Arthroscopic Treatment of Irreparable Rotator Cuff Tears using Fascia Lata Autografts: Preliminary Results

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Abstract

Better knowledge of lesion patterns together with advances in surgical devices and techniques have allowed the arthroscopic repair of large rotator cuff tears. However, there are still challenging situations such as chronic retracted degenerated cuff tears whose results of primary anatomic repair attempts are uncertain and unsatisfactory. Many of these tears are considered irreparable.

Recently, extracellular matrix scaffolds and tendon grafts have presented good results in the management of these “irreparable” tears. In order to evaluate preliminary results of fascia lata autograft for treating complex irreparable rotator tears, five patients were operated and followed by a mean of twelve months. Outcomes were measured using the UCLA, Visual Analogue Score for pain (VAS) and Constant scores. Results demonstrated fascia lata technique is useful to treat irreparable rotator cuff tears rendering significant functional improvement for patients.

Keywords: Arthroscopy, fascia lata, autologous tendon graft, massive rotator cuff tears.

Introduction:
Rotator cuff tear is an important cause of shoulder pain and disfunction. It affects about 40% of the United States population over 60 years-old requiring 30,000 to 75,000 rotator cuff repairs annually [1,2]. The rotator cuff tear is an important cause of shoulder pain and functional limitation. It affects approximately 40% of patients over 60 years old in the United States and between 30,000 to 75,000 rotator cuff repairs are performed annually [1,2]. Better knowledge of lesion patterns together with advances in surgical devices and techniques have allowed an overall tendon healing of 80% for smaller tears. On the other hand, large and massive tears are still a challenge for orthopedic surgeons. Their healing rates are lower than 30% [3]. To reduce failure of massive tears repairs, adjuvant grafts like synthetic dermal grafts, extracellular matrix scaffolds and fascia lata autografts have been proposed [4,5].

The purpose of this study is to evaluate preliminary results of arthroscopic treatment of massive irreparable rotator cuff tears using an autologous fascia lata graft to fill the cuff-to-bone gap.

Methods

Inclusion and Exclusion Criteria

Patients whose MRI presented supraspinatus and/or infraspinatus tears greater than 3 cm in medial-lateral or antero-posterior diameters and muscle fat degeneration stages III or IV of Goutallier-Fuchs [6] classification were considered potential irreparable tears. They were advised pre-operatively about the possibility of requiring a fascia lata autograft in case a tension-free tendon-to-bone reattachment cannot be achieved using conventional cuff repair techniques. Thus, at the time of surgery the ipsilateral thigh was harvested to serve as a free autologous fascia lata graft.

Exclusion criteria: (1) Goutallier-Fuchs stages I and II; (2) Neurologic impairment; (3) Irreparable subscapularis tears; (4) Rotator cuff arthropathy greater than stage 2 of Seebauer classification [7].

MRI evaluation

The degree of fatty infiltration of...
Operative Technique and Fascia Lata autograft usage decision during surgery

With patient in lateral decubitus under general anesthesia and traction on arm, camera was introduced on posterior portal to evaluate the glenohumeral joint. At this stage, subscapularis tendon was evaluated and repaired if necessary. Also, long head of biceps was evaluated for instability or degeneration and if positive, a tenotomy or tenodesis were performed.

After that, the scope was taken to subacromial space and bursectomy was performed. Rotator cuff tear was identified and classified according to shape (L, inverted L, U or C), length and retraction (width) using a calibrated ‘probe’. Tears greater than 5 cm in length or width were classified as massive. If between 3 and 5 cm, they are graded as large [6].

The cuff repair was always tried aiming a tension-free tendon-to-bone attachment. Capsular release, rotator interval sliding and tendon-to-tendon stitches were used when necessary. If even after that, there was still a gap between the tendon and the greater tuberosity, the tear was considered irreparable and fascia lata autograft was used to fill in the gap.

**Fascia lata autograft removal from ipsilateral thigh**

The fascia lata autograft was removed from ipsilateral thigh using a lateral incision 10 cm above knee joint line. (Figure 1). To avoid insufficient graft tissue, we always oversized 5 mm in addition to gap length and width. Finally, edges of graft were tied with a continuous PDS 5.0 suture (figure 2).

**Graft placement and tendon-to-graft repair**

Usually five portal were used to tendon-to-graft suture: posterior, anterolateral, lateral, lateral accessory and Neviaser. If necessary other portals may be used to reach a better angle for anchor insertion, sutures placement or adhesion releases. Cannulas were introduced on posterior, anterolateral and lateral portals. Two No.2 Ethibond threads were placed at supraspinatus edge through Neviaser portal. One thread at infraspinatus through posterior portal. Moreover, another thread at rotator interval through anterolateral portal. All four threads were taken to the lateral cannula to be stitched to the fascia lata graft. Afterwards, each thread was repositioned to its respective portal.

Introducing the graft onto subacromial space was always a delicate step, which requires progressive traction to threads and concomitant assistance to pass the graft through the lateral cannula avoiding folding or twist. In this way, the graft was strained open in the subacromial space with the use of a probe and knots were performed is the following sequence (figure 4): first two knots on the supraspinatus; then the one on infraspinatus; and finally the rotator interval knot.

At last, two or three suture anchors were placed on greater tuberosity to attach the graft to bone with ‘Revo’ simple knots.

**Post-operative care**

All patients were immobilized with a sling for 60 days. At fourth month
postoperatively, a MRI was done to evaluate healing and positioning of the graft (figure 5).

Results
From January to June 2016, eight patients received the fascia lata grafting for irreparable rotator cuff tears. Three patients were male and two females. They were followed up for an average of nine months post-operatively (6 to 18 months). Average age was 67 year-old (49 to 80 range). According to Goutallier-Fuchs, five patients were classified as stage III and three stage IV. All patients were Patte's grade III. Four cases were failed repairs and four were primary surgeries. Three cases required subscapularis repair and biceps tenotomy was performed in four cases and one biceps tenodesis was performed (Table 1).

Functional scores
VAS pre-operatively was 7.87±0.55 and decreased to 1.25±0.37 points post-operatively (P<0.001) (Table 2). The Constant score raised from 34.38±2.73 to 85.00±1.73 (P<0.001) (Table 3). In addition, UCLA score improved from 10.50±1.82 to 32±0.48 (P<0.001) (Table 4).

All curves passed in the DAgostino & Person normality test. Statistical analysis was performed by using the Student's T test. Scores improvement was as follows in Table 5.

MRI evaluation
All eight cases repeated MRI after 16 weeks of surgery. Seven patients presented continuity of tendon fibers-to-graft and graft-to-bone suggesting complete graft healing. One case presented a hypersignal on graft-to-bone interface at one coronal slice, which suggests incomplete integration of graft to bone. However, other slices had normal graft-tendon interface signals and patient had satisfactory functional scores. So, seven cases were considered to have complete healing and one partial healing.

Complications
There was one case of hematoma at the donor site for fascia lata graft that resolved spontaneously. Another patient had a frozen shoulder that evolved to complete ROM after six serial suprascapular nerve blocks. Seven patients presented pain at the surgery site.

Discussion
A reason for difficult treatment of massive rotator cuff tears is that pathogenesis of these lesions has not been fully clarified yet. Besides, rotator cuff has limited healing capacity at its humeral insertion. To overcome these limitations, new techniques have been proposed, like improving biomechanics with double-row repairs, biological enhancements using growth factors, cytokines, platelet-rich plasma (PRP), tendon grafting, extracellular scaffolds, gene therapy and tissue engineering on mesenchymal cells 1. Nowadays, extracellular matrix derivative scaffolds, polyurethane-urea and poly-L-lactic (PLLA) are commercially available and FDA approved to enhance rotator cuff repairs in humans. Their aim is to serve as a patch attached to the cuff supporting cell ingrowth over it [1]. Several studies have demonstrated pain reduction, improved daily live activities, satisfaction and cuff strenght increase with these scaffolds compared to pre-operative conditions [1,2]. Other option available is the human dermal matrix allograft for tendon augmentation. The allograft is processed and become acellular, which reduces immunogenic response, while extracellular collagen matrix remains intact and provide strength and support to tissue ingrowth [2].

The muscle fascia has similar structural and biochemical properties of a healthy tendon, but it has poor suture retention properties (10N), which limits its utility as a scaffold for rotator cuff repairs [1]. An alternative solution is to reinforce fascia with a PLLA polymer. Studies have showed that this technique may improve suture retention properties and decrease cyclic retraction gaps, turning it comparable to a human tendon. Soon, there will be reinforced fascias that will provide the necessary mechanical strength to enhance rotator cuff repairs, minimizing retractions and reducing repair failures [1].

Fascia lata autografts are consolidated techniques widely used in many areas of medicine like plastic surgery, neurosurgery, urology, orthopedics and ophthalmology. Complex cases head trauma with extensive loss of the scalp have shown good results using fascia lata grafts [13]. Barbosa et al used the fascia lata tensor muscle for operative wound complications in patients with genital neoplasia and severe inguinal defects, reporting that the graft is an important tool for reconstructing the inguinal ligament [14]. Sebastiá et al showed that fascia lata graft reduces incidence of complications in reconstructions of anophthalmic cavity with inclusion of implants coated with this graft [15]. Bayat et al used a fascia lata graft in an alpinist to reconstruct bilateral chronic retracted distal biceps rupture. Results were satisfactory regarding the supination and...
flexion strength of the elbow.16 Mori et al [17] compared 24 patients who underwent partial repair for massive irreparable rotator cuff tears to 24 patients with similar tears that underwent fascia lata graft to fill the gap. The recurrence rate in the partial repair group was 41.7% while in the fascia lata group it was 8.1%. The technique described in this article differs from Moris technique in graft removal and in the preparation of the graft. Mori removes the graft from proximal thigh, close to the greater trochanter, while we remove fascia lata at a distal thigh site close to the knee. In addition, we have created a double graft by removing a larger graft size and folding it by half, while Mori uses a single leaf graft. McCarron et al [5] evaluated the biomechanical properties of the fascia lata graft on 18 cadavers with 5 cm irreparable rotator cuff tear created by disinsertion of supraspinatus from the proximal humerus. In half of cases, the cuff was reattached using suture anchors only, while the other half received suture anchors and fascia lata grafts. All shoulders were subjected to a thousand cycles of 180N loading. Results showed the group with fascia lata reinforcement presented gaps along suture line 40% smaller than the group without it, suggesting that fascia lata minimizes tendon retraction and thereby decreases incidence of cuff repair failure [5]. Baker et al [4] in an animal study compared biomechanical properties of eleven dogs with similar tears that underwent fascia lata autograft to repair complex rotator cuff tears due to small complication rates, low morbidity at donor site, feasible technique and lower surgical cost when compared to synthetic grafts. In addition, our technique follows the biological concept of graft use for orthopedic lesions. As massive irreparable rotator cuff tears are relatively uncommon lesions, it is difficult to obtain large numbers of patients in order to produce a prospective randomized surgical Trial. So future comparative papers are necessary to prove effectiveness of this procedure. However, it is still a good and cheap option for dealing with chronic irreparable rotator cuff tears in patients younger than 70 years-old.

For the future, we understand there is a great difference between repair and tissue regeneration quality. Facing this undesired dichotomy, we intend to direct our future research to study biological evolution of the fascia lata graft to tendon healing.

Interest conflicts

The authors declare no conflict of interest.

References


Conflict of Interest: – NIL

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