GAVIN PUBLISHERS

OPEN ACCESS

Journal of Orthopedic Research and Therapy

Hackney R, et al. J Orthop Res Ther 5: 1166.

DOI: 10.29011/2575-8241.001166

Review Article

Synthetic Patch Augmentation of Irreparable Tears of the Rotator Cuff

Roger Hackney*

Spire Leeds Hospital, Jackson Ave, Roundhay, United Kingdom

***Corresponding author:** Roger Hackney, Spire Leeds Hospital, Leeds LS8 1NT, United Kingdom

Citation: Hackney R (2020) Synthetic Patch Augmentation of Irreparable Tears of the Rotator Cuff. J Orthop Res Ther 5: 1166. DOI: 10.29011/2575-8241.001166

Received Date: 03 July, 2020; **Accepted Date:** 28 July, 2020; **Published Date:** 03 August, 2020

Introduction

Massive tears of the rotator cuff represent a major challenge to the surgeon who wants to restore rotator cuff integrity and shoulder function over the long term. There are a number of options available to improve symptoms, including conservative treatment, simple arthroscopic surgery, partial repair, complete repair and more recently reverse total shoulder replacement superior capsular reconstruction and patch augmentation. [1] However, partial repairs fail after a few years, [2] and the risk of recurrence tear after a complete repair of a massive tear is up to 94% at 2 years. [3] Patches have been used to augment repairs of the rotator cuff. Autograft, allograft and xenograft as well as synthetic patches have been tried with varying success. [4-8]. The Leeds Kuff patch (Xiros UK) is a hydrophilic woven polyester with reinforcement around the edges designed to prevent pull-out of sutures. It is strong enough to bridge gaps in repaired tendons. The weave is designed to encourage tissue ingrowth. The patch is not bio-absorbable. The device is available in 3 sizes and is shaped to fit the humeral head. This is a single surgeon audit of outcome of the use of the Leeds Kuff patch for augmentation/bridging of partial repair of tears of the rotator cuff. These were large or massive tears that could not be fully closed/repaired even with an open repair technique.

Method

Over a 2-year period all patients undergoing Leeds Cuff patch augmentation of irreparable tears of the rotator cuff were followed up and assessed pre-operation and 6 months post-operatively with the Oxford Shoulder Score. All patients underwent initial investigation with ultrasound scan and/or MRI scan. The size of the tendon tear and the state of the muscle bellies in terms of fatty degeneration and atrophy were measured. Those with significant degenerative changes or with Goutallier [9] grade 4 atrophy were excluded. Patients were consented for arthroscopy of the shoulder and mobilisation of the rotator cuff tendons, with a view to proceeding to debridement, arthroscopic repair or open repair with patch augmentation. Surgery was performed under general anaesthesia with inter-scalene block with added dexamethasone for prolonged pain relief. Arthroscopy of the shoulder was performed. A lateral working portal was established and the rotator cuff mobilised using a suction diathermy device. If there was sufficient potential for partial repair, with grade 2 or less osteoarthritis then an open repair with Leeds Kuff patch augmentation was performed. A lateral deltoid splitting approach was used, peeling deltoid sub-periosteally from the antero-lateral acromion.

The tendon was mobilised carefully using 2 Ethibond stay sutures for traction and to improve access. Where possible, a side-to-side repair was achieved using the Ethibond or number 2 Orthocord suture with a small needle, used where access is restricted under the acromion. The tendon was repaired without undue tension, as excess tension is a risk factor for failure of healing [10]. The Leeds Kuff patch was then applied over the repair, using the stay sutures where appropriate and additional orthocord interrupted sutures to the edges. A 5 ethibond per-osseous suture was used to secure the patch laterally. A meticulous closure of deltoid was achieved using non-absorbable sutures and a subcuticular stitch for a cosmetic closure of the skin. Three weeks immobilisation in a polysling allowing passive movement only was followed by a standard protocol to return to function, with strengthening work at 8-12 weeks dependent upon progress. Oxford shoulder scores were collected pre-operatively and at 6 month follow-up.

Results

29 Patients were available for follow up at 6 months. The average age was 62 years (42-79). There were 5 females and 24 males. Oxford shoulder scores were taken at 6 months or after capsular release if required, which took place at 6 months. One polio victim who used callipers and crutches was assessed at 6 (OSS 32) and 12 months (OSS 48).

The average pre-op OSS was 17.9. (range 4 - 33)

The average post-op OSS was 44.3. (range 40 - 48)

The average improvement in OSS was 27.2 (range 13 - 41)

The best patient improved from 4 to 45, from pseudoparalysis to very good function. The lowest post-op score was 40, improved from 6.

5 cases underwent a capsular and sub-acromial release of adhesions

6 cases were revision procedures for previous failed arthroscopic repair.

There was one case of *Propionibacterium* acnes infection. This was managed by early aggressive debridement, retaining the patch, followed by 6 weeks intravenous antibiotics. The final OSS

was 48. Not all patients underwent scanning post repair, but if progress was slow, patients suffered a fall, or expressed concerns regarding progress, then an ultrasound scan was performed. 12 patients were scanned. In 9 cases the patch was completely intact. In 3 cases there was a gap at medial end of the patch. Access deep under the acromion process with massive retraction can be difficult at open surgery, and the gap may reflect an incomplete repair. This did not seem to affect outcome.

Discussion

A variety of patches have been used to augment repairs of large to massive tears of the rotator cuff. Using Xenografts, usually porcine, has generally given poor results. There have been adverse histological responses reported and in once study outcomes were worse with the patch than without. [7,8] Meta-analyses conclude that there are no benefits and more recurrences from xenografts. [11,12] Cadaveric human skin has been widely reported with beneficial outcomes. Venouziou [6] reported recurrence rates of 15% in augmented patients versus 40% in those without. The author has tried to use this device, but found it to have poor handling qualities, poor shelf life and expensive. The web site for the company marketing the Graft Jacket states that the graft is suitable for use as "an "augmentation graft", not "interposition graft", and can be incorporated into the musculotendinous bone complex such that rotator cuff healing and fixation can be enhanced". A number of synthetic patches have been tried. Marberry [13] reported his results with the artelon patch in 2012. The author has also used this patch and had excellent results when using the graft as an augmentation to repair. However, it was found that the biodegradable nature of the patch lead to medium term failures when an artelon patch was used to bridge larger gaps. Smolen [14] reported on the use of a polyester patch with a 14% recurrence rate. Ciampi [15] concluded that he had much better outcomes from a synthetic patch than a biological alternative. Other authors have presented their experience with the Leeds Kuff patch. Judhi [16] reported an improvement in the OSS from 22 to 43 with one clinical recurrence. This was at 12 months post surgery.

Professor Ofer Levy, [17] using an arthroscopic technique followed 28 patients for a mean of 55 months. Scores pre-operatively were Constant Score (CS) 44 and Subjective Shoulder Score (SSV) of 2.14/10. At follow up scores had improves to CS 72, and SSV 8.2/10. There was one acute infection and three were converted to a reverse total shoulder replacement for sub optimal results. Histology of the retrieved patches showed good fibro-connective tissue growth within and around the patch. There were no recurrences of tear in the remaining patients using USS or MRI. Where second look arthroscopy has been performed for shoulder stiffness in this series, excellent tissue ingrowth has been observed. (Figure 1) shows a shoulder with a massive tear, retracted to the glenoid. The patient was unable to work as a painter and decorator. He underwent a bridging repair with Leeds Kuff patch for an irreparable tear, but developed post-operative stiffness. At release, 6 months following his repair, his rotator cuff was observed to be intact with complete inclusion of the patch material within native tissue from both the articular and bursal side. (Figures 2 and 3). He was able to return to full work as a painter and decorator.

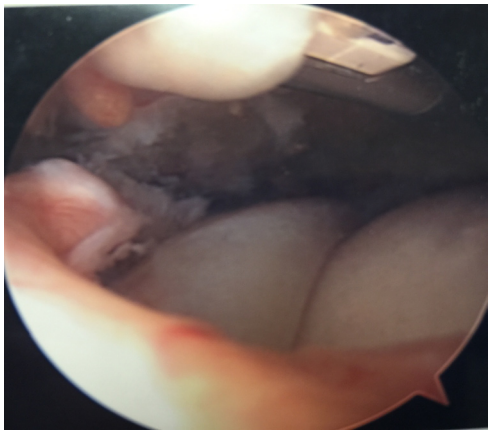

Figure 1: Massive retracted tear.

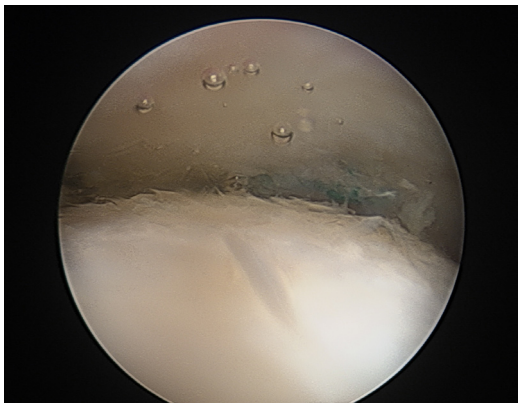

Figure 2: Complete incorporation of the patch by native tissue, bridging the gap. Articular surface view.

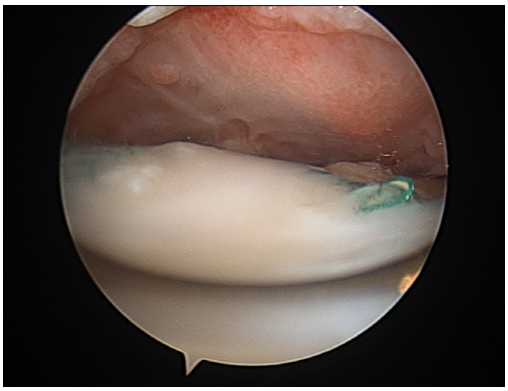

Figure 3: Subacromial view.

Conclusion

The Leeds Cuff patch can be used to bridge defects where the rotator cuff cannot be fully repaired. In this case series of 29 patients from a single surgeon, the Oxford Shoulder Score improved from 17.9 pre-operatively to 44.3 with a mean improvement of 27.2. When presented with revisions and partially repairable tears of the rotator cuff, the surgeon should consider bridging and augmenting

the repair with the Leeds Cuff patch to provide an excellent medium term outcome with native tissue ingrowth into the patch. Further studies will be required with controls without patch and to examine the nature of the tissue growing into the patch.

References

1. Liesnewski P, Cowling P, Hackney R (2017) Options before Reverse Total Shoulder Replacement. Advances in Shoulder Surgery. Open access peer-reviewed chapter 2017.
2. Di Benedetto ED, Di Benedetto P, Fiocchi A, Beltrame A, Causero A (2017) Partial repair in irreparable rotator cuff tear: long term follow up Acta Biomed 88: 69-74.
3. Harryman DT 2nd, Mack LA, Wang KY, Jackins SE, Richardson ML, et al. (1991) Repairs of the rotator cuff. Correlation of functional results with integrity of the cuff. J Bone Joint Surg Am 73: 982-989.
4. Mori D, Funakoshi N, Yamashita F, Wakabayashi T (2015) Effect of Fatty degeneration of the infraspinatus on the efficacy of arthroscopic patch autograft procedure for large to massive rotator cuff tears. Am J Sports Med 43: 1108-1117.
5. Barber FA, Burns JP, Deutsch A, Labbé MR, Litchfield RB. (2012) a prospective, randomized evaluation of acellular human dermal matrix augmentation for arthroscopic rotator cuff repair. Arthroscopy 28: 8-15.
6. Venouziou AI, Kokkalis ZT, Sotereanos DG (2013) Human dermal allograft interposition for the reconstruction of massive irreparable rotator cuff tears. Am J Orthop 42: 63-70.
7. Iannotti, JP, Codsi, MJ, Kwon, YW, Derwin, K, Ciccone, J, et al. (2006) Porcine small intestine submucosa augmentation of surgical repair of chronic two-tendon rotator cuff tears. A randomized, controlled trial. J Bone Joint Surg Am 88: 1238-1244.
8. Phipatanakul WP, Petersen SA (2009) Porcine small intestine submucosa xenograft augmentation in repair of massive rotator cuff tears. Am J Orthop 38: 572-575.
9. Goutallier D, Postel JM, Gleyze P, Leguilloux P, Van Driessche S (2003) Influence of cuff muscle fatty degeneration on anatomic and functional outcomes after simple suture of full-thickness tears. J Shoulder Elbow Surg 12: 550-554.
10. Davidson PA, Rivenburgh DW (2000) Rotator cuff repair tension as a determinant of functional outcome. J Shoulder Elbow Surg 9: 502-506.
11. Maillot C, Harly E, Demezon H, Le Huec JC (2018) Surgical repair of large-to-massive rotator cuff tears seems to be a better option than patch augmentation or débridement and biceps tenotomy: a prospective comparative study. J Shoulder Elbow Surg 27: 1545-1552.
12. Flury M (2016) Patch augmentation of the rotator cuff. A reasonable choice or a waste of money?. Orthopade 45: 136-142.
13. Marberry A (2013) Synthetic Reinforcement Patch in Repair of Challenging Two-Tendon Rotator Cuff Tears. Shoulder & Elbow 2013: 24-29.
14. Smolen D, Haffner N, Mittermayr R, Hess F, Sternberg C, et al. (2020) Application of a new polyester patch in arthroscopic massive rotator cuff repair-a prospective cohort study. J Shoulder Elbow Surg 29: e11-e21.
15. Ciampi P, Scotti C, Nonis A, Vitali M, Di Serio C, et al. (2014) The benefit of synthetic versus biological patch augmentation in the repair of posterosuperior massive rotator cuff tears: a 3-year follow-up study. Am J Sports Med 42: 1169-1175.
16. Umile Giuseppe Longo, Alfredo Lamberti, Wasim S Khan, Nicola Maffulli, Vincenzo Denaro (2011) Synthetic augmentation for massive rotator cuff tears. Sports Med Arthrosc Rev 19: 360-365.
17. Levy O (2019) Symposium S7: Strategies for Massive Irreparable Rotator Cuff Tears or Failed previous surgery - Chairman: O. Levy (UK / Israel) Co-Chairman: JL Osma (Colombia). Arthroscopic enhanced rotator cuff repair - with a patch, 14th International Congress of Shoulder and Elbow Surgery held in Buenos Aires, Argentina 2019.