SH79: Is there a role for debridement, antibiotics and implant retention (DAIR) when treating acute shoulder PJI?

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Response: DAIR may have a role in the "early" management of acute PJI with well-fixed, and especially modular, implants.

Strength of Recommendation: Limited

Delegate Vote: 47 (92%) agree; 0 disagree; 4 (8%) abstain

Rationale: A comprehensive literature search was performed in 2024 using databases: Medline, Embase, Web of Science, CINAHL, Scopus, Cochrane, Clinicaltrial.gov and PubMed to identify all studies on irrigation and debridement with implant retention (DAIR) when treating acute shoulder PJI. The search terms were Periprosthetic Joint Infection or Prosthesis-Related Infections, Shoulder or Shoulder Pain or Shoulder Joint or shoulder, Shoulder Joint or Arthroplasty, Replacement, Shoulder or Arthroplasty, Replacement or shoulder arthroplasty or Joint Prosthesis, Surgical Wound Infection or Shoulder Prosthesis or Anti-Bacterial Agents or intrawound shoulder or Vancomycin, Arthroplasty, Replacement, Shoulder/ or Prosthesis-Related Infections or Anti-Bacterial Agents or chronic shoulder periprosthetic joint infection or Shoulder Joint, debridement, antibiotics and implant retention, persistent positive culture or positive culture, Orthopaedic / orthopedic procedures or orthopaedic / orthopedic surgical protocols or Postoperative Complications. The systematic review software Rayyan was used to deduplicate the articles and for the literature screening process. *Inclusion criteria* for the search were English language articles, all papers include the shoulder arthroplasty, or Periprosthetic Joint Infection. *Exclusion criteria* were non-English language articles, animal studies, single case studies, case report studies, cancer, dentistry, knee, hip, ankle, spine, and elbow papers, however due to the low number of relevant publications found, relevant lower limb PJI publications were also reviewed.

Although debridement, antibiotics, and implant retention (DAIR) for a well-fixed implant may have a role in the acute management of prosthetic joint infection (PJI), there are no prospective or randomised studies to clarify its effectiveness. This is compounded by the many variables included in the reported studies, which are of low power and vary with respect to timing, type of implant (anatomic vs. reverse), whether modular components are exchanged, method of irrigation/debridement, patient co-morbidities, virulence of the organism, and whether supplementary local or systemic treatment regimens are used. Timing however is suggested as being the most critical factor secondary to the formation of the biofilm, thereby limiting infection eradication.

There is, however, also no standardisation of what constitutes an acute infection, but it has been suggested by the Infectious Diseases Society of America, that acute shoulder PJI includes those cases that present within one month of the index surgery [1]. However, intervention within three months of the initial surgery is routinely used in shoulder related PJI publications [2 - 6]. Furthermore, the timing of the formation of the biofilm is not known and is likely to vary, which could account for some variation in the success of DAIR [7,8]. The duration of the symptoms related to the onset of infection has therefore also been suggested as being integral to the success of DAIR, with reports that experiencing symptoms for less than 21 days before intervention is linked to its potential success [1,4,5,9,10,11].

The lack of standardisation of definitions causes difficulties. Reports of outcomes following early diagnosis (< 3 months) and DAIR have been reported. In studies where DAIR was combined with polyethylene liner (PE) and glenosphere exchange in acute infections, 57% success was reported in a series of only seven patients, but 100% success was reported in a study of 8 cases, but where more than one DAIR procedure was undertaken in 6 shoulders (2.5 +/- 1.6 revision procedures) [10,12]. In a series where DAIR was performed with only PE exchange, 3 of 7 cases (43%) were reported as successful, which was similar to 50% (2 of 4 cases) in another study [13,14]. In contrast, studies reporting outcomes of DAIR with no modular exchange have also reported a success rate of 70.6% in a series of 17 patients where the treatment was undertaken in chronic cases, more than 12 months following implantation, which mirrors a success rate of 68.6% and 69.6% in two systemic reviews [15.16,17]. 50% success (2 of 4 shoulders) has also been reported using DAIR for acute infection without modular exchange [9].

Although any reported success of DAIR may be attributable to the timing of the surgical intervention, the outcomes are conflicting and other variables have also been suggested [18]. These include the presence of highly virulent organisms, such as methicillin-resistant *S. aureus* (MRSA), patient specific factors, and whether modular components are exchanged [4, 19]. The perceived relevance of the biofilm formation in the use of DAIR would suggest that debridement alone would be less successful than the exchange of modular components. Component exchange also has the theoretical benefit of decreasing the biofilm load, whilst also improving surgical access for sample collection, meticulous synovectomy, debridement and irrigation, all of which might increase the chance of successful treatment [2,7,20]. There is however no standardisation of the choice of irrigation fluid or its mode of delivery, which further confuses outcomes.

The theoretical advantage of a successful DAIR, particularly for reverse shoulder arthroplasty which is amenable to modular exchange, is to achieve better functional outcomes compared with single or two stage revision. A standardised technique, and adequate antimicrobial treatment remain crucial to the success of DAIR, however the use of antibiotics with bactericidal activity against biofilm producing microorganisms has also been suggested to improve outcomes [4,18,21]. The use of antibiotic loaded hydrogel gels and calcium phosphate antibiotic carriers may also play a role in improving outcomes, but there is currently no evidence for their use in shoulder PJI [22,23].

DAIR may therefore have a role in the management of acute shoulder PJI, providing adequate definitions regarding the timing of intervention, and the standardisation of what constitutes a DAIR, are defined, thereby enabling the development of prospective and informative studies.

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