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5.3. TREATMENT: ONE-STAGE EXCHANGE

Authors: Navin Fernando, Pedro Foguet, Michael A. Mont, Nipun Sodhi, Robert Molloy, Ariel Saldaña

QUESTION 1: What are the potential advantages of a one-stage exchange arthroplasty?

RECOMMENDATION: The potential advantages of a one-stage exchange arthroplasty are multiple, including a decrease in surgical morbidity and mortality, earlier functional return, decrease in healthcare and global economic costs as well as an increase in health-related quality adjusted life years.

LEVEL OF EVIDENCE: Moderate

DELEGATE VOTE: Agree: 89%, Disagree: 8%, Abstain: 3% (Super Majority, Strong Consensus)

RATIONALE

While multiple studies have been performed evaluating the efficacy of a one-stage or two-stage exchange arthroplasty for periprosthetic joint infection (PJI) [1–13], the majority demonstrated a reduced rate of recurrent infection after a two-stage exchange in comparison to a one-stage exchange, although the comparative value of these results is difficult to interpret given discrepancies in patient comorbidities, bacterial profiles, treatment protocols as well as variances in the definitions of PJIs, clinical success, and failure.

In North America, treatment of PJIs using a two-stage revision procedure remains the most widely utilized and reported method in the literature [14–16]. However, there is no clear evidence that shows superiority of two-stage over one-stage revision in terms of success, eradication of infection or patient satisfaction [1–11,13,16–18]. In addition, one-stage revision has demonstrated multiple advantages in several prognostic and observational studies, particularly within the European literature [1–13].

Depending on the study and follow-up time, one-stage revision procedures have demonstrated a success rate ranging between 75 to 95% [1–5,7–13,17–19]. This is comparable to the reported reinfection rates after two-stage revisions between 9 and 20% of cases [20]. Furthermore, when appropriately performed, one-stage revision can avoid the morbidity associated with multiple surgeries while providing the advantages of reduced total length of stay, overall cost and earlier functional rehabilitation [19,20]. Other advantages include the reduced duration of postoperative systemic antibiotic therapy and systemic antibiotic side effects [19,20].

Despite this demonstrated success of one-stage revisions, it is critical to recognize that this procedure is contingent on strict patient selection criteria and specific operative planning protocols. For example, preoperative identification of the responsible bacterial organism in the synovial fluid is a prerequisite to determine the specific local and systemic antibiotic therapy regimen [3,6,10,11,19]. Also, patients who fail prior one-stage revision, those with an unclear causative pathogen or lack of susceptibility to available antibiotics and those with more extensive infections, may not be candidates for one-stage exchange [20].

In addition to strict selection criteria, several meticulous intraoperative steps, including aggressive soft tissue debridement, meticulous removal of the prior cement material and all hardware, as well as the use of antibiotic-loaded cement for reimplantation, along with specific postoperative antibiotic regimens, are important for success [19]. In a systematic review comparing one- to two-stage exchange, superior outcomes for one-stage revision were reported when performed in this selective patient population [21].

Two recent meta-analyses comparing outcomes for one-stage versus two-stage exchange for patients who have PJIs after both total hip [22] and total knee [23] arthroplasties demonstrated statistically equivalent reinfection rates for both protocols. These findings, were, however limited by the quality of the studies included in the meta-analyses, as well as a relative paucity of studies evaluating one-stage protocols in comparison to two-stage exchange.

Wolf el al. utilized Markov modeling in a decision-tree analysis to suggest a possible superiority of treatment of a one-stage exchange in comparison to a two-stage protocol as it pertains to health-related quality of life years, despite an objective decrease in recurrent infection with a two-stage protocol [24]. Although

the mortality increase in a two-stage protocol was most directly responsible for the predicted advantage of a one-stage protocol in this study, failure of reimplantation in some circumstances, time between procedures and a longer total recovery, were also utility values which favored direct exchange. Although the challenges in conducting an adequately powered randomized controlled trial to properly address this question are multiple, important controversy regarding this topic will likely remain until this is done.

Based on the current evidence, one-stage revision procedures can be utilized as an alternative to two-stage revision for PJIs, with comparable success. However, this may not be a suitable option for all patients with an infected prosthesis. Meticulous operative planning and surgical technique is important to achieve excellent outcomes. Future prospective, randomized, adequately powered, and preferably multicenter studies are necessary to delineate the superiority of a one- or two-stage revision approach for PJIs. It is likely that marked controversy regarding this topic will likely remain until such evidence becomes available.

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Authors: Peter Keogh, Andrew Toms, Akos Zahar, Fares Haddad, Shengjie Guo, S. McHale

QUESTION 2: What are the indications and contraindications for a one-stage exchange arthroplasty for the treatment of chronic periprosthetic joint infections (PJIs)?

RECOMMENDATION: One-stage exchange arthroplasty remains a viable option for the management of chronic PJIs. In patients with signs of systemic sepsis, extensive comorbidities, infection with resistant organisms, culture-negative infections and poor soft tissue coverage, one-stage exchange arthroplasty may not be a good option.

LEVEL OF EVIDENCE: Moderate

DELEGATE VOTE: Agree: 93%, Disagree: 5%, Abstain: 2% (Super Majority, Strong Consensus)

RATIONALE

The evidence for best practice in the management of PJIs is an evolving science with increasing popularity for one-stage revision arthroplasty over recent years. This popularity is mainly driven by a number of studies reporting comparable [1,2], if not better [3] outcomes of one-stage vs.two-stage exchange surgery and the potential for reduced patient morbidity, mortality and socio-economic burden with the former [4–6]. Excellent outcomes for infection-free survival are documented in the literature, especially where strict criteria for patient selection is met. Haddad et al. [3] in 2015 reported their series of 28 highly selected patients undergoing one-stage exchange for chronically infected knee arthroplasties with a 0% re-infection rate at a minimum of three years follow-up. Their cohort