

# Interposition Grafting Using Fascia Lata Autograft for Failed Rotator Cuff Repairs



Yu-Mei Wu, B.S., Hang Tang, B.S., Yi-Fan Xiao, B.S., Yi-Lin Xiong, M.D., Wei-Jie Liu, B.S., Jia-Hao Meng, B.S., and Shu-Guang Gao, M.D.

**Abstract:** Massive rotator cuff tears are a huge challenge for orthopaedic surgeons, as the patients may be in need of multiple operations, even including reverse total shoulder arthroplasty. The various repair methods for the rotator cuff, such as partial rotator cuff repair, patch-augmented rotator cuff repair, bridging rotator cuff reconstruction with graft interposition, tendon transfer, and superior capsular reconstruction, have always been the focus of research. During surgical intervention for failed rotator cuff repairs, complexity of tears, poor tissue quality, retained hardware, and adhesions are the problems routinely encountered. In this Technical Note, we describe the technique of interposition grafting using fascia lata autograft to reconstruct the rotator cuff after failed primary repair.

A large number of patients with shoulder joint pain, with a significant proportion caused by rotator cuff diseases, come to the hospital every day. The monthly prevalence of rotator cuff diseases in the general population is reported to be between 18% and 31%.<sup>1</sup> If a cuff tear occurs without surgical treatment, it may lead to muscle atrophy, fatty degeneration, persistent pain, and/or shoulder dysfunction.<sup>1,2</sup> The cumulative adverse event risk of rotator cuff repair

(RCR) within 6 months is 18.5%, mainly including shoulder stiffness, persistent/worsening pain, cuff defects, neurologic lesions, surgical site infection, and so on.<sup>3</sup> The main factors influencing rotator cuff healing can be generally divided into patient-related factors (such as age, tear size, and fatty infiltration) and non-patient-related factors (such as postoperative rehabilitation protocol, surgical techniques, and procedures).<sup>4</sup>

For patients who have undergone arthroscopic RCR but have poor clinical outcomes or an increased tear size, reconstruction surgery is needed.<sup>5</sup> For massive rotator cuff tears, the surgical procedures can be very challenging, as large tear size and fatty infiltration will significantly affect surgical planning. Moreover, other factors such as smoking, obesity, vitamin D deficiency, and hyperlipidemia have been identified as independent risk factors for primary RCR failure and the need for revision surgery.<sup>4,6</sup>

Interposition grafting (IG) is an effective procedure for irreparable rotator cuff injuries. This technique reattaches the rotator cuff to the footprint via a graft for the purpose of maximizing the preservation of rotator cuff muscle function. Compared to superior capsular reconstruction (SCR), the IG technique is characterized by a lower complication rate and better restoration of muscle strength.<sup>7</sup>

## Patient Evaluation and Indications for Surgery

The indication for IG is a massive, irreparable rotator cuff tear. Magnetic resonance imaging (MRI) is commonly used to assess the presence and extent of

*From the Department of Orthopaedics, Xiangya Hospital, Central South University, Changsha, Hunan, China (Y.-M.W., H.T., Y.-F.X., Y.-L.X., W.-J.L., J.-H.M., S.-G.G.); Hunan Key Laboratory of Joint Degeneration and Injury, Changsha, Hunan, China (S.-G.G.); Hunan Engineering Research Center of Osteoarthritis, Changsha, Hunan, China (S.-G.G.); and National Clinical Research Center of Geriatric Disorders, Xiangya Hospital, Central South University, Changsha, Hunan, China (S.-G.G.).*

*Y.M.-W. and H.T. contributed equally to this work.*

*The authors report the following potential conflicts of interest or sources of funding: This work was supported by the National Natural Science Foundation of China (No. 81672225, 81601941); the National Clinical Research Center for Geriatric Disorders, Xiangya Hospital, Central South University (2021KFJJ06); and Hunan Provincial Natural Foundation of China (2021JJ30040). Full ICMJE author disclosure forms are available for this article online, as [supplementary material](#).*

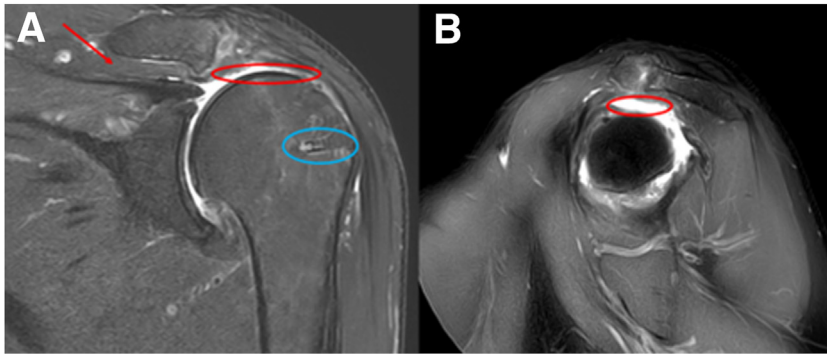
*Received July 4, 2023; accepted August 27, 2023.*

*Address correspondence to Shu-Guang Gao, M.D., Department of Orthopaedics, Xiangya Hospital, Central South University, No. 87 Xiangya Road, Changsha, Hunan, China 410008. E-mail: [gaoshuguang0341@qq.com](mailto:gaoshuguang0341@qq.com)*

*© 2023 THE AUTHORS. Published by Elsevier Inc. on behalf of the Arthroscopy Association of North America. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).*

*2212-6287/23942*

*<https://doi.org/10.1016/j.eats.2023.08.027>*



**Fig 1.** Preoperative coronal (A) and sagittal (B) views of magnetic resonance imaging of the left shoulder. A huge rotator cuff tear (red circle) can be seen. The supraspinatus has obvious retraction (red arrow), and the screws in the humeral head are basically stable (blue circle).

rotator cuff tears and is also an important tool for postoperative RCR examination (Fig 1). Poor-quality repairs and tendon retraction in modified Patte stage III are independent risk factors for postoperative retear.<sup>8</sup> Ultrasonography has similar diagnostic capabilities to MRI but is more convenient and economical. If ultrasonography or MRI cannot provide a diagnosis, magnetic resonance angiography may be required.<sup>9,10</sup> Patients experiencing failed RCR who have dynamic, functional demands and expectations may require revision surgery, with options including arthroscopic capsular release, rotator cuff reconstruction, superior capsule reconstruction, absorbable subacromial spacer, and reverse shoulder arthroplasty.<sup>11</sup> Specifically, arthroscopic IG using fascia lata autograft can restore shoulder function and result in a high proportion of recovery for recreational activities and work.<sup>12</sup>

In this Technical Note, we aimed to detail the technical steps (Table 1, Video 1) of arthroscopic IG using fascia lata autograft.

## Surgical Technique

### Anesthesia and Patient Positioning

Prior to entering the operating room, the patient is required to lie on a surgical bed fitted with a beach chair (Arthrex) to accept general anesthesia through an interscalene nerve catheter on the surgical side to reduce postoperative pain. After the general anesthesia is ready, the head and upper body are secured, and the beach chair is adjusted to 80° so that the patient can sit upright. The shoulder joint and outer thigh

of the operative side are then disinfected as appropriate.

### Diagnostic Arthroscopy

A standard arthroscopic posterior viewing portal is established approximately 2 cm medial and 2 cm inferior to the posterolateral corner of the acromion, followed by creation of the anterolateral and posterolateral approaches. The upper extremity is flexed 15° and abducted at 45° for subacromial diagnosis. The long head of the biceps tendon, glenoid labrum, subacromial surface of the rotator cuff, subscapularis tendon, and glenohumeral articular surface are explored sequentially. Then, the causes of rotator cuff repair failure are analyzed, and broken sutures, loose screws, and so on are checked carefully (Fig 2). After cleaning up the remaining stitches and grinding the shoulder seams into the desired shape, the edges of the tear are shaved to remove poor-quality tissue, and the footprint area is polished and shaped to improve healing after repair. Tears are deemed irreparable if the retracted tendon cannot be brought back to the footprint under reasonable tension.

### Graft Harvest and Preparation

The size of the broken area is measured using a suture lasso (Arthrex) preloaded with polydioxanone (PDS), and the distance from the stump to the greater humeral tuberosity is measured with the left upper extremity in 45° of abduction (both about 3.5 cm). An approximately 6-cm-long lateral thigh incision is created on the affected side to fully expose and intercept the fascia lata (8 cm long and 3 cm wide) from the middle. The fascia lata is then folded in half and sutured into a 4 × 3-cm patch with reinforced stitches (Smith & Nephew) (Fig 3).

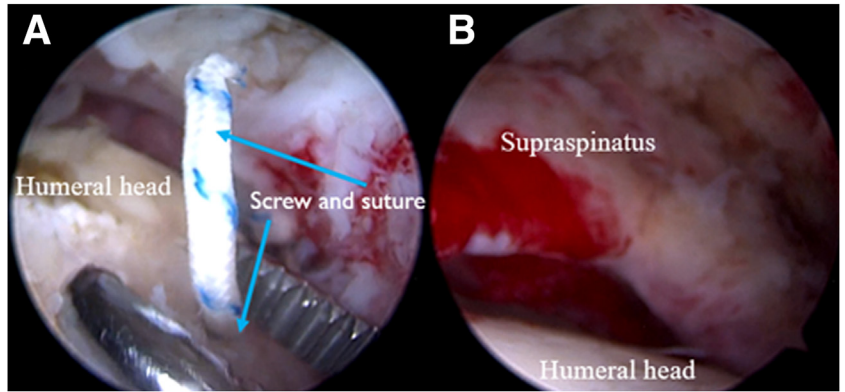
### Anchor Placement

The top of a 5-mL syringe is cut off to create a sheath (Fig 3), which is inserted through the anterior lateral approach to facilitate suture management. Four easily distinguishable sutures (white and colored) are evenly passed through the residual stump of the supraspinatus

**Table 1.** Tips and Main Surgical Procedures

Diagnostic Arthroscopy	Assess rotator cuff quality and confirm whether screws need to be removed.
Graft harvest and preparation	
Suture preparation on the humeral and rotator cuff sides	
Suture management and patch fixation	Suture of subscapularis and infraspinatus
	Implantation of lateral anchor

**Fig 2.** The remaining screws and the suture on the left humeral head are cleared under arthroscope in the beach-chair position. Then, stability of the screws is tested to ensure that they are firmly embedded in the left humeral head and can be retained. The supraspinatus is found retracted, but some rotator cuff masses are still acceptable. (Posterolateral approach)



with the aid of a suture gun (Smith & Nephew). Then, 2 suture anchors (4.5 mm TwinFix Ultra PK; Smith & Nephew) are screwed into the medial stop position of the supraspinatus at the greater tuberosity of the humerus. Subsequently, the 8 sutures on the anchors are pulled out one by one, with 2 threads of the same color clamped with hemostats for differentiation.

**Patch Fixing and Lateral Anchor Positioning**

The 4 sutures (Smith & Nephew) on the residual stump of the supraspinatus are passed through one end of the patch, and then the 8 sutures on the 2 anchors (4.5 mm TwinFix Ultra PK; Smith & Nephew) are evenly passed through the other end of the patch. After cutting the syringe sheath into pieces, the patch is pushed into the shoulder joint through the anterior lateral approach (Fig 4).

Subsequently, the sutures are tied onto the residual stump of the supraspinatus and secured, and the remaining part is cut off. Then, sutures of the same color are tied onto the anchor ends. The sutures are

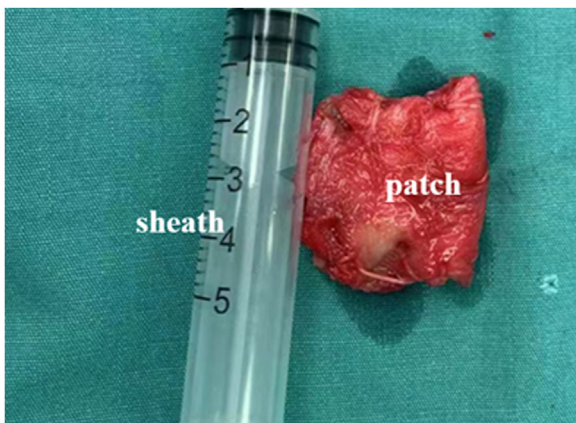
fixed by 2 shoulder lateral screws (5.5 mm PK; Smith & Nephew) for increased coverage, and the suture before and after the acromial fascia patch is reinforced. A nonabsorbable suture is passed through the subscapularis muscle and the patch at the front using a suture lasso (Arthrex) preloaded with PDS and sutured for reinforcement. Upon exploration, it is found that some areas behind the acromial fascia patch are not in close contact with the infraspinatus. Thus, a nonabsorbable suture (Smith & Nephew) is passed through the patch and the infraspinatus at the back and secured properly (Fig 5). It is observed that the acromial fascia patch is tightly sutured to the residual stump of the rotator cuff, and the defect above the greater tuberosity of the humerus is well covered. Finally, the incision is sutured to end the procedure (Fig 6).

**Rehabilitation**

In the early stage of postoperative rehabilitation (4-6 weeks), passive activities are allowed with the help of a healthy hand or rehabilitation therapist, during which the main objective is to exercise the range of motion of the shoulder joint. The shoulder joint on the surgical side is fixed with an abduction sling for 4 to 6 weeks. Active activity and gradual recovery of muscle strength training are initiated 8 weeks after surgery, but severe pain should be avoided.

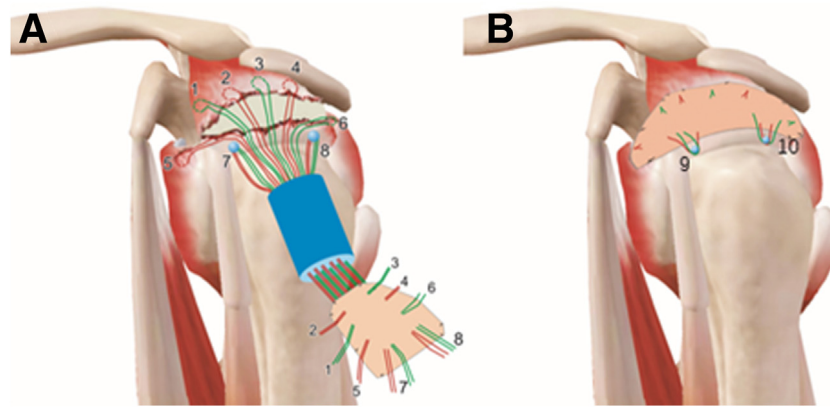
**Discussion**

Rotator cuff retearing is a common complication after RCR, which is found to be 15% within 3 months after surgery and 16% at 6- to 12-month follow-up. Therefore, for patients with extensive rotator cuff tears, the surgical plan must be carefully designed. In general, the larger the tear in the rotator cuff, the higher the risk of retearing. Moreover, many other postoperative factors also have an impact on retearing, such as active range of motion in the first 5 weeks after surgery, choice of suture method for initial rotator cuff tear, and the use of platelet-rich plasma (PRP) and tendon



**Fig 3.** The top of a 5-mL syringe is cut off to create a sheath. The fascia lata from lateral thigh incision is created on the affected side, folded in half, and sutured into a 4 × 3-cm patch with reinforced stitches.

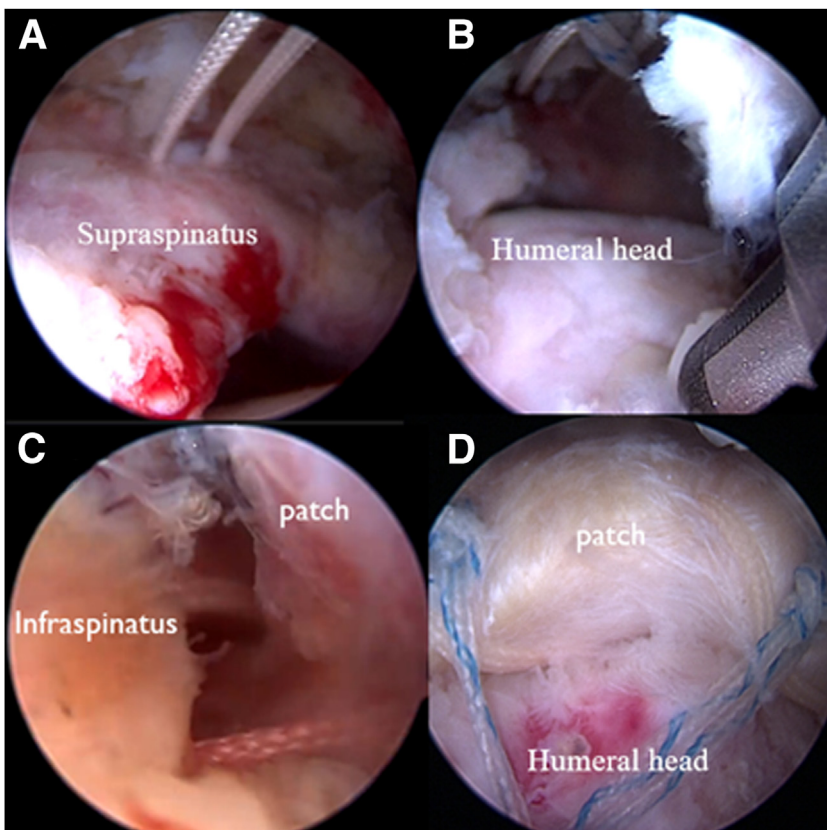




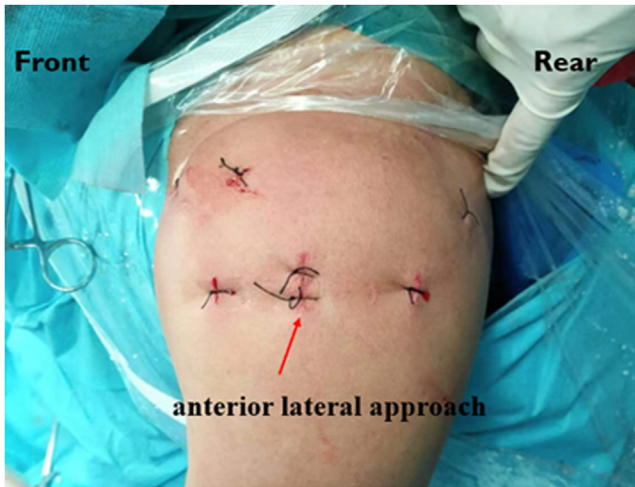
**Fig 4.** The 4 sutures (1-4) on the residual stump of the supraspinatus are passed through one end of the acromial fascia patch of the left shoulder, and the 8 sutures on the 2 anchors (7, 8) are evenly passed through the other end of the patch. Then, tears of subscapularis (5) and infraspinatus (6) are sutured with the patch (A). Subsequently, the sutures on the residual stump of the supraspinatus are tied and secured. After knotting the sutures of the same color on the anchor ends, 2 shoulder lateral PEEK (polyether ether ketone) screws (9, 10) are used to secure the remaining stitching for an increased coverage (B). (The observation approach is on the posterolateral approach, and the operation approach is on the anterolateral approach. Patient is in the beach-chair position.)

augmentation.<sup>4,13</sup> Such patients usually have large rotator cuff tears that cannot be repaired. If they are complicated with shoulder osteoarthritis, reverse total shoulder arthroplasty is also needed. In the shoulder-sparing surgery, SCR is more widely used and

reported than rotator cuff reconstruction. IG using fascia lata autograft to the ruptured rotator cuff can not only partially repair the supraspinatus, subscapularis, and infraspinatus but also construct the stress chain (Table 2).



**Fig 5.** Four sutures are inserted on the side of the left supraspinatus (A) under arthroscope, and 2 internal threaded screws are inserted into the greater tuberosity of the left humerus (B). After pulling in and fixing the patch, the torn infraspinatus is sutured onto the patch and secured with a knot (C). The remaining suture is fixed with external rows of screws to enhance the coverage (D). (A, B, D: Posterolateral approaches, C: Anterolateral approaches)



**Fig 6.** The incision is sutured to end the procedure of the left shoulder in the beach-chair position.

In 1978, Neviaser et al.<sup>14</sup> first proposed the use of grafts to repair false rotator cuff tears. Thereafter, the choice of grafts and the technique of using grafts for repair have become a research hotspot. Specifically, the choice of grafts for rotator cuff reconstruction is similar to that for SCR. In addition to the fascia lata autograft mentioned in this Technical Note, dermal allograft, polyglycolic acid sheet patch graft, latissimus dorsi transfer, and doubled autologous semitendinosus tendon graft have also been used as grafts for irreparable rotator cuff injuries.<sup>15-18</sup> Recently, Awad et al.<sup>19</sup> reported the use of an acellular dermal matrix to reconstruct an irreparable rotator cuff tear, which achieved promising medium-term results.

For rotator cuff reconstruction, one end of the patch needs to be bridged with a separate suture or screw to the footprint. The complex suture management and suture fixation of the patch through the surgical pathway are one of the reasons for the higher technical difficulty of the surgery. To ensure the graft and sutures not becoming entangled within the cannula or inside the joint, Rashid et al.<sup>20</sup> used a sleeve made of a 10-mL syringe for suture management and reported good results while avoiding many troubles during the surgical process.

For young patients with high functional requirements, SCR can be implemented for irreparable

large rotator cuff injuries when the shoulder is not complicated with osteoarthritis.<sup>21-23</sup> While restoring the stability of the shoulder, this technique does not need to repair tears of the supraspinatus tendon and infraspinatus tendon. IG is mainly suitable for rotator cuff tears with the following characteristics: (1) unable to be retracted, (2) having no severe fat infiltration, (3) the remaining rotator cuff having good texture and toughness, and (4) not prone to re-tear by suture cutting.

Some shortcomings involved in our surgical technique should be admitted. Due to limited application in clinical practice, the surgical time of this technique is relatively long, as it requires exploration and cleaning of the joint cavity, removal of the fascia lata autograft, and implantation and fixation of patches. The long surgical duration, coupled with the use of implants and grafts, leads to an increased risk of infection at the surgical site. The remaining sutures, screws, and poor-quality tissue from the first surgery need to be carefully cleaned, and factors like whether the remaining screws should be removed or kept in the joint need to be evaluated cautiously based on the actual situation. Moreover, careful attention should be paid to the placement of screws and the abduction angle of the shoulder during patch fixation. If the screws are too tight, the patient may have postoperative pain or even re-tearing. On the other hand, if the screws are too loose, the rotator cuff function cannot be restored desirably.

IG using fascia lata autograft for rotator cuff reconstruction is a promising surgical approach for the treatment of recurrent rotator cuff tears after repair. This technique can repair multiple rotator cuff injuries to the greatest extent, restore the function of the shoulder joint, and effectively relieve pain. It is particularly suitable for young patients with huge rotator cuff injuries. However, the current application of this technique is limited and there is a lack of effective long-term follow-up results.

## References

- Whittle S, Buchbinder R. In the clinic. Rotator cuff disease. *Ann Intern Med* 2015;162:Itc1-15.
- Saveh Shemshaki N, Kan HM, Barajaa M, et al. Muscle degeneration in chronic massive rotator cuff tears of the shoulder: Addressing the real problem using a graphene matrix. *Proc Natl Acad Sci U S A* 2022;119:e2208106119.
- Felsch Q, Mai V, Durchholz H, et al. Complications within 6 months after arthroscopic rotator cuff repair: Registry-based evaluation according to a core event set and severity grading. *Arthroscopy* 2021;37:50-58.
- Longo UG, Carnevale A, Piergentili I, et al. Retear rates after rotator cuff surgery: A systematic review and meta-analysis. *BMC Musculoskelet Disord* 2021;22:749.
- Lee S, Park I, Lee HA, Shin SJ. Factors related to symptomatic failed rotator cuff repair leading to revision

**Table 2.** Advantages and Disadvantages

Advantages	Disadvantages
Lower complication rate	Suture management is relatively complex
Better restoration of muscle strength	Longer operation time
Joint preservation surgery restores faster	Possibility of re-tearing

- surgeries after primary arthroscopic surgery. *Arthroscopy* 2020;36:2080-2088.
6. O'Donnell EA, Fu MC, White AE, et al. The effect of patient characteristics and comorbidities on the rate of revision rotator cuff repair. *Arthroscopy* 2020;36:2380-2388.
  7. Baek S, Shin MH, Kim TM, Im JM, Oh KS, Chung SW. Clinical outcomes of interposition graft versus superior capsular reconstruction in patients with irreparable rotator cuff tears: A systematic review and meta-analysis. *Orthop J Sports Med* 2021;9:23259671211022241.
  8. Guo S, Zhu Y, Song G, Jiang C. Assessment of tendon retraction in large to massive rotator cuff tears: A modified Patte classification based on 2 coronal sections on preoperative magnetic resonance imaging with higher specificity on predicting reparability. *Arthroscopy* 2020;36:2822-2830.
  9. Roy JS, Braën C, Leblond J, et al. Diagnostic accuracy of ultrasonography, MRI and MR arthrography in the characterisation of rotator cuff disorders: A systematic review and meta-analysis. *Br J Sports Med* 2015;49:1316-1328.
  10. Gyftopoulos S, Cardoso MDS, Rodrigues TC, Qian K, Chang CY. Postoperative imaging of the rotator cuff: A systematic review and meta-analysis. *AJR Am J Roentgenol* 2022;219:717-723.
  11. Desmoineaux P. Failed rotator cuff repair. *Orthop Traumatol Surg Res* 2019;105:S63-S73.
  12. Mihata T, Lee TQ, Hasegawa A, et al. Five-year follow-up of arthroscopic superior capsule reconstruction for irreparable rotator cuff tears. *J Bone Joint Surg Am* 2019;101:1921-1930.
  13. Sheps DM, Silveira A, Beaupre L, et al. Early active motion versus sling immobilization after arthroscopic rotator cuff repair: A randomized controlled trial. *Arthroscopy* 2019;35:749-760.e742.
  14. Neviasser JS, Neviasser RJ, Neviasser TJ. The repair of chronic massive ruptures of the rotator cuff of the shoulder by use of a freeze-dried rotator cuff. *J Bone Joint Surg Am* 1978;60:681-684.
  15. Hirahara AM, Adams CR. Arthroscopic superior capsular reconstruction for treatment of massive irreparable rotator cuff tears. *Arthrosc Tech* 2015;4:e637-641.
  16. Mochizuki Y, Ochi M. Clinical results of arthroscopic polyglycolic acid sheet patch graft for irreparable rotator cuff tears. *Asia Pac J Sports Med Arthrosc Rehabil Technol* 2015;2:31-35.
  17. Muench LN, Kia C, Williams AA, et al. High clinical failure rate after latissimus dorsi transfer for revision massive rotator cuff tears. *Arthroscopy* 2020;36:88-94.
  18. Milano G, Saccomanno MF, Colosio A, et al. Arthroscopic superior capsule reconstruction with doubled autologous semitendinosus tendon graft. *Arthrosc Tech* 2020;9:e1665-e1672.
  19. Awad MA, Sparavalo S, Ma J, King JP, Wong I. Interposition graft bridging reconstruction of irreparable rotator cuff tears using acellular dermal matrix: Medium-term results. *Arthroscopy* 2022;38:692-698.
  20. Rashid MS, Novak M, Lo A, Lo IKY. A technique using an easy-to-fabricate cannula to manage sutures and aid graft passage in arthroscopic superior capsular reconstruction. *Arthrosc Tech* 2019;8:e847-e850.
  21. Mihata T, Lee TQ, Hasegawa A, et al. Arthroscopic superior capsule reconstruction can eliminate pseudoparalysis in patients with irreparable rotator cuff tears. *Am J Sports Med* 2018;46:2707-2716.
  22. Mihata T, Lee TQ, Fukunishi K, et al. Return to sports and physical work after arthroscopic superior capsule reconstruction among patients with irreparable rotator cuff tears. *Am J Sports Med* 2018;46:1077-1083.
  23. Smith TJ, Gowd AK, Kunkel J, Kaplin L, Waterman BR. Superior capsular reconstruction provides sufficient biomechanical outcomes for massive, irreparable rotator cuff tears: A systematic review. *Arthroscopy* 2021;37:402-410.