Management of Prosthetic Joint Infection

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KEYWORDS

• Prosthetic joint infection • Periprosthetic joint infection • Osteomyelitis
• Joint arthroplasty • 2-Stage exchange • Joint replacement • Septic arthritis

KEY POINTS

- Although definitive cure of prosthetic joint infection (PJI) may not always be possible, alleviation of the symptoms of PJI and restoration of function should always be the goal.
- Successful treatment involves débridement of infected tissue, explicit management of the prosthesis, and pathogen-directed antimicrobial treatment tailored to the specific surgical approach.
- The choice of medical/surgical strategy depends on chronicity of infection, condition of the joint and implant, and patient ability and desire to undergo 1 or more surgeries.

INTRODUCTION

Joint arthroplasty has improved life for millions of people around the world. The benefits of this procedure include restoration of function and relief of pain. Fortunately, the incidence of peri-PJI or PJI is low. When it does occur, PJI is a challenging condition to treat. The purpose of this review is to provide an overview of the management of PJI.

GENERAL PRINCIPLES AND TREATMENT SUCCESS

In its simplest form, the goal of medicine is to cure disease afflicting a patient. For a PJI, this ideally means eradication of infection and resolution of the symptoms associated with infection, ultimately leading to freedom from further therapy.[1] In reality, "cure" may not be an achievable goal for all patients. Therefore, the goals of PJI treatment (and the corresponding definition of treatment success) should take into account patient preferences and may align more closely with the concept of disease control rather than cure, thus seeking to minimize the impact of PJI on the quality and quantity

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of a patient's life. For example, the most common single symptom of PJI is pain.[2] Accordingly, relief of pain must be of paramount importance but is not the only consideration. Other priorities, such as restoration of function, avoidance of further surgical interventions, and freedom from antimicrobial suppression, may be of varying degrees of importance to individual patients. An open and honest discussion of realistic treatment goals help guide the choice of medical and surgical approach.

There are several different surgical treatment strategies that are described in this review. Each of these strategies has identical components: (1) débride all infected tissue; (2) minimize or eliminate the impact of the prosthesis on perpetuating biofilm-related infection, either by complete resection of the prosthesis or exchange of the removable components; and (3) maintain sufficient soft tissue coverage to permit healing. These are similar to the principles of surgical osteomyelitis management described by Dr J. Albert Key more than 70 years ago.[3] Coordination with a plastic surgeon may be needed to achieve dead space management and soft tissue coverage, particularly in the setting of hip arthroplasty infection and multiply revised joints, respectively. A conceptual overview of the different medical/surgical treatment strategies is shown in **Fig. 1**.[4]

Successful medical therapy begins with an accurate microbiologic diagnosis of the cause of the infection to permit the most effective, safe, and narrow spectrum of antimicrobial therapy. Reported antimicrobial allergies should be investigated thoroughly, and patients with reported penicillin allergy should undergo allergy consultation and penicillin skin testing to make available all necessary antimicrobial therapy. The choice and duration of antimicrobial therapy should be modified according to the surgical approach (discussed later; see **Fig. 1**). Development of and coordination with an outpatient antimicrobial therapy program are critical to monitor for and minimize antimicrobial treatment-related side effects.[5] In addition, there are antimicrobial-related adverse effects that are unique to prolonged antimicrobial use, such as minocycline skin change.[6] Providers managing long-term PJI treatment must be aware of these effects and discuss them with patients. The authors' strategy for monitoring for adverse effects associated with oral antimicrobials is to perform complete blood cell count with differential, liver function testing, and serum creatinine measurement every 2 weeks for 1 month, monthly for 2 months, and yearly thereafter.

SELECTION OF A MEDICAL/SURGICAL STRATEGY

Several factors must be considered when determining an appropriate treatment strategy, including the duration of symptoms, the stability of the implant, the condition of the soft tissue and bone stock, presence of systemic infection symptoms, patient comorbidities, ability or desire to undergo multiple surgeries, patient preferences, and the pathogen causing the infection. The acuity of the symptoms, in conjunction with the availability of surgical expertise, also determines the strategy. If the most appropriate surgical strategy is beyond the capability of the available orthopedic surgeon, then referral to a higher level of care is indicated. Several different algorithms have been published to guide clinicians to appropriate surgical strategy, based on these factors.[7–10] These algorithms may help identify patients who may be likely to have a good outcome with a single surgery, such as débridement, antibiotics, and implant retention (DAIR) or 1-stage exchange (OSE),[11] an approach supported by the literature.[12,13] The algorithm in the IDSA guidelines may also help identify patients in whom a 2-stage exchange (TSE) is less appropriate than alternative approaches, such as permanent resection or arthrodesis, amputation, or medical therapy alone.[9] A modified version of this algorithm is shown in **Fig. 2**.[9]