

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

Niso Eduardo Balsini¹, Olinto Lago Junior¹

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 Analogical 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 dysfunction. 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

also prepared with asepsis and antisepsis for this purpose.

Inclusion criteria were: (1) Patte's medial-to-lateral retraction grade 3

[7]; (2) Goutallier-Fuchs supraspinatus and/or infraspinatus fat degeneration stages III or IV; (3) Teres Minor intact (negative Horner Test); and (4) intraoperative gap preventing cuff-to-bone attachment.

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 [8].

Patient evaluation

All patients were evaluated pre- and post-operatively using visual analysis score (VAS), UCLA and Constant scores one month before and six months after the surgery. Active range of movement (ROM) and painless ROM were evaluated for anterior elevation, external rotation and internal rotation comparing to contralateral side. A digital dynamometer was used to measure shoulder elevation strength in orthostatic position with arm positioned at 90° of abduction in the scapular plane, elbow extended and forearm pronated. Measurement was performed 3 times and average was recorded. Data related to Constant score compared both sides and the difference of values was defined as excellent (<11); good (11 to 20); fair (21 to 30); and poor (>30 points).

MRI evaluation

The degree of fatty infiltration of

¹Clinica do Joelho, Ombro e Esporte - Instituto Balsini, Joinville, SC, Brazil.

Address of Correspondence

Dr. Niso Eduardo Balsini
Clinica do Joelho, Ombro e Esporte - Instituto Balsini
Quinze de Novembro, 1156, Joinville, SC, Brasil.
CEP: 89201602

Email:- balsiniortopedia@gmail.com



Niso Eduardo Balsini

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Figure 1 : Fascia lata autograft removal from ipsilateral thigh. The patient positioned in lateral decubitus, the incision is performed 10cm proximal to the articular line of the knee.

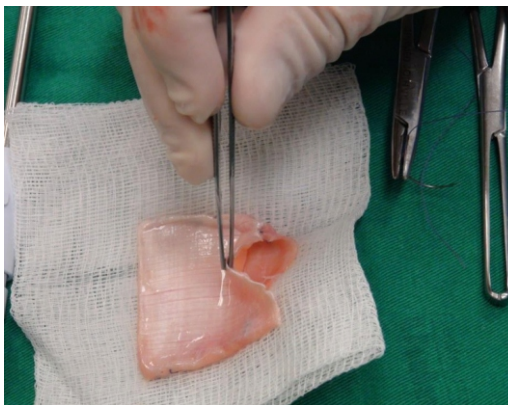


Figure 2: The fascia lata graft is folded in half and sutured in the edges with PDS thread 5.0.



Figure 3: The fascia lata graft is introduced into the subacromial space through lateral cannula.

supraspinatus, infraspinatus and subscapularis was graded analysing sagittal MRI cuts using the Goutallier classification adapted for MRI by Fuchs. Muscle degeneration was graded using the most lateral T1 image in which spine of scapula was seen in contact with its body (scapular Y view). According to Goutallier-Fuchs [6,9], a five-stage classification was used: no fat infiltration (stage 0); occasional lines of fat between muscle fibers (stage 1); significant amount of fat, but fat-muscle ratio lower than 50% (stage 2); fat-muscle ratio of 50% (stage 3); fat-muscle ratio higher than 50% (stage 4). Cuff retraction was graded according to Patte classification: retraction at the level of greater tuberosity (grade 1); retraction at the level of humeral head (grade 2); retraction at glenoid level (grade 3). Cuff and graft healing and re-rupture were evaluated by MRI according to criteria well established in literature [10, 11, 12]. Complete tears in repaired cuffs were diagnosed when presence of high-intensity signal or tendon-to-bone gap on two or more consecutive T2-weighted cuts. Grafts were evaluated based on their appearance compared to rotator cuff remains at tendon-graft interface and at humeral head footprint. Intact grafts showed absence of high intensity signal at areas of native rotator cuff, tendon-graft and humeral head-graft interfaces. Not-intact grafts showed high intensity signal that these interfaces.

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 Neviasser. 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 Neviasser 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

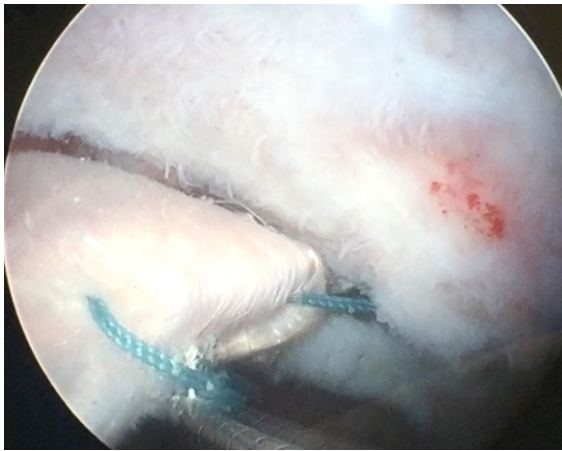


Figure 4 : Fascia lata graft in the subacromial space. The traction in the thread previously passed through the supraspinatus tendon, infraspinatus and rotator interval makes the graft opens in the subacromial space. Afterworks, reinsertion of the graft to greater tuberosity is done with metallic ancorS.

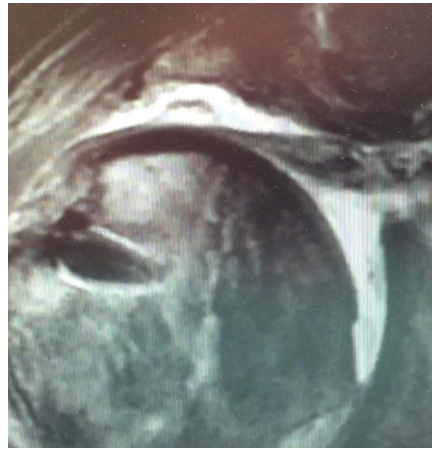


Figure 5: Postoperative resonance after 4 months of surgery with fascia lata graft showing good integration between the supraspinatus tendon and the graft.

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 DAgnostino & 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.

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 strength 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]. Sebastia 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 late group it was 8.1%. The technique described in this article differs from Mori's 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 submitted to surgery in both shoulders. In one group, only partial sutures were done and in the other fascia, lata reinforcement was performed. Results showed a significant increase in the loading force of tendon that received the fascia lata graft, suggesting that this technique might bring benefits to humans.

Based on these reports, we decided to use 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

- Maffulli N, Longo UG, Loppini M, Berton A, Spiezia F, Denaro V. Tissue engineering for rotator cuff repair: an evidence-based systematic review. *Stem Cells Int.* 2012; 2012:418086.
- Bond JL, Dopirak RM, Higgins J, Burns J, Snyder SJ. Arthroscopic replacement of massive, irreparable rotator cuff tears using a GraftJacket allograft: technique and preliminary results. *Arthroscopy.* 2008;24(4):403-409.e1.
- Nho SJ, Yadav H, Pensak M, Dodson CC, GoodCR, MacGillivray JD. Biomechanical fixation in arthroscopic rotator cuff repair. *Arthroscopy.* 2007;23(1):94-102, 102.e1.
- Baker AR, McCarronJA, TanCD, IannottiJP, DerwinKA. Does augmentation with a reinforced fascia patch improve rotator cuff repair outcomes? *Clinical Orthop Relat Res.* 2012;470(9):2513-21.
- McCarron JA, Milks RA, Mesiha M, Aurora A, Walker E, Iannotti J P, et al. Reinforced fascia patch limits cycling gapping of rotator cuff repairs in human cadaveric model. *J Shoulder Elbow Surg.* 2012;21:1680-6.
- Goutallier D, Postel JM, Bernageau J, Lavau L, Voisin MC. Fatty muscle degeneration cuff ruptures. Pre- and post-operative evaluation by CT scan. *Clin Orthop Relat Res* 1994;304:78-83.
- Patte D. Classification of rotator cuff lesions. *Clin Orthop Relat Res* 1990; 254:81-86
- Seebauer L. Seebauer. Total reverse shoulder arthroplasty: European Lessons and future trends. *Am J Orthop (Belle Mead NJ).* 36(12 Suppl 1) (2007),pp.22-28.
- Fuchs B, Weishaupt D, Zanetti M, Hodler J, Gerber C. Fatty degeneration of the muscles of the rotator cuff: assessment by computed tomography versus magnetic resonance imaging. *J Shoulder Elbow Surg.* 1999;8:599-605.
- Mellado JM, Calmet J, Olona M, et al. Surgically repaired massive rotator cuff tears: MRI of tendon integrity, muscle fatty degeneration, and muscle atrophy correlated with intraoperative and clinical finding. *AJR Am J Roentgenol.* 2005;184(5):1456-1463.
- Gusmer PB, Potter HG, Donovan WD, O'Brien SJ. MR imaging of the shoulder after rotator cuff repair. *AJR Am J Roentgenol.* 1997;168(2):559-563.
- Owen RS, Iannotti JP, Kneeland JB, Dalinka MK, Deren JA, Oleaga L. Shoulder after surgery: MR imaging with surgical validation. *Radiology.* 1993;186(2):443-447
- Bazzi K, Formighieri B, Lorico T L, Rocco M, Machado M F, Vilella L. Reconstruções complexas do couro cabeludo: um desafio aos cirurgiões. *Rev. Bras. Cir. Plást.* 2010; 25(supl): 1-102
- Barbosa, E. Malheiro, N. Tomada, P. Silva, J. Silva, C. Silva, J. Reis, J. Amarante *Acta Urológica* 2006, 23; 3: 67-70.
- Sebastiá Roberto, Lessa , Sergio Lessa, Eduardo Emery Flores. Reconstrução da cavidade noftálmica com implante esférico revestido de enxerto autólogo de fáscia lata. *Rev Bras Oftalmol* 59(2):132-143, fev.2000.ilus.
- A. Bayat, L. Neumann, W.A. Wallace Late repair of simultaneous bilateral distal biceps brachii tendon avulsion with fascia lata graft *Br J Sports Med,* 33 (4) (1999), pp. 281-283
- Mori D, Fumakoshi N, Yamashita F. Arthroscopic surgery of irreparable large or massive rotator cuff tears with low-grade fatty degeneration of the infraspinatus: patch autograft procedure versus partial repair procedure. *Arthroscopy.* 2013;29(12):1911-1921.

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