HK-62 – Can one stage exchange be done in patients with fungal periprosthetic joint infection (PJI)?

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Response/Recommendation:
Yes. One-stage exchange arthroplasty is a viable option for selected patients with fungal PJI.

Level of Evidence: low

Delegate vote:

Rationale:

Fungal prosthetic joint infections (fPJI) represent a challenging condition requiring a multidisciplinary approach to optimize patient outcomes. Key components of management include patient optimization, thorough surgical debridement, administration of both systemic and local antifungal therapies, and extended postoperative care. Both single-stage and two-stage exchange arthroplasties have demonstrated high success rates, with the choice of surgical strategy influenced by patient-specific factors, the identified pathogen, and the presence of comorbidities. A tailored approach is essential for achieving the best possible outcomes in patients with PJI, particularly those caused by fungi.

In a multicenter study, Dinh et al. [1] evaluated outcomes of PJI caused by Candida species. The study found significant differences in outcomes when comparing debridement, antibiotics, and implant retention (DAIR) vs. single-stage exchange ($p = 0.008$) and DAIR vs. two-stage exchange ($p = 0.003$). However, there was no significant difference in outcomes between single- and two-stage exchange arthroplasties. Factors influencing treatment failure included age and the absence of prosthesis removal. Notably, infections caused by *C.parapsilosis* had better prognoses compared to other species. Similarly, Fusini et al. [2,3] conducted systematic reviews on fungal PJI treatment after total hip arthroplasty (THA) and total knee arthroplasty (TKA). Both reviews highlighted the low level of evidence in the literature. Despite this, results indicated no significant difference in relapse or eradication rates between single- and two-stage exchange arthroplasties. While two-stage exchange were the most frequently used approach, single-stage exchange yielded comparable outcomes. *C.albicans* and other Candida species showed similar relapse and eradication rates. Grzelecki et al. [4] analyzed treatment outcomes for fungal PJI and found that two-stage exchange protocols were more effective for *C.parapsilosis* infections compared to *C.albicans*. Their literature review concluded that single- and two-stage exchange strategies generally yielded similar success rates across all Candida species.

In a systematic review of surgical treatments for fungal PJI after THA, Guan et al. [5] reported pooled success rates of 50.0% for surgical debridement, 42.9% for spacer

implantation, 55.0% for resection arthroplasty, 86.7% for one-stage revision, and 88.5% for two-stage revision, with significant differences between these approaches ($p = 0.009$). While one-stage exchange arthroplasty showed success rates comparable to two-stage revisions in selected cases, the latter was typically reserved for more complex situations. There is emerging evidence for utilizing the single-stage approach. George et al. [6] reported that single-stage revisions with fluconazole monotherapy were effective for selected TKA cases, particularly in non-immunocompromised patients with good soft-tissue conditions. Prolonged postoperative antifungal therapy guided by C-reactive protein (CRP) levels was essential. Klatte et al. [7] presented a single-stage protocol with only one re-infection observed in ten cases over seven years. Success relied on comprehensive pre-, intra-, and postoperative management. Ji et al. [8] advocated for single-stage revisions with uncemented implants for chronic PJI after THA, including fungal infections. However, fungal cases were rare in their dataset, and long-term outcomes require further investigation. Rowan et al. [9] highlighted evidence supporting single-stage revisions even for atypical PJIs, including those caused by fungal species. Prerequisites included preoperative identification of the causative microorganism and thorough mechanical debridement. Jenny et al. [10] reports two successful cases of one-stage exchange for *C.albicans* PJI, where the pathogen was identified solely through intraoperative samples. Both patients remained infection-free two years postoperatively, despite the typically poor prognosis associated with the absence of preoperative identification.

In the majority of the reviewed literature two-stage revision seems to be a reliable approach for most patients and it is considered as the preferred procedure. Gonzalez et al. [11] analyzed 225 fungal PJI cases, reporting highly variable recurrence rates ranging from 0% to 50%. Despite the absence of standardized treatment guidelines, two-stage exchange arthroplasty emerged as the predominant approach due to its reliability. Koutserimpas et al. [12,13,14] conducted several reviews highlighting the success rates of various surgical strategies. For fungal PJI after TKA, two-stage revision demonstrated a success rate of 92%, compared to 75% for one-stage revision, 80% for resection arthroplasty, and 67% for both arthrodesis and DAIR. In a 2019 systematic review of PJI caused by non-albicans Candida species, two-stage revision had significantly higher success rates compared to one-stage revision (96% vs. 73%; $p = 0.023$). These findings underscore the superior outcomes of two-stage approaches, particularly in complex fungal infections. Kuiper et al. [15] reviewed 164 cases and similarly recommended two-stage revision as the standard for all fungal PJI cases. Their analysis found no compelling evidence supporting alternatives such as one-stage revision, DAIR, or antifungal therapy alone. Kuo et al. [16] highlighted poor long-term outcomes with irrigation, debridement, and single-stage revisions, emphasizing the importance of optimizing patients' systemic health prior to two-stage surgery. Nace et al. [17] explicitly recommended against one-stage revision and DAIR for fungal PJI due to the robust biofilm associated with fungal pathogens, which diminishes the efficacy of these interventions. Starnes et al. [18] recommended aggressive surgical management, including two-stage exchange combined with prolonged antifungal therapy (≥3 months),

as the current best practice. Debridement and Girdlestone procedures were shown to be less effective compared to staged revisions. Theil et al. [19] provided further evidence supporting two-stage revision, particularly when fungal organisms are identified preoperatively. In a retrospective analysis, Brown et al. identified 31fungal PJI cases (13 THA and 18 TKA) in 31 patients treated during a period of 18 years, representing 0.9% of the 3,525 PJIs treated at the Mayo Clinic [20]. Candida species accounted for 81% of infections. At mean follow-up of 4 years, survivorship free from revision or implant removal at 2 years was 45% in THA and 70% in TKA. Survivorship free from reinfection at 2 years was 38% in THA and 76% in TKA..

In conclusion, management of fungal PJI is a complex process requiring a multidisciplinary approach tailored to patient-specific factors, the causative microorganism, and the presence of comorbidities. While one-stage revision is a viable option for carefully selected patients, particularly for those with favorable conditions and preoperative pathogen identification, two-stage exchange arthroplasty still remains as the most commonly employed approach, especially in complex cases. Prolonged antifungal therapy and rigorous perioperative management are crucial to optimizing outcome of PJI, particularly those caused by fungal species.

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