

Editorial Commentary: Bridging Graft Techniques Improve Short-Term Outcomes for Irreparable Rotator Cuff Tear Repair



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Abstract: There is a growing need for nonarthroplasty treatment options for irreparable rotator cuff tears. Options include superior capsular reconstruction (SCR), tendon transfers, subacromial balloon spacer, bridge grafting, biological tubero-oplasty, and partial rotator cuff repair with or without augmentation. In our experience, repair with marginal convergence techniques is superior to SCR; if there is enough tissue, repair is the preferred strategy. In an effort to improve outcomes after repair, there has been increased interest in the use of interposition or bridging graft (BG) techniques, in which an allograft or autograft is secured on the humerus laterally and to the remnant tendon medially. Interposition or bridging grafts can be used to supplement partial repair in an effort to replace the patient's own missing tissues, and restore the biomechanical force couple of the rotator cuff and create a humeral head-depressing spacer effect in the subacromial space. These techniques show promising results compared to superior capsular reconstruction. Various graft options for BG are available, including human dermal allograft, fascia lata autograft, and tenotomized biceps autograft. Multiple animal studies have demonstrated that interposition grafts can improve the biomechanical properties of the repair construct, and histological studies in animal models have shown evidence of tissue in-growth into the BG, which could lead to increased repair strength over time. Finally, recent studies suggest that a bridging graft may improve short-term outcomes compared to partial repair alone. It remains to be seen whether this difference is clinically meaningful and durable.

See related article on page 251

The treatment of irreparable rotator cuff tears remains challenging for both surgeons and patients. Irreparable rotator cuff tears may present in the setting of prior chronic asymptomatic tears that become acutely symptomatic, following ignored or neglected traumatic tears, or as recurrent tears after prior rotator cuff repair. Asymptomatic rotator cuff tears are common and have been reported to be present in 30-40% of individuals above the age of 60 years.^{1,2} The natural history of untreated asymptomatic rotator cuff tears has been well studied, and 30-50% of these tears will progress over the next 2 to 3 years, which is typically associated with the development of symptoms, including pain and weakness.³⁻⁵ By the time these tears are detected, many are associated with significantly

increased retraction or muscle atrophy,^{4,6} factors associated with decreased chances for a successful repair.⁷⁻⁹ Although patients may mention a recent acute injury, this represents a chronic process.

Treatment options for irreparable rotator cuff tears include, but are not limited to, reverse total shoulder arthroplasty, superior capsular reconstruction, tendon transfers, subacromial balloon spacer, bridge grafting, biological tubero-oplasty, and partial rotator cuff repair with or without augmentation.^{10,11} As life expectancy grows and as the incidence of rotator cuff tears grows along with it, there continues to be interest in nonarthroplasty treatment options for irreparable rotator cuff tears. While superior capsular reconstruction remains helpful for certain patients, in our experience, when the senior author compared repair with marginal convergence techniques to superior capsular reconstruction (SCR), our institution found improved outcomes with repair, suggesting that if there is enough tissue to repair the tear, then that is the preferred strategy.¹² We prefer to use the patients' own

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tissue when possible, even if techniques such as margin convergence are required to complete the repair.

In an effort to improve outcomes after repair, there has been increased interest in the use of interposition or bridging graft (BG) techniques, in which an allograft or autograft is secured on the humerus laterally and to the remnant tendon medially.¹³ As was shown by Petrii et al.,¹⁴ BG techniques can be done with allograft tissues to restore the biomechanical force couple of the rotator cuff and to create a humeral head-depressing spacer effect in the subacromial space. Autograft tissue can be used for BG, thus presenting an option which retains and incorporates the patient's own tissue to achieve rotator cuff repair when repair of the native tendon to the footprint is not achievable. These techniques have shown promising results, even when compared to superior capsular reconstruction (SCR).¹⁵ Lin et al. performed a systematic review of 23 studies, including 238 patients who underwent SCR and 593 who underwent repair with BG techniques, and found that, while both groups had an improvement in clinical and functional outcomes, patients who underwent repair with BG augmentation had superior clinical and functional outcomes and a similar complication rate.¹⁶

Various graft options for BG are available, including human dermal allograft, fascia lata autograft, and tenotomized biceps autograft. Multiple animal studies have demonstrated that interposition grafts can improve the biomechanical properties of the repair construct, and histological studies in animal models have shown evidence of tissue in-growth into the BG, which could lead to increased repair strength over time.^{13,17,18} Mori et al. recently published a comparative study with a minimum follow-up of 7 years comparing outcomes after partial rotator cuff repair to partial repair with a BG technique using a fascia lata autograft and found superior Constant scores and Constant strength scores in the BG group.¹⁹ Lewington performed a meta-analysis of BG techniques and, while they observed promising results for the use of BG in rotator cuff repair, they noted that none of the 15 included studies were randomized, and only 2 were comparative.²⁰

In the present study, "Mini-Open Fascia Lata Interposition Graft Results In Superior 2-Year Clinical Outcomes When Compared to Arthroscopic Partial Repair for Irreparable Rotator Cuff Tear: A Single-Blind Randomized Controlled Trial," Ribeiro, Nogueira, Costa, Tenor, and da Costa address this need for randomized studies comparing partial repair with and without BG. The authors performed a single-blinded randomized controlled trial, in which 22 patients with irreparable rotator cuff tears were randomized to isolated arthroscopic partial repair of irreparable rotator cuff tears and 20 patients to mini-open partial repair with bridging interposition fascia lata autograft.²¹ There were no

differences in preoperative patient-reported outcome (PRO) scores or active range of motion between the two cohorts. At a minimum of 24 months postoperatively, the BG group had significantly better University of California at Los Angeles Shoulder (UCLA), American Shoulder and Elbow Surgeons (ASES), Constant, and visual analog scale for pain (VAS) scores, greater active external and internal rotation, and smaller difference in side-to-side frontal flexion strength. The minimally clinically important difference (MCID) for UCLA scores was exceeded by 100% of the graft group and 95% of the partial repair group, and by 100% of both groups for ASES scores. When retear rates were analyzed on magnetic resonance imaging by nonblinded raters, the retear rate in the BG group was significantly lower than the partial repair group (15.0 vs 45.5%).

There are many strengths to this study. There is huge potential for selection bias when making the decision to perform one of these two techniques, and the randomized study design helped address many of the shortcomings with prior retrospective comparative studies in this area. The authors evaluated patient demographics known to be associated with inferior outcomes, as well as tear size, pattern, and degree of muscle atrophy, and they found no difference between the two cohorts, further enhancing the validity of their findings.

Although both groups had excellent rates of achieving the MCID for the UCLA and ASES Score, it is worth noting that, while the BG group had greater UCLA and ASES scores, the difference in improvement between both groups did not reach the MCID. In other words, while BG techniques do appear to yield greater improvements in outcomes statistically, it is unclear whether this difference is clinically meaningful.

The authors defined irreparable tears as an irreparable supraspinatus with a repairable infraspinatus. There is a wide spectrum of irreparable rotator cuff tears with regard to the degree of fatty atrophy, tear size, and the number of tendons involved. It is important to judiciously use the term irreparable rotator cuff tears and to distinguish this from massive rotator cuff tears, as not all massive rotator cuff tears are irreparable. Indeed, we have certainly had multiple cases where, after the appropriate releases and other techniques, such as margin convergence, were performed, we were able to repair a seemingly irreparable massive rotator cuff tear.

We would not generalize the findings of this study to all irreparable rotator cuff tears, particularly those with an irreparable supraspinatus and infraspinatus, those that involve the axial plane force couple, or those that involve tendons from both axial and transverse force couples. Nevertheless, for this specific condition of an irreparable supraspinatus with a repairable infraspinatus and an otherwise intact axial force couple, the

data from this study supports the hypothesis that the BG technique shows promise. The authors advocate for using patients' own tissue when possible, which may be an important factor in improving healing, although it does add to the risk for some morbidity at the harvest site. We commend the authors for demonstrating how the use of a BG technique with fascia lata autograft may give partial repair a leg to stand on for the treatment of irreparable rotator cuff repairs.

Disclosure

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