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QUESTION 3: What is the treatment “algorithm” for infection after Achilles tendon repair/reconstruction?

RECOMMENDATION: The initial treatment of an infected Achilles tendon reconstruction should include thorough debridement of all infected tissues with the removal of retained sutures or foreign material. Cultures should be taken at the time of debridement and antibiotic administration should be dictated by the result of culture and continued until inflammatory markers and clinical symptoms normalize. If significant soft tissue defect in the overlying area remains, the choice of tendon reconstruction and/or transfer with soft tissue coverage should be left up to the discretion of the treating surgeon based on preference and expertise. Revision reconstruction should be delayed until the infection is cleared.

LEVEL OF EVIDENCE: Moderate

DELEGATE VOTE: Agree: 100%, Disagree: 0%, Abstain: 0% (Unanimous, Strongest Consensus)

RATIONALE

Infection following Achilles tendon repair/reconstruction is a potentially catastrophic complication of a relatively common orthopaedic procedure. Wound complications following Achilles tendon repair occur in approximately 10% of cases [1], although the proportion of patients requiring secondary surgery or prolonged care has been reported to be substantially lower (2.44%) [2]. The loss of Achilles tendon tissue and soft tissue coverage secondary to infection leads to poor results and can be difficult to manage [3].

The optimal treatment of an infection following Achilles tendon repair/reconstruction consists of infection eradication, maintenance or restoration of ankle plantar flexion and soft tissue coverage. A literature search for the treatment of infection following Achilles tendon repair/reconstruction reveals a heterogeneous collection of expert opinions and case reports/series on how to accomplish these goals, with no definite consensus. While the literature generally agrees that the most important aspect of treatment revolves around an extensive debridement of the infected/necrotic tissue and antibiotic coverage, each author has their own opinion on how tendon and soft tissue defects should be addressed. These opinions range from extensive debridement with functional rehabilitation alone [4,5], to local tendon/tissue transfer [6–11], to free flaps [12–17]. Additional variations of treatment include single versus staged procedures [18,19], the utilization of cement spacers [18,19], tissue expanders [19] and negative pressure wound therapy [20,21].

Given the heterogeneity of the literature and the lack of any high level of evidence publications on the subject matter, we are unable to formulate a definitive consensus statement with regards to soft tissue coverage of the infected Achilles tendon following a prior repair/reconstruction. There is, however, evidence to suggest that thorough debridement of all infected tissue with the removal of retained suture or foreign material and antibiotic administration should be the initial step in the treatment of these patients. Cultures should also be taken at the time of debridement and antibiotic administration should be culture-driven and continued until inflammatory markers and clinical symptoms normalize. If significant defects remain in the Achilles tendon and overlying soft tissue following debridement, the choice of tendon reconstruction and/or transfer with soft tissue coverage should be left to the discretion of the treating surgeon based on preference and expertise.

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QUESTION 4: Should treatment of diabetic foot osteomyelitis be based on bone biopsies?

RECOMMENDATION: Yes. Bone biopsies play both a crucial diagnostic and interventional role in the management of diabetic foot infection. While bone biopsies are not required in every case of diabetic foot infection, their most important role is in guiding accurate antibiotic treatment, as they provide more accurate microbiological information than superficial soft tissue samples in patients with diabetic foot osteomyelitis.

LEVEL OF EVIDENCE: Moderate

DELEGATE VOTE: Agree: 100%, Disagree: 0%, Abstain: 0% (Unanimous, Strongest Consensus)

RATIONALE

Diabetic foot infections of the skin and soft tissue can lead to contiguous spread to underlying bone, resulting in osteomyelitis. Where a diabetic foot ulcer fails to heal with no other apparent reason or when exposure of bone is observed, osteomyelitis should be suspected. Plain radiography has demonstrated to have poor sensitivity in detecting osteomyelitis in the early stages [1].

Moreover, plain radiography and other imaging modalities do not identify pathogenic organisms, and, thus cannot guide antibiotic therapy. Despite the ease of obtaining superficial wound swab cultures, the cultured organisms are polymicrobial and do not correlate well with bone biopsy cultures and, therefore, should not be used to guide antibiotic therapies [2–6]. A single retrospective multicenter cohort study reported that the rate of infection resolution was significantly higher in the group for whom the choice of antibiotic regimen was based on bone culture versus those based on wound swab culture (82% vs. 50%, $p = 0.02$) [7].

Bone biopsies taken for microbiological and histopathological analysis are the gold standard for a definitive diagnosis of osteomyelitis [8–10]. A specimen can be obtained either transcutaneously through uninfected skin or as part of an operative procedure following debridement. Bone biopsies play both a crucial diagnostic as well as interventional role in the management of diabetic foot infection. While bone biopsies are not required in every case of diabetic foot infection, their most important role is in guiding accurate antibiotic treatment.

A positive microbiological result is where one or more pathogens from a reliably-obtained bone specimen is cultured [11]. It has shown to give a sensitivity of 92% and specificity of 60% in diagnosing diabetic foot osteomyelitis [12]. Reliable and accurate identification of the causative pathogens in diabetic foot infections is important, as prolonged antimicrobial therapy is tailored according to microbiological susceptibility profile. Most diabetic foot osteomyelitis cases are polymicrobial, with *Staphylococcus aureus* being the most commonly isolated pathogen (50% of cases). Other frequently isolated organisms include coagulase-negative staphylococci, *Enterobacteriaceae*, aerobic streptococci and *Pseudomonas aeruginosa* [8,13,14]. Contamination of contiguous wound colonizing flora and skin commensals may give a false positive result, whereas prior antibiotic therapy, patchy infectious involvement or inability to culture fastidious organisms may yield false-negative results [11].

Positive histological findings include aggregates of inflammatory cells (neutrophils, lymphocytes, histiocytes and plasma cells), erosion of trabecular bone, marrow changes (fat necrosis, edema, fibrosis and reactive bone formation) [11,15,16]. Other causes of inflammation may give false-positive histological results, whereas sampling errors can give a false-negative result. Histological analysis may have better sensitivity than bacteriological cultures, as the latter is often performed under flawed conditions. However, a study by Meyr et al. has questioned the statistical reliability of the histopathologic diagnosis of diabetic foot osteomyelitis using bone biopsies, quoting a 41% of clinically significant disagreement between different pathologists, falling short of what would be expected of a “reference standard” [16]. This highlights the controversy in histopathological patterns and findings that pathologists use as a reference to establish a diagnosis of osteomyelitis [15,17,18].

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