

Editorial Commentary: Dermal Allografts Are Indicated for Repair of Irreparable Rotator Cuff Tears and for Revision Surgery, and May Be Cost-Effective for Primary Repair



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Abstract: Improving rotator cuff repair results is the goal of all shoulder surgeons. The addition of a biologic graft may speed healing, allow accelerated rehabilitation, and increase healing rates. Recent research suggests that augmentation of rotator cuff repair using dermal allograft may be cost-effective. Indications for dermal allografts are revision rotator cuff repairs and primary cuff repairs in which a tensionless repair cannot be accomplished. Allografts act as a load-sharing device to allow tendons to heal without tension. They also serve to fill the gap in irreparable cuff tears. It is important to understand that augmentation will not compensate for advanced muscle fatty atrophy or neurapraxia. Precautions to prevent *Cutibacterium acne* nosocomial infection are essential. The healing time of dermal grafts is considerably longer than the repaired native cuff tendon, requiring supervised rehabilitation. Dermal allografts are a crucial tool for repair of irreparable rotator cuff tears and for revision surgery. From an economic standpoint, they now also may be considered for use in primary rotator cuff repair surgery.

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Replacing rotator cuff tendons? DO let it get under your skin (dermal allograft).

We all want to improve our rotator cuff repair success rates. Dermal allografts play an important role in rotator cuff surgery. We owe a great debt to Steve Snyder (and our friends at Southern California Orthopedic Institute [SCOI], Mark Getelman and Joe Burns) and Alan Barber for what we know about the use of dermal allografts in rotator cuff surgery. They have instructed us about the technical aspects of the repair as well as biologic rationale for the repairs.¹⁻⁶ To this point, no study has evaluated the costs related to these techniques.

In "Rotator Cuff Repair With Graft Augmentation Improves Function, Decreases Revisions, and Is Cost-Effective"⁷ Drs. Quigley, Verma, Evuarherhe, and Cole make a strong economic argument for its use in primary

cuff repairs. This is a Level IV economic analysis whose stated purpose was "to evaluate the cost-effectiveness of the use of extracellular matrix (ECM) augment at the time of primary rotator cuff repair." Their conclusion was "Graft augmentation does come with a significant upfront cost; however, based upon our decision-tree analysis, it may represent a cost-effective procedure. There is evidence to potentially consider increased use in rotator cuff repairs, while being cost effective." This is an important first study that quantifies the full, all-encompassing costs of rotator cuff repair using dermal allograft supplementation for primary rotator cuff repair.

While the study's conclusions are easy to understand, the road to get to that ultimate destination is a little difficult. To help aid in understanding, allow me to define the study's acronyms:

- EQ-5D (European Quality of Life 5 Dimension): Descriptive system for health-related quality of life states in adults, consisting of 5 dimensions (Mobility, Self-care, Usual activities, Pain & discomfort, Anxiety & depression), each of which has 5 severity levels that are described by statements appropriate to that dimension.

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- ICER (Incremental Cost-Effectiveness Ratio): An incremental cost-effectiveness ratio is a summary measure representing the economic value of an intervention, compared with an alternative (comparator).
- QALY (Quality Adjusted Life Years): QALYs provide a common currency for measuring the extent of health gain that results from health care interventions and, when combined with the costs associated with the interventions, can be used to assess their relative worth from an economic perspective. Cost effectiveness is based on previous literature whereby an intervention is considered cost effective if the ICER is less than \$50,000/QALY.
- ECM (extracellular matrix): In this article, this means a dermal allograft.

It is acknowledged that this study has limitations. This is a retrospective review of a prospectively collected database spanning 18 years, introducing reporting bias. The study does not control for age differences and demography (body mass index, worker's compensation status, smoking status, athlete status, and type of previous surgery). Given the time range, the paper cannot control for advances in technology and surgical expertise. The study also does not account for the increased operating room time (and therefore increase costs) to secure a dermal allograft graft. However, these limitations do not outweigh the study's benefit to the scientific literature.

In our practice, over the past several years, we have focused on biologic grafts to speed healing, allow accelerated rehabilitation, and increase healing rates. Currently, we use dermal allografts for revision rotator cuff repairs and primary cuff repairs in which a tensionless repair cannot be accomplished. Allografts act as a load-sharing device to allow tendons to heal without tension.⁵ They also serve to fill the gap in irreparable cuff tears.^{6,8} It is important to understand that augmentation will not compensate for advanced muscle fatty atrophy or neurapraxia.⁹

We are always concerned about *Cutibacterium acnes* nosocomial infections in revision cuff surgery and in allograft procedures. *C acnes* is a lipophilic, anaerobic, non-spore-forming, gram-positive bacillus that mainly colonizes the pilosebaceous glands of human skin. It has been implicated as the leading cause of prosthetic joint infection and open shoulder surgeries. *C acnes* rarely manifests as overt clinical, laboratory, or imaging features.¹⁰ The diagnosis is highly dependent on the quality of the samples taken and the methodology used by the microbiology laboratory to isolate this bacterium. Culture time is long, so ask your laboratory to hold your specimen for at least 21 days.¹¹

We have all patients undergoing shoulder procedures that involve allografts (or open techniques) prophylactically apply Bactroban (mupirocin) to the inside of

both nostrils twice a day for 5 days before surgery. We previously had patients use chlorhexidine gluconate to gently wash their shoulder and axillae twice a day for 5 days before surgery. However, we now have them wash with 5% benzoyl peroxide based on newer studies.¹² During surgery, we do not permit the allograft to ever rest on the patient's native skin. Rather, while placing sutures and passing the allograft arthroscopically into the shoulder, the graft always rests on a dry sterile surgical towel.

The healing time of dermal grafts is considerably longer than the repaired native cuff tendon. Because of that, it is important that patient, therapist, and surgeon follow a very traditional rehabilitation protocol.^{1,3}

In conclusion, dermal allografts traditionally have given shoulder surgeons a crucial tool in the repair of irreparable cuff tears and in revision cuff surgery. From an economic standpoint, they now also may be considered for use in primary rotator cuff repair surgery. In other words, do let rotator cuff repairs get under your skin (dermal allograft).

References

1. Snyder SJ, Arnoczky SP, Bond JL, Dopirak R. Histologic evaluation of a biopsy specimen obtained 3 months after rotator cuff augmentation with GraftJacket Matrix. *Arthroscopy* 2009;25:329-333.
2. Wong I, Burns J, Snyder S. Arthroscopic GraftJacket repair of rotator cuff tears. *J Shoulder Elbow Surg* 2010;19:104-109.
3. Dierckman B, Ni JJ, Karzel RP, Getelman MH. Excellent healing rates and patient satisfaction after arthroscopic repair of medium to large rotator cuff tears with a single-row technique augmented with bone marrow vents. *Knee Surg Sports Traumatol Arthrosc* 2018;26:136-145.
4. Johns C, Snyder S. Massive irreparable rotator cuff tears: A solution that bridges the gap. *Sports Med Arthrosc Rev* 2015;23:130-138.
5. Barber FA, Herbert MA, Coons DA. Tendon augmentation grafts: Biomechanical failure loads and failure patterns. *Arthroscopy* 2006;22:534-538.
6. Barber FA, Herbert MA, Boothby MH. Ultimate tensile failure loads of a human dermal allograft rotator cuff augmentation. *Arthroscopy* 2008;24:20-24.
7. Quigley R, Verma N, Evuarherhe A Jr, Cole B. Rotator cuff repair with graft augmentation improves function, decreases revisions, and is cost-effective. *Arthroscopy* 2022;38:2166-2174.
8. Lewington MR, Ferguson DP, Smith TD, et al. Graft utilization in the bridging reconstruction of irreparable rotator cuff tears: A systematic review. *Am J Sports Med* 2017;45:3149-3157.
9. Laskovski J, Abrams J, Bogdanovska A, et al. Arthroscopic rotator cuff repair with allograft augmentation: Making it simple. *Arthrosc Tech* 2019;8:e597-e603.
10. Patel MS, Singh AM, Gregori P, Horneff JG, Namdari S, Lazarus MD. *Cutibacterium acnes*: A threat to shoulder surgery or an orthopedic red herring? *J Shoulder Elbow Surg* 2020;29:1920-1927.

11. Lutz M, Berthelot P, Fresard A, et al. Arthroplastic and osteosynthetic infections due to *Propionibacterium acnes*: A retrospective study of 52 cases, 1995-2002. *Eur J Clin Microbiol Infect Dis* 2005;24:739-744.
12. Kolakowski L, Lai JK, Duvall GT, et al. Neer Award 2018: Benzoyl peroxide effectively decreases preoperative *Cutibacterium acnes* shoulder burden: A prospective randomized controlled trial. *J Shoulder Elbow Surg* 2018;27:1539-1544.