for continued therapy and if agreed upon after discussion by a multidisciplinary team.

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QUESTION 2: Does extended oral antibiotic prophylaxis following reimplantation reduce the risk of future failure? If so, what type of antibiotic should be administered and for how long?

RECOMMENDATION: Possibly. There is emerging evidence that administration of three months of oral antibiotics directed towards the original infecting organism following reimplantation reduces the risk of early failure secondary to periprosthetic joint infections (PJIs).

LEVEL OF EVIDENCE: Moderate

DELEGATE VOTE: Agree: 76%, Disagree: 18%, Abstain: 6% (Super Majority, Strong Consensus)

RATIONALE

PJIs are one of the most devastating complications following hip and knee arthroplasty and are associated with significant morbidity and mortality [1–3]. Several approaches have been used to treat this complication, one being a two-stage exchange arthroplasty with placement of an antibiotic-impregnated spacer followed by directed antibiotic therapy [4]. Hanssen et al. reported a 90% success rate with a two-stage exchange arthroplasty approach [4]. More recent studies have shown higher failure rates with this treatment modality due to reinfection with either the same or with a new organism [5–7].

To address the question of whether antibiotic treatment following reimplantation surgery had any effect on the subsequent failure rate, we conducted an extensive literature search. After removal of duplicates, 111 articles were found. After review of the abstracts, 52 additional articles were excluded. The remaining 59 articles were reviewed, among which 3 original scientific publications compared an extended course of postoperative antibiotics following a two-stage exchange.

All three studies were current, with publication dates ranging from 2011 to 2016. Study populations ranged from 66-107 patients. The highest quality study was a multicenter prospective randomized controlled trial. Two retrospective studies have evaluated the use of prophylactic antibiotics following reimplantation. Zywiel et

al. followed two cohorts of patients following a two-stage revision knee arthroplasty. Twenty-eight patients had a mean of 33 days of oral antibiotics (range, 28-43 days) following the reimplantation procedure and 38 patients received between 24 and 72 hours of post-operative intravenous antibiotics as standard prophylaxis. Patients were followed over a 12-month period and evaluated for reinfection. They found that the risk of reinfection with extended oral antibiotics was 4% compared with 16% in the control cohort that received routine perioperative antibiotics [8]. The single patient who was reinfected in the oral prophylaxis cohort was found to be infected with methicillin-resistant *Staphylococcus aureus*, which was present at the time of the original component removal. In contrast, a variety of low virulence organisms were the cause of reinfection in the group that received short-term prophylactic antibiotics intravenously. In a study by the same group that examined patients treated for periprosthetic hip infections, Johnson et al. found a 13.6% rate of reinfection in the perioperative antibiotic group compared to 0% reinfection in those patients treated with oral antibiotics for 14 days following a two-stage exchange [9].

There is presently one randomized controlled trial that reported the use of prolonged prophylactic oral antibiotics following reimplantation [10]. This multi-institutional study randomized patients to receive three months of oral antibiotics or standard prophylactic intravenous antibiotics only for up to 72 hours. This study included a total of 107 patients who were undergoing a two-stage revision hip or knee arthroplasty for a periprosthetic infection that met the MusculoSkeletal Infection Society (MSIS) criteria at the first stage and with negative cultures at the second stage. The rate of reinfection was 19% in the control group compared to 5% in the treatment group ($p = 0.0162$). Eight of the nine infections in the control group and one of the three in the extended oral antibiotic group were infections associated with a new organism. In the antibiotic cohort, three patients had to stop their antibiotic due to adverse reactions such as gastrointestinal upset and nausea. Three additional patients had minor adverse reactions such as rash or yeast infection; however, they continued to take the oral antibiotic despite these side effects.

Based on the available literature, there is moderate evidence to suggest that relatively short (three months) courses of oral antibiotic, following reimplantation after a two-stage exchange may reduce early failure with reinfection. All studies evaluating the role of antibiotic suppression have been short term and longer follow-up of the same cohort is needed as the one randomized trial did not report a full two years of follow-up for all enrolled patients. In addition, it is important to note that there were some issues with the administration of antibiotics and some patients had to discontinue the antibiotic. Administration of antibiotics under any circumstances needs to be weighed against its harm to the patient in terms of adverse effects and harm to society in terms of cost and its potential to cause emergence of resistant organisms.

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QUESTION 3: When is the optimal time to change intravenous (IV) antibiotic(s) to an oral agent(s) after a resection arthroplasty as part of two-stage exchange?

RECOMMENDATION: There is evidence to support pathogen-specific, highly bioavailable oral antibiotic therapy as an appropriate choice after resection arthroplasty in a two-stage treatment of periprosthetic joint infections (PJIs) after an initial IV antibiotic period of at least 5-7 days.

LEVEL OF EVIDENCE: Limited

DELEGATE VOTE: Agree: 83%, Disagree: 14%, Abstain: 3% (Super Majority, Strong Consensus)

RATIONALE

Resection arthroplasty with a two-stage exchange is utilized in the management of PJIs in patients who are not candidates for a one-stage exchange, are medically able to undergo multiple surgeries and in whom the surgeon believes that replantation arthroplasty is possible [1]. An important part of the exchange arthroplasty includes administration of systemic antimicrobial therapy. The optimal time and the mode of administration of systemic antimicrobials has been the subject of numerous studies, with no definitive recommendations available.

Several studies recommend 4-6 weeks of pathogen-specific IV or highly bioavailable per oral (PO) antimicrobial therapy for patients with PJIs who have undergone two-stage exchange arthroplasty [1–3].