

HK-95-Does intraarticular antibiotic infusion have a role in the management of patients with periprosthetic joint infection (PJI)?

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Response/Recommendation:

Yes. Intraarticular antibiotic infusion is a safe and effective adjunct for managing PJI, delivering high local antibiotic concentrations with minimal systemic toxicity. Given its favorable safety profile and efficacy across various surgical strategies, it may be considered an important option in the management of PJI.

Level of Evidence: Moderate

Delegate Vote:

Rationale:

Intraarticular (IA) antibiotic infusion has become an important adjunctive therapy in treating periprosthetic joint infections (PJI). By delivering high concentrations of antibiotics directly to the site of infection, it enhances the eradication of biofilm-associated pathogens while reducing systemic toxicity. Its applications have been explored in the context of both hip and knee arthroplasty, particularly in debridement, antibiotics, and implant retention (DAIR), single-stage revision, and two-stage revision[1].

In DAIR, which aims to retain the existing implant, IA antibiotic infusion has been explored as an effective method for managing acute infections and culture-negative (CN) cases. The Li Cao team reported an infection control rate of 87.7% in early postoperative infections treated with IA vancomycin infusion combined with systemic antibiotics. This protocol utilized a three-way branch system to deliver antibiotics over 12 to 14 days, achieving high local antibiotic concentrations and supporting effective infection control in early PJI[2]. Similarly, Chaityakit et al. investigated IA antibiotic infusion in patients with acute hematogenous PJI following TKA, combined with DAIR. Antibiotics were infused over a three-week period with dose escalation, achieving an infection control rate of 86.6%[3]. Perry et al. employed a pump system to deliver antibiotics continuously over 8 to 15 weeks, reporting an infection control rate of 83.3%[4].

In single-stage revision, IA antibiotic infusion has demonstrated significant efficacy in managing chronic PJI in both hip and knee arthroplasty. The Li Cao team reported infection control rates ranging from 87.1% to 90.2%, effectively addressing multidrug-resistant organisms, polymicrobial infections, culture-negative PJIs, and patients with multiple failed surgeries[5–9]. Notably, a success rate of 72.7% was achieved in fungal PJIs, underscoring its utility in challenging infections[10]. Particularly impactful in hip arthroplasty with cementless fixation, this approach eliminated reliance on high-dose antibiotic-loaded bone cement (ALBC). Antibiotics

were administered via a three-way branch system over 12 to 14 days, achieving therapeutic vancomycin concentrations in synovial fluid, with peak levels of 14,933.9 µg/mL and trough levels above 5,495.0 µg/mL at 24 hours, exceeding the minimum biofilm eradication concentration (MBEC)[11,12]. The safety profile was favorable, with no significant systemic toxicity reported and a low incidence of acute kidney injury[13,14]. Antony et al. reported an 89% clinical cure rate using IA antibiotic infusion via Hickman catheters over 4 to 6 weeks combined with aggressive debridement in single-stage revision[15]. Whiteside's team has employed IA vancomycin infusion via Hickman catheters since 1999, achieving clinical success rates up to 94.4%. Their protocol maintained synovial peak vancomycin concentrations of 9,242 µg/mL, with therapeutic trough levels sustained over six weeks. The infusion began at a low dose and was gradually increased over several days to a maintenance level, administered every 12 or 24 hours based on serum levels and patient tolerance. The safety profile was favorable, with minimal systemic side effects, and catheter-related complications, such as temporary occlusion and leakage were uncommon[16–19].

In two-stage revisions, a multicenter randomized controlled trial (RCT) assessed a seven-day IA antibiotic irrigation protocol for chronic PJI. High-dose antibiotics were intermittently delivered via a percutaneous catheter system immediately following debridement and prosthesis removal. The protocol demonstrated effective infection control by reducing inflammatory markers in the joint, preparing optimal conditions for second-stage reimplantation. The regimen was well-tolerated, with no systemic toxicity or renal impairment, and all experimental group patients underwent reimplantation within 7–9 days, compared to a longer interval in the control group [20].

Intraarticular antibiotic infusion is a valuable adjunct in PJI management, providing high local antibiotic concentrations while minimizing systemic toxicity. Its efficacy across DAIR, single-stage, and two-stage revisions supports its role as an essential treatment strategy. However, standardization of infusion protocols, including antibiotic selection, dosing strategies, and duration, remains a challenge. Future research should focus on optimizing these parameters and evaluating long-term outcomes through randomized controlled trials.

References

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