

## ALLOMEND® CLINICAL REPORT SERIES

## VOLUME 2 - CASE STUDY

# SUPERIOR CAPSULAR RECONSTRUCTION WITH AN ACELLULAR DERMAL MATRIX FOR RECONSTRUCTION OF A MASSIVE, IRREPARABLE ROTATOR CUFF TEAR

W. Anthony Frisella M.D., M.A.  
Advanced Bone & Joint, St. Peters, MO

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## ABSTRACT

Massive, irreparable rotator cuff tears represent a clinical challenge in shoulder surgery. Although multiple treatment options have been proposed, clinical improvement is limited, especially in longer-term follow up.

Since 2016, the author has used dermal allograft for superior capsular reconstruction of the shoulder in younger patients with massive, irreparable rotator cuff tears. This paper presents a case in which AlloMend® Acellular Dermal Matrix (ADM) (AlloSource®, Centennial, CO) allograft was used for superior capsular reconstruction of the shoulder. At four months postoperatively, ultrasound examination showed the graft was intact. The patient reported a significant reduction in pain and demonstrated improved strength and range of motion.

## Introduction

Patients with massive rotator cuff tears typically present with pain, weakness and pseudoparalysis of the shoulder. The primary etiology of rotator cuff pathology is degenerative, with intrinsic biological factors and extrinsic mechanical factors also playing a role.<sup>1</sup>

Historically, treatment options for massive rotator cuff tears have included debridement of the torn tendon, partial repair, biceps tenotomy and latissimus tendon transfer.<sup>2-6</sup>

Reverse total shoulder arthroplasty, developed in France and approved in the United States in 2003, has been the treatment of choice for older patients with irreparable rotator cuff tears<sup>7</sup>. However, evidence suggests that the outcomes for reverse total shoulder arthroplasty are poor in younger patients<sup>8</sup> and deteriorate with time,<sup>9</sup> making this a less attractive option for this population.

Superior capsular reconstruction is a less morbid alternative to reverse total shoulder arthroplasty for younger patients with an irreparable rotator cuff tear. Superior capsular reconstruction was pioneered in Japan more than a decade ago. Fascia lata autograft, harvested from the thigh, was the graft material used in the original description of superior capsular reconstruction.<sup>10</sup> In the U.S., dermal allograft has been proposed as an alternative to fascia lata autograft, sparing the patient the additional morbidity of graft harvest from the thigh.<sup>11</sup> To date, the author has used AlloMend ADM allograft for capsular shoulder reconstruction procedures in 14 patients.

AlloMend® ADM is produced through a proprietary process of cleaning, rinsing and decellularizing donated human dermal tissue. It is terminally sterilized to a Sterility Assurance Level of  $10^{-6}$  and is available in a variety of thicknesses and sizes.<sup>12</sup>

In studies, AlloMend ADM (**Fig. 1**) exhibited significant tensile strength:  $20.7 \text{ MPa} \pm 2.2$ . Further, depending on the thickness of the graft, its suture retention strength ranged from 62 to 124 N/mm—and since thicker grafts are recommended for superior capsular reconstruction procedures, this meets or exceeds surgical requirements for use in a soft tissue environment. The graft would be as strong or stronger than the 2-0 suture used in its placement and the suture would be more likely to fail than the AlloMend ADM itself.<sup>13</sup>

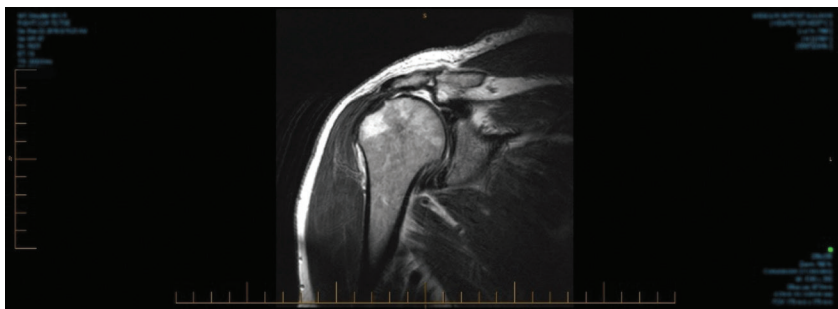


**Figure 1.** AlloMend ADM tissue allograft.

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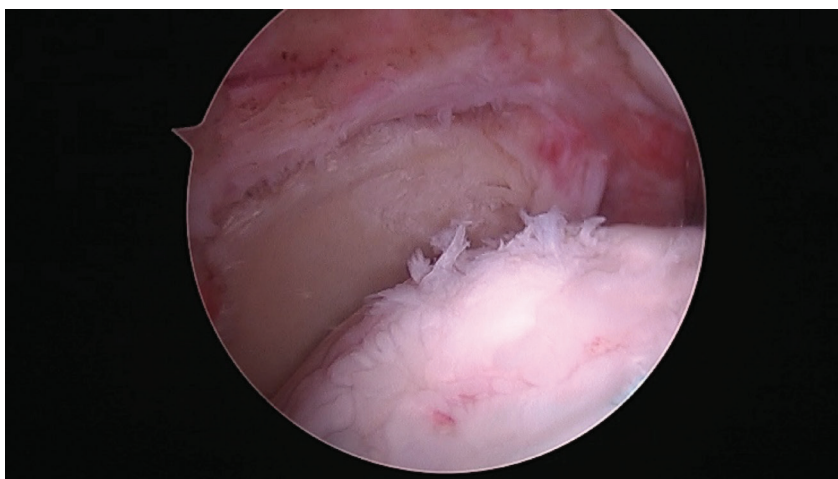
The patient is a 56-year-old male with a massive right rotator cuff tear that occurred five years earlier. He was able to function reasonably well for the first four years before experiencing an increase in pain and difficulty lifting his arm. Physical examination of the patient demonstrated 45 degrees of active abduction, 45 degrees of active forward flexion and profound weakness of 3/5 in external rotation. Passive range of motion was preserved and the arm could be brought into full forward flexion with assistance. His neurological examination, including deltoid function, was normal.

MRI showed a massive rotator cuff tear with proximal humeral head migration, atrophy of the supraspinatus and infraspinatus muscles and retraction of the residual rotator cuff tendon medial to the glenoid (**Fig. 2**). The patient underwent eight weeks of physical therapy but showed no improvement in function or pain reduction.



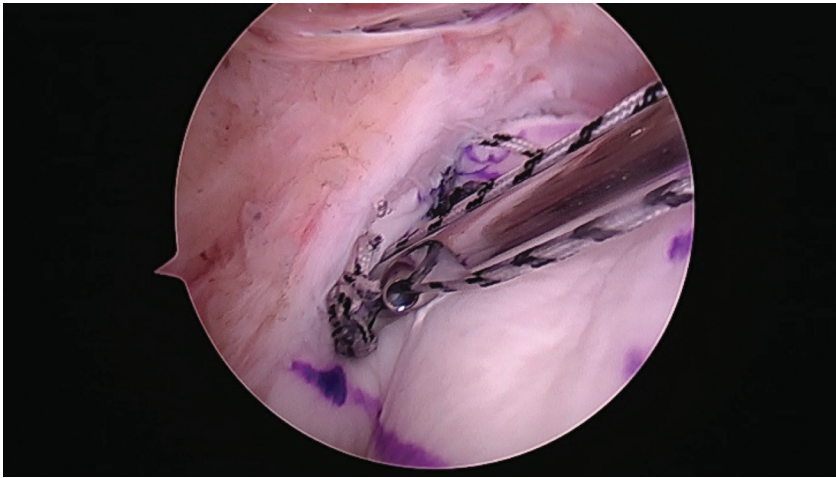
**Figure 2.** Preoperative MRI. The supraspinatous and infraspinatous tendons are torn and the humeral head is migrated proximally. Tendon retraction and muscle atrophy and fatty infiltration are present.

The patient underwent arthroscopic superior capsular reconstruction, and in the course of the surgery the author confirmed a massive, immobile and irreparable rotator cuff tear (**Fig. 3**).

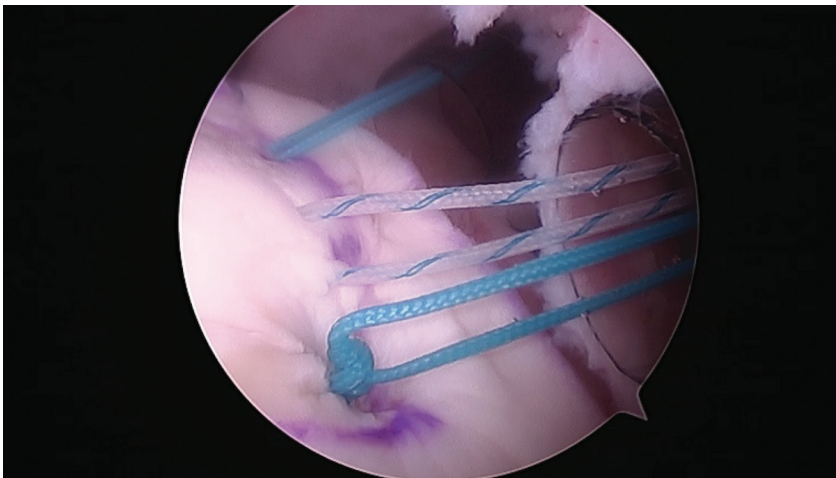


**Figure 3.** Initial operative findings confirmed a massive, irreparable rotator cuff tear. There is absence of the rotator cuff, which was immobile and irreparable.

The graft was cut to match the size of the defect with an additional allowance of 5.0 mm anterior-to-posterior and 1.0 cm medial-to-lateral graft to allow the graft to be repaired to the residual rotator cuff posteriorly and allow for a double-row repair laterally on the greater tuberosity. The graft was folded and passed into the shoulder joint through an arthroscopic cannula. It was affixed medially to the glenoid with multiple suture anchors (**Fig. 4**) and laterally to the greater tuberosity using a double-row technique (**Fig. 5**).

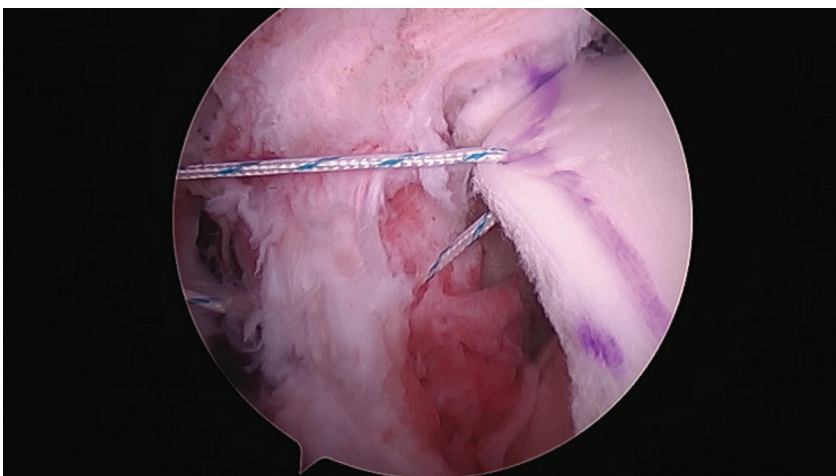


**Figure 4.** Graft fixation with suture anchors onto the glenoid.



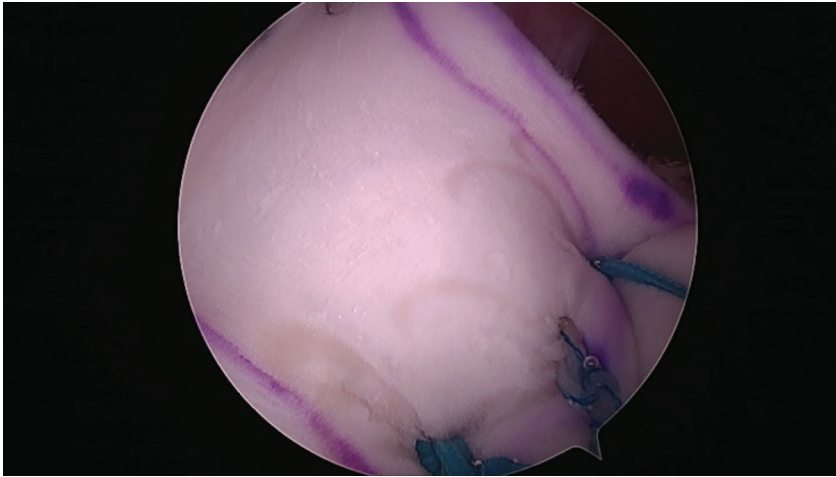
**Figure 5.** Graft fixation onto the greater tuberosity.

Sutures were placed between the graft and residual rotator cuff posteriorly (**Fig. 6**).

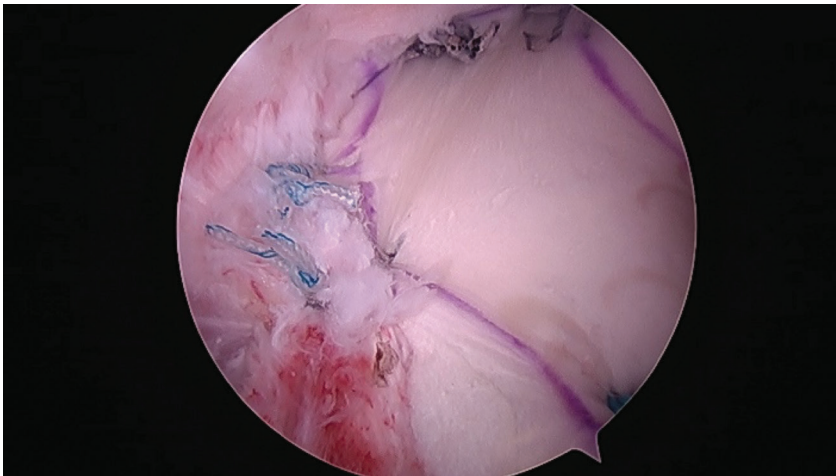


**Figure 6.** Incorporation of the graft into the residual posterior rotator cuff.

The final position of the graft bridged between the glenoid and greater tuberosity and incorporated the remaining posterior rotator cuff, eliminating the defect in the superior capsule (**Figs. 7 and 8**).



**Figure 7.** Final graft fixation on the greater tuberosity.

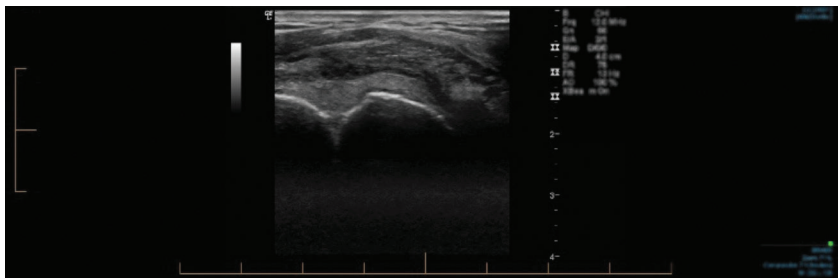


**Figure 8.** Final graft fixation on the glenoid.

Postoperatively, the patient remained in a sling for six weeks and underwent gentle, passive shoulder motion therapy under supervision. At six weeks, therapy was advanced to include active motion. Strengthening exercises were initiated at three months.



At his four-month evaluation, the patient reported a significant improvement in pain. Physical examination indicated forward flexion had increased from 45 to 150 degrees and rotator cuff strength had increased from 3/5 to 4/5. Ultrasound examination of the graft demonstrated that it was intact (**Fig. 9**).



**Figure 9.** Four months postoperative ultrasound. The graft is well-fixed at the greater tuberosity and passes under the acromion to the glenoid.

## Conclusion

Reconstruction of the superior capsule of this patient's shoulder using AlloMend® ADM resulted in significant improvement in subjective and objective outcome measurements. There was a marked improvement in reported pain levels, as well as in clinically observed function as measured by range of motion and strength. In addition, the graft remained in place as indicated by ultrasound imaging.

Thus, AlloMend ADM appears to be well-suited as an alternative to fascia lata autograft in superior capsular reconstruction to treat massive rotator cuff tears. Its high tensile strength and suture strength help ensure it will remain intact and in place in the presence of the significant biomechanical pressures and stresses in this location.

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12. Data on file at AlloSource.
13. Data on file at AlloSource.



W. Anthony Frisella, M.D., graduated magna cum laude from Harvard University in 1995 and went on to receive his medical training at Washington University in St. Louis, Missouri. After his residency in orthopedic surgery at the University of Iowa in 2006, Dr. Frisella completed a shoulder surgery fellowship at Beth Israel Medical Center in New York. In 2007, he joined Advanced Bone & Joint (then St. Peters Bone & Joint) in the St. Louis area where he specializes in disorders and injuries of the shoulder and upper extremity.

Dr. Frisella is board-certified by the American Academy of Orthopedic Surgery. He has served as an instructor in shoulder arthroscopy at the Orthopedic Learning Center in Chicago and has published papers, contributed a textbook chapter and spoken nationally on rotator cuff repair and shoulder replacement.

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