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Functional repair in massive immobile rotator cuff tears leads to satisfactory quality of living: results at 3 years follow up.

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Abstract

Purpose The aim of this retrospective study was to report clinical results of a selective population undergone to arthroscopic functional repair of massive, contracted, immobile rotator cuff tears.

Methods From 2005 to 2009, 311 patients with rotator cuff tears were treated at our institution. Of them 26 shoulders in 25 patient with a mean age of 64 years that presented a massive, contracted immobile tear repaired using a an interval slide technique, were included in this study.

Results The mean postoperative follow-up period was 39 months (range, 19 to 70 months). The mean post-operative Disabilities of the Arm, Shoulder and Hand (DASH) score and Simple Shoulder Test (SST) score were respectively 20,91 and 8.8 (range DASH: 0,83 - 59,1; range SST: 2 to 12). Based on Single Assessment Numeric Evaluation (SANE) score, the outcome of surgery was satisfactory with a mean of 76% (range, 0% to 100%). The residual level of pain was low, as reported by a final mean Visual Analog Scale (VAS) score of 1.8 (range: 0-8). The mean post-operative range of motion (ROM) was 157.5° in forward elevation (range, 90° to 180°) and 55.3° in extra rotation (range, 0° to 90°). 11 patients reached mid-back, in 7 the lower back and in 8 cases reached their upper back.

Conclusions Arthroscopic functional repair could be considered an appropriate treatment option in case of massive, contracted and immobile cuff tears. This treatment can provide improvement in pain and function that positively affects patients' quality of life without precluding other, more invasive, eventually consequent solutions.

Key Words: quality of living, rotator cuff tear, rotator cuff repair, arthroscopic functional repair, massive immobile tears.

Introduction

Rotator cuff tears continue to be a common cause of pain and disability. Massive rotator cuff tears may present poor mobility with severely contracted tissue from a medial to lateral and an anterior to posterior direction. This lack of mobility precludes a direct repair to bone, as in crescent shaped tears. In these cases, a salvage technique such as a functional repair may be used as an alternative to more invasive solutions, like reverse prosthesis or tendon transfers.

A functional repair could be defined by a restoration of the anterior-posterior forces, typically repairing subscapularis and infraspinatus with partial/limited repair of the supraspinatus or no repair at all [1].

Patients with this kind of disability aim to re-obtain a pain free shoulder that allows a return to the previous quality of living. This study aims to point out the results of quality of living in a selective population underwent to arthroscopic functional repair of massive (two or more tendons), contracted, immobile rotator cuff tears at middle term follow up.

Methods

The design of the study was a retrospective case series of a specific population. Patients were included according to pre-defined inclusion - exclusion criteria as following:

Inclusion criteria:

- Pre-operative magnetic resonance imaging (MRI) demostrating massive rotator cuff tear, tendon retraction (retraction to the level of the glenoid, grade 3, according to Patte Score) [2] and fatty degeneration (any grade for the supraspinatus, < 4 for the infraspinatus, according to Goutallier Score) [3,4].
- Preoperative symptoms as pain, lost of strength and range of motion (ROM) of the shoulder, not responsive to conservative treatment lasting at least 6 months.

- Intra-operative confirmation of tendon contraction and immobility.
- Minimum available follow up of 18 months.

Exclusion criteria:

- Osteoarthritis of the gleno-humeral joint
- Frozen shoulder
- Neuromuscular or other skeletal pathologies
- History of trauma
- Previous shoulder surgeries
- Major medical problems
- Medical records not completely available

Surgical Technique

Following induction of general anaesthesia, the patients were placed in the lateral decubitis position. Diagnostic glenohumeral arthroscopy was performed through a standard posterior portal. In cases of massive tears a tenotomy of the long head of the biceps was performed routinely.

Following appropriate treatment of any intraarticular pathology, the arthroscope was placed into the subacromial space through the same posterior skin incision. With the arthroscope posterior, the medial to lateral mobility of the tear was assessed using a soft tissue grasper introduced through the lateral portal. If the lesion involved more than 2 tendons that were not mobile from medial to lateral, then the tear was classified as massive and immobile. U shaped tears were repaired combining a convergent repair of the anterior and posterior components. This can leave a partial unrepaired portion of the supraspinatus. Crescent tears were usually amenable to partial repair using a double interval slide technique, while L shaped tears were addressed with a single interval slide at the level of the apex.

For an anterior interval slide a basket punch was introduced through the lateral portal and the supraspinatus tendon was then released from lateral to medial, starting at the free margin of the tendon tear and progressing to the base of the coracoid [5]. For a posterior interval slide the lateral border of the scapular spine was exposed. The posterior edge of

the supraspinatus was then released by incising the interval between supraspinatus and infraspinatus tendons and progressing towards the scapular spine. Care was taken in each release to avoid injury to the suprascapular nerve.

The anterior and posterior cuff was addressed first, leaving the supraspinatus repair afterwards. If the supraspinatus was not feasible for a tension free repair a partial repair with a medialized footprint was accepted. If the supraspinatus was still under tension with a partial/medialized repair this was left unsutured.

Postoperative Management

Following the procedure, the operated arm was placed at the side in a sling with a small pillow. The sling was worn continuously for 4 weeks. Active elbow flexion and extension was encouraged. Patients performed scapular exercises immediately.

At 4 weeks, the sling was discontinued, and passive physiotherapy was commenced. Isotonic strengthening was not begun until 8-10 weeks following surgery. Progressive activities were incorporated as strength allowed. Unrestricted activities are usually resumed 6 months following surgery.

Clinical Assessment

Patients were clinically evaluated at final follow up with specific rating scales. Four quality of living scores were used: Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire, Visual Analog Scale (VAS), Simple Shoulder Test (SST), Single Assessment Numeric Evaluation (SANE). ROM was assessed through a validated quantitative scale [6]. The DASH consists mainly of a 30-item disability/symptom scale, scored by 5 scale levels: 1 = no difficulty/symptoms, 2 = mild difficulty/symptoms, 3 = moderate difficulty/symptoms, 4 = severe difficulty/symptoms, and 5 = extreme difficulty (unable to do)/symptoms. All scores were transformed into a scaling system from 0 = best function/no symptoms to 100 = worst function/symptoms. The DASH total score, is determined by [(sum of n response)/n – 1]x25 [7]. The SST is a subjective questionnaire composed of 12 "yes" or "no" questions that assess shoulder pain and function [8]. A positive answer was allotted 1 point and a negative answer given a score of 0. This resulted in a maximum possible score of 12, indicating greater shoulder function. The intensity of pain was determinate by VAS, a scale presented as a horizontal row of equidistant numbers from 0 to 10, with the ratings given as "no pain" at 0 and "pain as

bad as you can imagine" at 10 [9]. SANE rating is determined by the subject's written response to the following question: "How would you rate your shoulder today as a percentage of normal (0% to 100% scale with 100% being normal)?" [10]. A diagram-based validated tool to determine patients active shoulder ROM in forward elevation, external rotation, and internal rotation was adopted. [6]

Results

From 2005 to 2009, 434 shoulder arthroscopies were performed at our institution. 311 rotator cuff tears were treated. 117 were massive rotator cuff tears and 26 in 25 patients presented a massive, contracted immobile tear. All these patients were available for follow up and represented the study group. 15 were men and 10 were women with a mean age of 64 years (range, 49 to 74 years). The mean postoperative follow-up period was 39 months (range, 19 to 70 months). 18 patients suffered the disease on their right shoulder, 6 on the left side and one patient both shoulders. 23 patients presented a dominant right side, 1 a dominant left side and 1 patient referred a neutral dominance.

The cuff was completely repaired in 18 shoulders with an L-shaped or a crescent tear using an interval slide technique. 11 of them received a single posterior interval slide and 7 a double interval slide.

A complete cuff repair was not possible in the remaining 8 shoulders and a partial repair was performed: 5 were U shaped tears and 3 sustained a single interval slide in L shaped tears.

Surgical procedure and anesthesia were well tolerated by the patients and there were no intraoperative or early postoperative complications. At short-term follow-up evaluations there was no evidence of flogosis, infection, or wound dehiscence. No long-term complication was reported. Details about clinical outcomes, evaluated by DASH score, SST, SANE and VAS score and Range of motion (ROM) are shown in Table 1. The mean post-operative DASH and SST were respectively 20,91 and 8.8 (range DASH: 0,83 - 59,1; range SST: 2 to 12). Based on SANE Score, the outcome of surgery was satisfactory with a mean of 76% (range, 0% to 100%). The residual level of pain was low, as reported by a final mean VAS of 1.8 (range: 0-8). The mean post-operative ROM was 157.5° in forward

elevation (range, 90° to 180°) and 55.3° in extra rotation (range, 0° to 90°). 11 patients reached mid-back, in 7 the lower back and in 8 cases reached their upper back.

Discussion

The treatment of massive contracted and immobile cuff tears ranges from non-operative to complex strategies: partial repairs with interval slide technique, scaffold augmentation, tendon transfers and grafting, arthroplasties [11,12]. This last one represents the finish line of a painful and uncomfortable course often full of relapses and treatments' failures. A logical algorithm takes into account the less invasive solution first, with the primary intent of restoring shoulder function and patient's comfort.

Functional repairs are recommended to reestablish a stable fulcrum kinematics [12]. Arthroscopic partial repairs supported by interval slides present a good compromise to improve quality of life in patients with massive contracted, immobile rotator cuff tears [1,5,13,14]. Burkhart et al [14] reported that partial repair for large and massive rotator cuff tears leads to a significant improvement of pain and shoulder function. Berth et al [15], regardless of the high rates of structural failure, reported good or excellent satisfactory outcomes after partial rotator cuff repair of 21 patients. Moreover, results of partial repair were better than debridement alone, as previously remarked by Duralde et al [16]. Tauro et al [5], treated 42 large and contracted rotator cuff tears reporting 64% of good/excellent results. 93% patients were satisfied with their operated shoulder and had improvement in function, strength and active range of motion. Burkhart and Lo [17] treated 9 massive, contracted and immobile rotator cuff tears with the interval slide method, reporting 8 (88,8 %) satisfied patients and an overhead shoulder function's improvement in all of them. The reason of these improvements is supported by the repair strategy. As the tear is anatomically deficient but biomechanically intact, re-attachment of the inferior half of the infraspinatus tendon is critical: in fact it restores the posterior moment and it balances the transverse plane force couple, resuming a normal

glenohumeral fulcrum [13]. While considering this biomechanical rule it makes sense that partial repair of the rotator cuff is a feasible salvage option [18].

Previous authors agree about the difficulty of an arthroscopic repair of a massive contracted immobile cuff. It requires advanced and challenging techniques and a deep knowledge of the shoulder biomechanics [12]: Tauro expected a 10% rate failure [5]. It is recommended to spare the coracoacromial arch as it is considered an important restraint against superior migration of the humeral head, especially if the tear cannot be repaired completely or if the cuff repair should fail [5]. Another important structure to preserve is the suprascapular nerve: its motor branches to the infraspinatus muscle are at risk in lateral mobilization techniques, especially during the posterior interval slide. Thus it is recommended to avoid the bony surface of the posterior glenoid neck [19].

In our study 26 arthroscopic functional repairs were performed, for the treatment of massive, contracted and immobile cuff tears. Surgical results revealed an mean post-operative VAS of 1,8 showing a low level residual pain. The mean DASH score was 20,91 out of 100 point (range: 0,83 – 59,1); which means the average quality of living was in the results in the best fourth of the whole range. The average SST score was of 8,8 (range: 2-12) and 13 (50%) reached the score of 10 points. The average value of SANE was of 76% (range: 0% - 100%). In 16 (61,5%) cases the patients were completely satisfied of the surgical results (SANE $\geq$ 80%), in 5 (19,2%) considered the treatment adequate (SANE 60% - 70%) and the in remaining 5 (19,2%) complained an unsatisfying recovery (SANE < 60%). Concerning range of motion, the average forward flexion was 157,5° (range: 90° - 180°) with 22 (84,6%) shoulders able to reach at least 135°; on the other hand the average external rotation was 55,3% (range: 0°-90°) and in 17 (65,3%) cases it reached a minimum of 60°.

In our study surgical results were evaluated mainly through subjective scores rather than functional objective ones: in fact our main purpose was to investigate how the patients felt the operated shoulder in daily activities. In 21 cases (80,7%) the recovery was retained satisfying from the patients; these satisfaction rate were similar to the ones found in Tauro and Burkhart series, respectively 93% and 88,8% [5,14]. The absence or the decrease of pain could probably be indicated as the main reason of patient satisfaction. This is supported considering that 4 out of the 5 shoulders whose recovery was considered inadequate a postoperative pain persisted, with VAS exceeding the value of 6 (range 0-

10), and a SST score lesser than the total of 6 points (range 0-12). The average value of DASH score (20,91) reported patients capable to afford everyday life, with their operated shoulder. Just 8 (30,7%) exceeded the value of 25 ranging in the inferior three forth of the scale, but only 4 declared an unsatisfactory (SANE) result. 3 out of these 4 presented the worst VAS of the series, remarking as the pain disables quality of life.

The main limit of the present study is the absence of patients' preoperative evaluations or a control group that limit the possibility to define exactly the indications of this procedure. Study group is limited but the accuracy of the indication limit the possibility of wider populations. The lack of a postoperative imaging control is another partial limit but the aim of the study was specifically directed to define the subjective quality of living of these patients.

Conclusion

Arthroscopic functional repair could be considered an appropriate treatment option in case of massive, contracted and immobile cuff tears. It markedly improves patients' quality of life without precluding other, more invasive, eventually consequent solutions. On the other hand, as all salvage procedures, it requires an extreme accuracy in the tear's pattern identification and patient selection.

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