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CORR Insights®: Synthetic Mesh Improves Shoulder Function After Intraarticular Resection and Prosthetic Replacement of Proximal Humerus

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Where Are We Now?

The proximal humerus is a common anatomic location for the occurrence of sarcomas. Although various reconstruction options are available after intraarticular resec-

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tion, surgeons most commonly use endoprosthetic implantation. The glenohumeral articulation is extremely complex, composed of several musculotendinous units that all function synergistically to produce the most mobile joint in the body. This complexity is extremely difficult to reproduce after endoprosthetic reconstruction. As a result, two problematic issues tend to arise—instability and poor active ROM. Both of these conspire to produce a lifetime of poor function postoperatively in a frequently young and active patient population. Several solutions to these issues have been proposed. Use of allograft-prosthetic composites, which facilitate repair of the rotator cuff to the allograft, provides a theoretical advantage of biological healing [1]. Suture of the rotator cuff tendons directly to various synthetic mesh materials, which are wrapped

around the endoprosthesis, as has been reported in the current study, provides a solid and stable platform for which to repair the transected tendons [3]. In both of these situations, instability continues to be a problem in a subset of patients and functional ROM is rarely, if ever, obtained. A more recent development is the reverse shoulder prosthesis, which relies on the retained deltoid to allow for a more functional ROM. Despite some evidence that active ROM is improved, the evidence must be weighed against the risk of prosthetic loosening and subsequent need for revision [2]. It remains evident that a satisfactory solution still eludes us.

Where Do We Need To Go?

The study by Tang et al. is a nonrandomized comparison of two techniques of soft tissue reconstruction after intraarticular resection of the proximal humerus. An endoprosthesis was implanted into each patient and the remaining rotator cuff and deltoid were

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either repaired directly to the endoprosthesis or to a synthetic mesh that had been wrapped around the prosthesis and affixed to the remaining glenoid. An attempt was made to repair the tendons in an anatomic position with nonabsorbable sutures. Tang and colleagues carried out a comprehensive radiographic, clinical, and function assessment of the patients' outcomes. The authors found that patients who had synthetic mesh reconstruction had superior functional outcome using two validated outcome measures, had improved active ROM, and no instances of instability when compared with the group of patients who had no mesh reconstruction. The active ROM in this group of patients appears to be superior to most series in the literature. This is an important finding as impaired ROM is the most problematic outcome after proximal humerus resection. This development raises several questions (1) Is it the material that promotes ongrowth/ingrowth of soft tissue leading to improved tensile strength and therefore range of motion? (2) Is it the repair technique? (3) Does the postoperative rehab protocol affect ultimate ROM and functional outcome? (4) Although ROM is improved, it is nowhere near normal. Therefore, do other methods of reconstruction such as reverse shoulder arthroplasty deserve further consideration for reconstruction in these situations? (5) Are other

approaches, including tissue engineering of ligaments and tendons, likely to lead to improved reconstructive techniques and outcomes?

How Do We Get There?

Although the article by Tang et al. shows promising results in terms of improved function and ROM with mesh reconstruction, they are limited by the retrospective nature of the study and by potential biases that influence the results of studies of that design. Any studies to further address this issue ideally therefore should be prospective. Given the rarity of this surgical procedure, multicenter surgical trials will be needed to answer the important clinical questions that remain on this topic. We first should try to answer whether mesh reconstruction indeed is superior compared to repair of the rotator cuff directly to the endoprosthesis, in a prospective fashion with blinded observers to assess functional outcome and range of motion. This will help us learn whether the additional cost of mesh reconstruction, in terms of surgical time and material expense, is justified. Following that, we should thoroughly investigate the role of a reverse shoulder prosthesis in this clinical setting. Given the apparent improved functional outcome in retrospective studies, it merits prospective

comparison to mesh reconstruction, provided the latter demonstrates superiority in the initial inquiry I proposed. The additional cost and complications with reverse shoulder arthroplasty need to be investigated carefully. Finally, there needs to be ongoing translational research in tissue engineering of ligaments and tendons.

Our techniques of limb salvage surgery have improved in recent years, but reconstructive techniques generally have lagged behind. The development of a reconstructive method that also provides near-normal function of the shoulder after intraarticular resection and prosthetic replacement would be an enormous advance in our subspecialty.

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