Management of fracture-related infection in the presence of critical bone defects

Bone & Joint 360

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Introduction

Unfortunately, despite best practices in theatre asepsis and patient optimization, most orthopaedic surgeons dealing with traumatic injury will, at some point in their careers, need to manage fracture-related infection (FRI). The incidence of FRI varies from 1% to 6% after the surgical management of closed fractures, increasing to between 2% and 35% following open injuries.[1] FRI worsens patient outcomes and is associated with increased healthcare-related costs.[2]

The management of deep infection in the presence of a critical bone defect raises the stakes of a poor outcome dramatically, with the rate of amputation historically being higher than 10%. Compared with those used in periprosthetic joint infection, robust evidence to inform FRI protocols remains somewhat lacking, being limited largely to case series and small retrospective cohort studies. The current 'best practice' guidelines promote appropriate surgical debridement, microbiology sampling, host optimization, and a multidisciplinary team approach to managing FRI.[3,4] Sticking to the principles within these algorithms can greatly increase the chances of successful limb salvage.[5]

General principles

The overall aim in the management of FRI is the eradication of infection, leading to bone healing and ultimately the restoration of function. Surgical management involves adhering to the principles of deep-tissue sampling, excision of non-viable tissue, antibiotic therapy, and dead space management.

Tissue sampling allows for both the confirmation of deep infection and to guide antibiotic therapy. A combination of sampling for both microbiological and histopathological analysis has been shown to improve the accuracy of diagnosing FRI.[6] Samples should be obtained early in the surgical procedure before contamination occurs.[7] At least five deep tissue samples are recommended and should be obtained from sites around the fracture and adjacent to any implants.[8] Separate instruments should be used for each sample to avoid cross-contamination.[9]

Adequate debridement of the infected field is vital. All non-viable bone and soft tissue should be removed (Figure 1).[10] Punctate bleeding suggests viable bone that can heal with local or systemic antibiotic therapy.[11] Low-pressure irrigation, rather than pulse lavage, is recommended to avoid driving bacteria deeper into the tissues.[12] There is little evidence to support the addition of antibiotics or antiseptics to the irrigation fluid.[2] The use of additives to the irrigation fluid is therefore currently not advised as they may contribute to cell toxicity.[13]

Dead space is managed by the insertion of a void filler, usually containing topical antibiotics. Carriers include polymethylmethacrylate (PMMA) cement and ceramics. Ceramics have been associated with increased wound discharge compared with PMMA spacers; there is some evidence to show that the concentration of local antibiotics is unaffected by negative pressure dressings should one be used to manage this wound discharge.[14]

Bone and soft-tissue defects requiring reconstructive surgery may become apparent after an appropriate debridement. The planning of incisions with a plastic surgeon is beneficial in allowing for an adequate debridement to be performed without creating an unexpected soft-tissue defect. This may necessitate transferring