EDITORIAL COMMENTARY

Arthroscopy
The Journal of Arthroscopic and Related Surgery
AANA ADVANCING THE SCOPE
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Editorial Commentary: Rotator Cuff Repair Augmentation: Arguably the Only Meaningful Improvement in Rotator Cuff Repair Outcomes in Last 40 Years, While Being Cost-Effective

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Abstract: Rotator cuff repair (RCR) remains one of the most commonly performed orthopaedic procedures and represents a dynamic scientific evolution. This progression toward optimizing patient outcomes has certainly been nonlinear, and it requires that we ask of ourselves: have advances in RCR delivered on this promise? Advances in surgical approach, repair configuration, and the introduction of marrow stimulation have produced largely equivalent outcomes, leaving retear rates persistently high, especially for large and massive tears. To that end, structural augmentation with allograft or xenograft has emerged as a notable exception, showing lower retear rates, improved functional outcomes, and structural integrity across multiple cohorts when compared with primary RCR alone. Despite a higher upfront cost and increased operative complexity, recent cost-effectiveness analyses affirm that allograft augmentation yields an incremental cost-effectiveness ratio within acceptable thresholds. This may challenge the philosophy that augmentation ought to be reserved only for revision or complex RCR. Xenograft, while cost-effective by some estimates, may represent a significantly higher complication profile without corresponding improvements in healing or function. The accumulating evidence positions allograft structural augmentation as arguably the only advancement in RCR that has delivered on the process of improving patient outcomes, and importantly, it does so while maintaining cost effectiveness.

Arthroscopy. 2026;00:1-3

Those interested in providing improved patient outcomes from rotator cuff repair surgery should read with great interest "The Use of Allograft or Xenograft Augmentation in Rotator Cuff Repair Is Cost-Effective Particularly With Allograft" by Kruse, Bouchard, Dagher, Hantouly, Parlange, Bhandari, and Khan.[1] Structural augmentation with either allograft or xenograft comes at a high upfront cost ($4360 in this study), increased surgical time, and increased surgical complexity; all of which have led to slow adoption of the technique for routine use. Despite the slow adoption, structural augmentation has not only decreased retear rates, but also optimized patient-reported outcomes while being cost-effective. This study showed an incremental cost-effectiveness ratio (ICER) well under the current accepted threshold of $100,000/QALYs (quality-adjusted life years), well above the $50,000/QALYs in our previous cost-effectiveness analysis, which found rotator cuff repair with graft augmentation to be cost-effective.[2,3] The study by Kruse et al. showed an incremental cost-effectiveness ratio of $18,844 for allograft augmentation and $62,620 for xenograft augmentation. Simply put, Kruse et al. conclude that structural augmentation with either xenograft or allograft leads to cost-effective improvements in patient outcomes, particularly with human allograft. This study further contributes to the literature that, in light of the impact on patient quality of life and the cost of revision surgery, graft augmentation of rotator cuff repairs should be considered in the setting of primary repair, not only reserved for revision or complex situations.

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View this article online at wileyonlinelibrary.com. DOI: 10.1002/arj.70344

This study highlights that while rotator cuff repair surgery remains one of the most common orthopaedic procedures performed, it remains in a constant state of evolution. The goal of this evolution has been better patient outcomes, but has this goal been obtained? Repairs began as open procedures, then mini open, then arthroscopically assisted, and lastly to the current gold standard of fully arthroscopic rotator cuff repair. The result? Incisions got smaller (although more of them), arguably with generally similar clinical outcomes. Similarly, repair techniques have evolved from transosseous tunnels to single row repair, to double row repair, to transosseous equivalent repairs (now commonly called suture bridge repairs), and now back to transosseous tunnels.[4] Despite this, studies routinely report that single row repair is inferior, while failing to show any clinical incremental improvement for all techniques since double row repair.[5,6] Initially, bone marrow stimulation at the tuberosity showed promise to stimulate healing, but recent randomized controlled trials and meta-analyses have shown no benefit to healing or outcomes.[7,8] Hernigou et al. showed a reduced concentration of mesenchymal stem cells present at the tendon-bone interface in torn rotator cuffs.[9] This has led to biologic augmentation during rotator cuff repair in the form of platelet-rich plasma and bone marrow aspirate concentrate, both of which have shown promise.[10,11] Simply primarily repairing the same tendon that was initially torn has had disappointing outcomes,[12] no matter how we tackle it via various surgical approaches, repair types, or bone marrow stimulation.

While all else has shown little progress, rotator cuff repair augmentation has shown improved healing rates and patient outcomes compared with nonaugmented repairs. Rotator cuff repair augmentation can be done either through biologic augmentation or structural augmentation, with the focus of this editorial on structural augmentation. Lee et al. showed that in a randomized control trial of large rotator cuff tears repaired with or without allograft augmentation, the augmented group displayed statistically significant increased ASES scores compared with the control group (78.9 vs 70.8; $P < .05$) and lower retear rates at 5.7-year follow-up (9.1% vs 38.1%; $P < .05$).[13] Similarly, a 2024 Level III meta-analysis compared allograft augmentation with primary rotator cuff repair, showing a lower retear rate in the augment group (11% vs 34, $P = .0006$) and improved ASES scores (87.7 vs 82.1; $P = .01$) and Constant score (90.1 vs 87.3; $P = .02$).[14]

Additionally, this study highlights a comparison of graft source options. This study showed that xenograft augments had a much higher incremental cost-effectiveness ratio, meaning a higher cost per quality-adjusted life year added compared with the allograft augment group. Similarly, a 2025 Level III meta-analysis showed that with xenograft augmentation, the retear rate, strength, and range of motion were not improved compared with the primary repair group, while having a significantly higher complication rate (OR 3.65, $P = .02$).[15] Human allograft tissue at this time appears to be superior in outcomes, with lower complication rates.

In conclusion, despite the constant evolution of rotator cuff repair techniques, graft augmentation of primary rotator cuff repairs is one of the only incremental improvements that has shown improved patient outcomes and lower retear rates. The concern for this augmentation has been both added surgical time and cost, but at this point, it is becoming clear that the added cost not only leads to better outcomes but is also cost-effective.

DISCLOSURES

The author (B.J.C.) declares the following financial interests/personal relationships which may be considered as potential competing interests: Aesculap/B.Braun and Medipost: Research support; *American Journal of Sports Medicine*: editorial or governing board; Arthrex and Moximed: IP royalties, paid consultant, research support; Bandgrip: stock or stock options; Elsevier Publishing: IP royalties, publishing royalties, and financial or material support; *Journal of the American Academy of Orthopaedic Surgeons*: editorial or governing board; JRF Ortho: other financial or material support; National Institutes of Health (NIAMS & NICHD): Research support; Ossio: stock or stock options. The other authors (R.J.Q., K.S.S.) declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this article.

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