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CORR Insights®: Conversion of Stemmed Hemi- or Total to Reverse Total Shoulder Arthroplasty: Advantages of a Modular Stem Design

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Where Are We Now?

Care of patients with proximal humerus fractures and shoulder arthritis has advanced tremendously in the last half-century. What began as simple fracture

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management and palliative care for the patient with arthritis, was transformed in the 1970s by Neer’s seminal work [1], and now offers surgeons and their patients advanced surgical options for degenerative joint disease of the glenohumeral joint, complex proximal humerus fractures, and even arthritis in patients with rotator cuff deficiencies. As the use of shoulder arthroplasty has increased, so have the complications and need for revision arthroplasty. Wieser and colleagues have pointed out that failure of anatomic shoulder arthroplasty often results in conversion of anatomic constructs to semi-constrained devices such as reverse shoulder arthroplasty. As surgeons, we strive to minimize surgical trauma; intuitively, stem removal is potentially more destructive than retention. While reverse shoulder arthroplasty is not a

panacea, it has become one of the most common methods of revision, due to the nature of the soft-tissue or bone deficiencies. As a result, prosthetic designs are evolving to platform or convertible stems; theoretical advantages of these stems include the ability to serve as a single stem option for anatomic or reverse replacements and the ease of conversion from an anatomic construct to a reverse replacement in situ. The authors of the current study state the problems with stem removal and attempt to demonstrate the advantages of a convertible implant.

Where Do We Need To Go?

Because reverse shoulder arthroplasty, when used in the revision setting, has a high complication rate (as does anatomic revision) the authors postulated that better pain relief and improved function might be achieved with fewer complications if the primary stem did not need to be explanted. While this is

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intuitive, the authors confirmed that revision of a shoulder arthroplasty to a reverse replacement has less blood loss, shorter operative times, and fewer near-term complications when retention of the initial stem was possible. The intent of the current study, however, was not to identify the reasons for revision or to identify how to avoid revision. What's troubling is the fact that the average time from the index procedure to the revision was only 38 months. Additionally, the authors state that improper placement of the initial stem may preclude retention; in fact, 30% of the shoulders underwent removal of the modular stem. Additionally, the group with the stem exchanges often returned to the operating room for subsequent surgery. Wieser and colleagues also suggest that there may be a role for resurfacing or stemless humeral implants to avoid stem-related complications in revision shoulder arthroplasty. Along that line of reasoning, several manufacturers have introduced "stemless" shoulder arthroplasty, but as of this writing, none of these systems have been approved by the FDA. However, I have participated in the FDA Investigational Device Exemption for one such device and can offer that data

from Europe is encouraging. Additionally, other "stemmed" options with reduced geometry are currently available, but revision data has not entered the peer review. What also remains unknown, is whether a change in stem size can improve the index operation, extending the event horizon for revision.

How Do We Get There?

It remains unclear whether it is better to exchange an easily removable stem and perform a reverse shoulder arthroplasty, or to accept some compromise with a convertible stem if the position is not ideal. As implant designs evolve, improvements in technology will make revision from an anatomic implant to a reverse design easier. Caution must be exercised, however, as the adaptable implants are not a substitute for meticulous surgical technique, and this paper is specific to a single humeral implant. The authors provide some suggestions to aid surgeons with implant positioning; an intra-operative radiograph or c-arm is an essential adjunct, and is useful during both trialing and final implantation to assess

the quality of the reduction in both fracture and revision cases. Typically, the contralateral extremity can serve as the ideal template for the reconstruction. Moreover, different implant designs lend themselves more easily to explanation than conversion; this series cannot be extrapolated to all convertible stems, but could serve as a foundation to compare different systems. Case series of revision of resurfacing or stemless prosthesis to reverse arthroplasty would be needed to validate claims of easy revision. Studies that track the incidence of revision of shoulder arthroplasty based upon surgeon training or experience would help answer the question of who should be performing the cases. With the cost of revision shoulder arthroplasty, a careful evaluation of the reasons for revision and reasons for the index operation may be required, as one could argue that many of the initial cases may have had longer survivorship if a reverse arthroplasty had been performed.

Reference

1. Neer CS 2nd. Replacement arthroplasty for glenohumeral osteoarthritis. *J Bone Joint Surg Am.* 1974;56:1–13.