Editorial Response: Orthopedic Prosthesis Salvage

The surgical replacement of a painful, poorly functioning joint with a new prosthetic joint offers enormous potential for increased mobility, freedom from pain, and independence for millions of persons worldwide. Infection of these arthroplasties, which occurs overall in <4% of patients over the lifetime of the joint, is among the most serious complications of prosthetic joint replacement and, when untreated, leads inevitably to failure of the prosthesis.

Physicians and surgeons advising patients with this serious problem are confronted with a confusing multiplicity of treatment options and medical-surgical combinations. Should patients with prosthetic joint infection be treated with a defined course of antibiotics alone, without initial surgery, as suggested by a few investigators [1]? Which patients are optimally served by attempts to surgically salvage the existing prosthesis, and how should antibiotic therapy be managed for these patients? When is surgical treatment, with or without antibiotic-impregnated cement, effective as a sole modality, without use of systemic antibiotics [2]?

Which antibiotics are optimally effective with these retained prostheses? How long should antibiotic therapy continue in order to optimize efficacy and minimize toxicity? Should some patients be maintained with long-term suppressive antimicrobial therapy? Is there a special role for rifampin in the treatment of a retained prosthesis that is infected [3]? Which patients are best served by initial surgical removal of the prosthesis? For patients treated initially with resection arthroplasty, should a new joint be implanted immediately or after a period of months? How should antibiotic therapy be managed in each of these differing surgical situations?

Not only do host factors affect these critical decisions, but so do microbial factors. It is clear that optimal decisions focus on objectives for the individual patient, that is, achieving functionality, mobility, and a pain-free joint with the least possible morbidity. Eradication of infection may be the best long-term approach to achieve these patient-specific goals but is generally not, per se, the sole objective. Because surgical and medical treatment options are so closely intertwined, it is equally apparent that a close, cooperative relationship between surgical and medical care-givers is essential to achieve optimal therapeutic outcomes for these patients.

The report by Tattevin and colleagues [4] in the current issue of Clinical Infectious Diseases again directs our attention to the selection of patients with prosthetic joint infection for potential salvage procedures. The high failure rate associated with component retention was recognized in early reports of the management of prosthetic joint infections. Among 42 hip arthroplasty infections reported by Fitzgerald and colleagues [5], only 18% were cured with salvage of the prosthesis. In another study [6], conducted between 1972 and 1987, only one of 35 hip prostheses with infection was retained with success.

More recently, Drancourt and colleagues [7] attempted to treat staphylococcal prosthetic joint infection with a combination of ofloxacin and rifampin and component retention; 61% of these prostheses ultimately had to be removed. In contrast, Tsukayama et al. [8] reported a 71% success rate with debridement and component retention in 35 early postoperative hip arthroplasty infections. In a more recent study of 42 hip prosthetic joint infections [9] treated with debridement and retention of the components, for the 14% that were managed successfully, the mean time to debridement after the onset of infection was 6 days (vs. 23 days in cases for which this approach failed [P = .06]).

Another approach was studied by Segretti et al. [10]. They conducted a retrospective analysis of 18 patients with prosthetic joint infection treated with debridement, component retention, and prolonged oral suppressive antibiotic therapy. Fifteen patients responded to this approach and retained a functional prosthesis after a mean duration of suppression of 48.9 months. All of these studies varied in terms of patient-selection criteria, selection and duration of antimicrobial therapy, definition of infection, type of devices implanted, and duration of follow-up. These studies illustrate the challenges of interpreting the existing literature and in managing prosthetic joint infections when component retention is a consideration.

Tattevin and colleagues [4] in this issue present the results of a careful and thoughtful retrospective analysis of their experience in a Paris hospital that is expert in the management of prosthetic joint infections. Among patients treated with debridement and component retention, they found the only independent predictor of treatment failure was the duration of symptoms prior to the initiation of surgical intervention. The mean duration of symptoms among the 40% of patients successfully treated with debridement and component retention was <5 days, compared with 54 days for the remaining 60% whose therapy failed.

In a North American study recently reported by Brandt and colleagues [11], findings were remarkably similar. In that study, among patients with Staphylococcus aureus–infected prosthetic joints treated with debridement and component retention, there was a statistically significant higher probability of treatment failure if the duration of symptoms prior to initiation of debridement was >2 days. In another notable recent report from Switzerland, Zimmerli and colleagues [3] described favorable outcomes for patients with staphylococcal orthopedic implant–related infections whose hardware was retained and who were treated with antimicrobial regimens including rifampin.

The median duration of infection before debridement in this study was 5 days. Despite differences, these important studies (among others) from different centers and different countries are all consistent
with regard to the observation that a successful outcome for orthopedic implant infections treated with debridement but retention of implants and with antimicrobials is possible if intervention occurs very early in the course of infection. Intervention occurring after 1–2 weeks of symptomatic infection is unlikely to be successful.

These important observations have significant clinical implications for physicians and surgeons advising patients with prosthetic joint infections. Clinicians caring for these patients should avoid dogmatic, preprogrammed approaches and consider carefully which of the multiple approaches may be best suited to an individual patient’s needs. This involves close cooperation and communication among the orthopedic surgeon, medical physician, and patient. Most patients with a prosthetic joint are elderly, have significant comorbidities, or both. Hence, a nonoperative or limited operative approach to the management of prosthetic joint infection is attractive.

Nonetheless, if the infection has been symptomatic for more than 1 or 2 weeks, resection arthroplasty is usually the option most likely to achieve a satisfactory long-term result. When this is not possible and debridement with retention of hardware is under consideration, patients should be fully informed of the high likelihood of eventual relapse (typically within 1–2 years). Chronic suppressive antimicrobial therapy is often offered in this setting, although clear evidence from a randomized, blinded clinical trial supporting its use is lacking, and retrospective studies have reached conflicting conclusions about benefit [10, 11].

The study by Tattevin and colleagues [4] is an important contribution to our understanding of the treatment options available for patients with prosthetic joint infections and the appropriate selection of patients for attempted prosthesis salvage. We fully agree that randomized, controlled clinical and surgical trials, although technically challenging, will be necessary to fully answer the many remaining questions.

Michael R. Keating and James M. Steckelberg
Division of Infectious Diseases, Mayo Clinic and Mayo Foundation, Rochester, Minnesota

Acknowledgment

The authors wish to acknowledge the very helpful review and comments by Douglas Osmon, M.D., as well as his longstanding professional collaboration and collegial support.

References