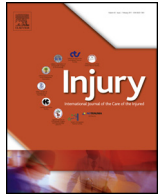




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Soft-tissue defects of the Achilles tendon region: Management and reconstructive ladder. Review of the literature

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ABSTRACT

Introduction: Defects of the Achilles tendon region represent a challenge for reconstructive surgeons. Several options are available but there is still no reconstructive ladder for this specific and tricky area. An up-to-date reconstructive ladder according to local and general conditions is proposed based on our multicentre experience and an extensive review of the English literature on PubMed.

Materials and methods: An extensive review of the English literature was performed on PubMed using the following key-words: "Achilles region", "heel", "soft-tissue reconstruction", "flaps", "grafts" and "dermal substitutes".

Results: A total of 69 complete papers were selected, covering the last thirty years' literature. Although most of the studies were based on limited case-series, local and general conditions were always reported. A comprehensive reconstructive ladder of all the available reconstructive techniques for the Achilles region has been created based on our personal multicentre experience and the results of the literature review.

Conclusions: The reconstructive ladder is a concept that is still a mainstay in plastic surgery and guides decisions in the repair strategy for soft tissue defects. The optimal solution, according to the experience of the surgeon and the wishes of the patient, is the one that implies less sacrifice of the donor site. Perforator flaps should be the first-line option for small-to-moderate defects; the distally-based sural flap is the most reported for moderate-to-large defects of the Achilles region, and free flaps should be reserved mainly for complex and wide reconstructions.

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Introduction

The Achilles tendon region is easily injured. Repair of Achilles tendon wounds constitutes a real dilemma in reconstructive surgery because of the function of the tendon and the paucity of soft tissues surrounding the area, and requires a multidisciplinary approach involving plastic and orthopaedic expertise. Soft-tissue defects range from minimal tendon exposure to severe infected bone exposure, in which there is likely to be simultaneous tendon

loss that requires repair to guarantee plantar flexion. Defects of the Achilles tendon and the overlying region might be primary to systemic illness, secondary to direct trauma, iatrogenic complications following steroid infiltration or the result of surgical repair of ruptures of the Achilles tendon. Epidemiology of soft tissue defects shows that the male-to-female ratio is nearly 20:1 and the average age of patients is 30–40 years. Patients with risk factors like diabetes mellitus, smoking, and rheumatoid arthritis undergoing corticosteroid therapy are at greater risk for these complications [1]. Furthermore, the Achilles tendon is the most frequently damaged tendon in the lower limb and constitutes 20% of all large tendon lesions.

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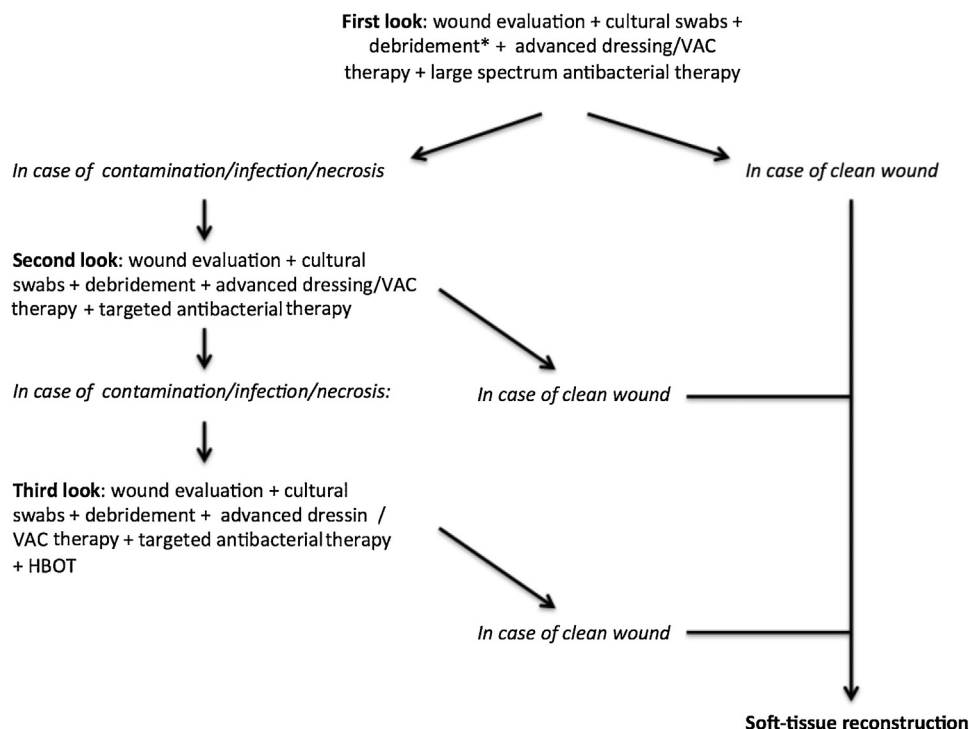


Fig. 1. Debridement protocol.

*in case of high-energy blunt trauma, fasciotomies of the involved compartments are recommended.

The management of lower limb wounds requires a complex and staged strategy. The first approach is based on cultural swabs for eventual targeted therapy, surgical debridement (this must always be performed) and wound evaluation for reconstruction planning (Fig. 1).

This paper has been written based on our multicentre experience and an extensive review of the English literature on PubMed using the following key-words: “Achilles region”; “heel”; “soft-tissue reconstruction”; “flaps”; “grafts” and “dermal substitutes”.

Materials and method

An extensive literature review was performed and 69 complete papers were selected, covering the last thirty years’ literature. Although most of the studies were based on limited case-series, local and general conditions were always reported. A comprehensive reconstructive ladder of all the available reconstructive techniques for the Achilles region has been created based on our personal multicentre experience and the results of the literature review.

Debridement

Debridement is the key to success in the management of major limb injuries [2]. As stated by Hallock, three words aptly summarise what is needed—debridement, debridement, and then more debridement—until only viable tissues remain [3]. Indeed, skin excision with a 2–3 mm margin around the contaminated and grit-laden tissues, exploration through all layers, and excision of damaged muscle are mandatory. Any dead and contaminated tissue, if left, would become a medium for infection and therefore must be removed. We never perform debridement of the skin or of deeper tissues under tourniquet control so as to preserve only viable tissues. The first look should be performed within 6–12 hours of injury for the best results [4,5]. At the end of the

procedure, the wound should be washed with abundant quantities of saline, preferably as pulsed lavage. Once a wound is clean and there is no bleeding, soft-tissue coverage should be planned in the form of primary closure (such as suturing, skin grafts or flaps) or in the form of secondary closure (such as vacuum-assisted closure [VAC], dermal substitutes or advanced dressings) depending on the intraoperative wound condition. If the wound at first look is largely contaminated or there are signs of infection, reconstruction must be delayed and a second look (and further looks, if necessary) will be needed and repeat debridement may be required every 48–72 hours. In fact, infection is directly proportional to inadequacy of debridement [6]. According to Medina et al., in addition to the soft-tissue evaluation, the vascular status of the limb needs to be assessed early on [7]. Obvious arterial insufficiency must be rectified immediately, with urgent fasciotomies performed, if required, to normalise compartment pressures before huge irreversible damages occur [8].

Antibiotic therapy

Besides surgical debridement, lower limb wounds should always be treated with the administration of intravenous antibiotics and tetanus prophylaxis. As demonstrated by Gosselin et al. in a Cochrane review, there is a significant reduction in wound infections in patients who received antibiotic prophylaxis for all types of open fractures compared with patients who received no antibiotic prophylaxis [9]. Moreover, Patzakis and Wilkins reviewed more than 1,000 open fractures and concluded that the single most important factor in reducing infection rate was the early administration of antibiotics [10]. In their study, patients who were administered antibiotics within 3 h of trauma had an infection rate of 4.7%, compared to 7.5% in those for whom antibiotic treatment was administered 3 h or more after trauma. Despite the importance of antibiotic administration in lower limb wounds, the exact length of treatment remains controversial and arbitrary. There are no specific guidelines regarding the type of

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