SH83: Is there a role for routine exchange of all well-fixed implants in revision shoulder arthroplasty without clinical or radiographic signs of infection?

Liaison: Surena Namdari
Lead Delegate: Edward McFarland
Supportive Delegates: Tom Duquin; Gabor Skaliczki; Matthew DiPaola
Supportive Author: Bradley Hawayek; Jacob Mogerman

Response: There is not a role for routine exchange of well-fixed implants in revision shoulder arthroplasty without clinical or radiographic signs of infection.

Strength of Recommendation: Limited

Delegate Vote: 35 (97%) agree; 0 disagree; 1 (3%) abstain

Rationale: A comprehensive literature review was performed to identify all studies on modular shoulder arthroplasty systems and their outcomes when undergoing revisions. Searches for the terms "retention", "well fixed", "convertible", "conversion", "revision", "reoperation", and "shoulder arthroplasty" were performed using the search engines PubMed and Embase which were searched through December 2024. Inclusion criteria for our systematic review were all English studies (Level I-IV evidence) that reported on use of convertible systems in cases of revision shoulder arthroplasty. Exclusion criteria were non-English language articles, nonhuman studies, retracted papers, case reports, review papers, studies with less than <10 patients in the sample size, studies without clinical follow-up, and technique papers without patient data. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) criteria were followed. Thirteen articles met inclusion and exclusion criteria and were reviewed.

Revision shoulder arthroplasty in the setting of well-fixed components without clinical or radiographic signs of infection poses a decision-making challenge for shoulder arthroplasty surgeons. The high prevalence of *Cutibacterium acnes* in prosthetic joint infection (PJI) of the shoulder often makes diagnosis and treatment of PJI difficult. Options for single-stage revision include a complete revision with removal and explant of well-fixed components and reimplantation, or a modular exchange with retention of well-fixed components (ie humeral stem and/or glenoid component). The main benefit of modular exchange is the avoidance of additional morbidity associated with removal of well-fixed components, while one potential downside with retention of well-fixed components during revision is that in the case of an indolent infection, the retained components may act as a persistent nidus.

The use of modular exchange in revision total shoulder arthroplasty has been reported to result in shorter operative time, less estimated blood loss, and reduced complication rate.[1–7]. Revision of stemmed arthroplasties with complete removal of all components is a more demanding surgery, associated with increased operative time, increased estimated blood loss, and carries with it a possibility for humeral osteotomies and allograft augmentation.[4,5] Complication rates are also higher for complete exchange of components and include humeral shaft fractures and loss of both humeral and glenoid bone stock.[8,9]

There is currently a lack of evidence for or against the routine exchange of all well-fixed, well-positioned implants in the setting of revision shoulder arthroplasty without clinical or radiographic evidence of infection. Some studies have reported similar reinfection rates with

debridement and retention of well-fixed implants compared to complete single-stage and two-stage revisions, particularly in the acute setting.[10,11] Kew et al. explored outcomes after debridement, antibiotics, and implant retention (DAIR) found that DAIR was a viable option with similar reinfection rates as compared to two-stage revisions, 29.4% versus 23.8% respectively.[12] However, in other studies that directly compare modular exchange vs complete single-stage revision, complete single-stage revision has been reported to carry a significantly lower reinfection rate.[13] In studies evaluating complete single-stage exchange, Grosso et al. reported a reinfection rate of 5.9% in patients who underwent complete removal of all cemented components during revision.[14] Furthermore, studies by both Topolski et al. and Kelly & Hobgood demonstrated reinfection rates ranging from 13% to 25% respectively for patients undergoing complete single-stage revision in what was presumed to be aseptic shoulders.[15,16]

These studies have several major limitations which limit the ability to draw conclusions on the efficacy of modular component exchange versus complete exchange in the setting of patients undergoing revision with well-fixed components without clinical or radiographic signs of infection. First, there is a high level of heterogeneity of patient-related factors and treatment reported amongst the studies available. Most studies that compare complete versus modular component exchange did not specifically identify patients who did or did not have clinical or radiographic signs of infection at the time of revision surgery. Additionally, duration of follow-up was short. Although most studies had a minimum follow up of two years, some included patient's with as little follow up as 10 months, making it difficult to evaluate the risk of infection related complications in complete versus modular component exchange as patients may have experienced infection related complications that were missed due to short follow-up duration.

The current literature lacks evidence to determine the role of routine exchange of all well-fixed components in patients undergoing revision without clinical or radiographic signs of infection. Complete exchange carries risk of significant complications and further bony or soft tissue damage that may outweigh the risk of potential of recurrent infection long-term. Surgeons must weigh the risks and benefits of complete versus modular component exchange in these patients, and further prospective studies with standardized treatment protocols are needed to determine the role of complete vs modular exchange in this setting.

References:

1. Crosby LA, Wright TW, Yu S, Zuckerman JD. Conversion to Reverse Total Shoulder Arthroplasty with and without Humeral Stem Retention: The Role of a Convertible-Platform Stem. J Bone Joint Surg Am. 2017 May 3;99(9):736–42.

2. Williams PN, Trehan SK, Tsouris N, Dines JS, Dines DM, Craig EV, et al. Functional Outcomes of Modular Conversion of Hemiarthroplasty or Total to Reverse Total Shoulder Arthroplasty. HSS J Musculoskelet J Hosp Spec Surg. 2017 Jul;13(2):102–7.

3. Reuther F, Irlenbusch U, Kääb MJ, Kohut G. Conversion of Hemiarthroplasty to Reverse Shoulder Arthroplasty with Humeral Stem Retention. J Clin Med. 2022 Feb 4;11(3):834.

4. Magosch P, Lichtenberg S, Tauber M, Martetschläger F, Habermeyer P. Prospective midterm results of a new convertible glenoid component in anatomic shoulder arthroplasty: a cohort study. Arch Orthop Trauma Surg. 2021 May;141(5):717–24.

5. Kany J, Amouyel T, Flamand O, Katz D, Valenti P. A convertible shoulder system: is it useful in total shoulder arthroplasty revisions? Int Orthop. 2015 Feb;39(2):299–304.

6. Castagna A, Delcogliano M, de Caro F, Ziveri G, Borroni M, Gumina S, et al. Conversion of shoulder arthroplasty to reverse implants: clinical and radiological results using a modular system. Int Orthop. 2013 Jul;37(7):1297–305.

7. Wieser K, Borbas P, Ek ET, Meyer DC, Gerber C. Conversion of Stemmed Hemi- or Total to Reverse Total Shoulder Arthroplasty: Advantages of a Modular Stem Design. Clin Orthop. 2015 Feb;473(2):651–60.

8. Dilisio MF, Miller LR, Siegel EJ, Higgins LD. Conversion to Reverse Shoulder Arthroplasty: Humeral Stem Retention Versus Revision. Orthopedics. 2015 Sep;38(9):e773-779.

9. Cisneros LGN, Atoun E, Abraham R, Tsvieli O, Bruguera J, Levy O. Revision shoulder arthroplasty: does the stem really matter? J Shoulder Elbow Surg. 2016 May;25(5):747–55.

10. Jacquot A, Sirveaux F, Roche O, Favard L, Clavert P, Molé D. Surgical management of the infected reversed shoulder arthroplasty: a French multicenter study of reoperation in 32 patients. J Shoulder Elbow Surg. 2015 Nov;24(11):1713–22.

11. Jacquot A, Samargandi R, Peduzzi L, Mole D, Berhouet J. Infected Shoulder Arthroplasty in Patients Younger than 60 Years: Results of a Multicenter Study. Microorganisms. 2023 Nov 14;11(11):2770.

12. Kew ME, Mathew JI, Wimberly AC, Fu MC, Taylor SA, Blaine TA, et al. Outcomes after débridement, antibiotics, and implant retention for prosthetic joint infection in shoulder arthroplasty. J Shoulder Elbow Surg. 2024 Feb;33(2):e68–78.

13. Stone GP, Clark RE, O'Brien KC, Vaccaro L, Simon P, Lorenzetti AJ, et al. Surgical management of periprosthetic shoulder infections. J Shoulder Elbow Surg. 2017 Jul;26(7):1222–9.

14. Grosso MJ, Sabesan VJ, Ho JC, Ricchetti ET, Iannotti JP. Reinfection rates after 1-stage revision shoulder arthroplasty for patients with unexpected positive intraoperative cultures. J Shoulder Elbow Surg. 2012 Jun;21(6):754–8.

15. Kelly JD, Hobgood ER. Positive culture rate in revision shoulder arthroplasty. Clin Orthop. 2009 Sep;467(9):2343–8.

16. Topolski MS, Chin PYK, Sperling JW, Cofield RH. Revision shoulder arthroplasty with positive intraoperative cultures: The value of preoperative studies and intraoperative histology. J Shoulder Elbow Surg. 2006 Jul 1;15(4):402–6.