which analyse fasciocutaneous sural flaps with a distal base in paediatric patients.⁶

The aim of reconstructive procedures in rear foot and ankle fractures is to offer a long-lasting, stable and properly shaped weight support where a shoe can be worn with or without orthopaedic support.⁸

The clinical context of an exposed Gustilo-Anderson III-B calcaneus fracture associated with osteomyelitis is a scenario that is indicated for a reverse flow sural flap.⁹

Open fractures or exposed tendons, and especially the Achilles tendon, should be covered immediately to prevent complications, thereby reducing the number of infections, rehabilitating the patient rapidly and reducing the duration of hospitalisation.¹⁰

It has been confirmed that skin grafts and the contraction associated with them that develops around the joints may produce enough deformity and scar tissue to create a secondary deformity that may inhibit growth. Flaps of skin are therefore preferred when repairing areas around the joints, such as the region of the foot and ankle, even when there is new granulation tissue.⁹

Although a sural flap with a distal base may provide simple coverage for the soft tissue and defective skin on the ankle and foot, it may also have limitations, as the more distal coverage of the foot defect is restricted to the mid sole. In female patients there may be a cosmetic problem. In this situation a free flap may be selected in a less visible donor location, such as an antero-lateral thigh flap or one with the thoracic-dorsal artery perforator. Other options should be considered if the distal perforator is compromised by the injury, and lastly, a voluminous appearance may sometimes require revision surgery.⁴ An unattractive scar on the rear calf is the greatest problem; nevertheless, these flaps are an ideal option because of their reliability, simplicity and good functional results.

The literature contains descriptions of the use of external fixation to immobilise the ankle and raise the heel after the transfer of free tissue to cover defects in the lower part of the leg resulting from chronic ulceration or traumatic injuries.⁷ By gradually correcting contractions in the foot and allowing the flap to be raised and free of pressure the risk of necrosis is reduced.

Hoke's technique of lengthening the Achilles tendon is indicated in patients with spastic equinus; nevertheless, in patients with injuries in the form of cuts or loss of its distal insertion, this procedure makes lengthening possible without further injuring the tendon, given that there is no complete section but rather partial ones in different segments, without sacrificing its vascularisation.

The reverse flow sural flap is a useful tool in paediatric patients with lesions of the distal third of the leg and foot, including the heel. This is due to its easy dissection and the fact that staff trained in the use of microsurgery or microsurgical equipment are not required, its reliability and the resulting sensitivity and proprioception of the receptor site. It offers mechanical support to the heel and has low rates of complications. The success of this technique is associated with appropriate indication, rigorous preoperative planning, the size of the defect, careful dissection by the surgeon and postoperative care.

Level of evidence

Level of evidence IV.

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Conflict of interests

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