EVALUATION OF PATIENTS UNDERGOING ROTATOR CUFF SUTURE WITH THE MODIFIED MASON-ALLEN TECHNIQUE

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ABSTRACT

Objective: The purpose of this study was to clinically evaluate patients who underwent Arthroscopic Rotator Cuff Repair (RC) using the Modified Manson-Allen technique. Methods: We evaluated 79 patients who underwent shoulder arthroscopy. The lesions were repaired using the modified Mason-Allen suture between 2003 and 2009, divided by Cofield classification and clinically evaluated by the scoring system of the University of Los Angeles (UCLA) in the pre- and postoperative periods. Results: The evaluation of lesion sizes showed 7 small lesions (<1cm), 55 average lesions (1-3cm) and 17 large lesions (3-5cm), and in this last group there were 5 reruptures and the patients were reoperated by the same technique. Comparing the pre (14.1) and postoperative (32.6) values by UCLA system there was a significant improvement of score (142.3%), regardless of lesion size. The modified Mason-Allen suture provided satisfactory clinical results, regardless of lesion size, similar to those found in literature. The rerupture rate was high in large lesions. New suture techniques have been developed with the aim of reducing the incidence of rerupture. Conclusion: The modified Mason-Allen suture technique provided clinical improvement, regardless of lesion size. ***Level of Evidence IV, Cases Series.***

Keywords: Rotator cuff. Arthroscopy. Shoulder joint.

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INTRODUCTION

Rotator cuff (RC) lesions are one of the causes of shoulder pain and a frequent motive of medical consultations. These lesions can occur in any age group and appear in different forms, from tendinitis to rotator cuff arthropathy. The surgical or conservative treatment is defined according to the type of lesion (partial or complete) and is based on factors such as age, clinical condition, pain and joint dysfunction. Surgical treatment has been increasingly indicated, with the arthroscopic form being the most common procedure in recent years.[1]

The goal of RC repair regardless of the technique used is to achieve anatomic restoration with a decrease in pain and improvement of shoulder function.[2] There are several RC suture techniques, of which those used most often for arthroscopic suturing include: double-row, single-row with simple suture and the modified Mason-Allen suture technique, which consists of the use of a double-loaded anchor and the combination of a horizontal "U" shaped suture with a simple suture using the threads from the same anchor.[3]

Repair using the modified Mason-Allen suture technique presents the advantages of being more financially economical and requiring less surgical time than the double-row suture. Compared with the simple repair it demonstrates greater resistance to tension between suture thread and tendon.[4]

The aim of our study was to evaluate clinical improvement in patients submitted to arthroscopic RC repair using the modified Mason-Allen technique.[5]

MATERIAL AND METHODS

The prerequisites for inclusion of the patients submitted to shoulder arthroscopy for the performance of the study was the presence of isolated RC lesion repaired by arthroscopy using the modified Mason Allen suture technique. The exclusion criteria were: other associated shoulder pathologies (instability, SLAP, Bankart or chondral lesions); associated or unassociated massive lesions; fatty degeneration and cases in which the review of medical records did not allow adequate fact-finding. After evaluating the inclusion and exclusion criteria, 79 patients operated between 2003 and 2009 were selected as study subjects. The preoperative and intraoperative data were gathered by means of a review of medical records and the postoperative results were assessed by the surgeon and by a second medical evaluator who was a resident of the service.

All the authors declare that there is no potential conflict of interest referring to this article.

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All the surgeries were performed by the surgeon using the beach chair position and the patients were anesthetized with brachial plexus block associated with general anesthesia. The duration of the procedures ranged from 30 minutes to one and a half hours. The lesions were divided according to size by the Cofield Classification[6] into small (less than 1 cm), medium (between 1 and 3 cm), large (from 3 to 5 cm) and massive (more than 5cm). The patients were immobilized with a splint for six weeks and after this period they began the six-month physiotherapy program. The follow-up time was from two to six years and all the patients were evaluated in the preoperative and postoperative periods using the UCLA scoring system.

The UCLA scoring system was described by Amstutz et al.[7] and is composed of three criteria: pain, function, muscle strength and movement, which add up to a total of 35 points. The higher the score achieved, the better the result. In 1986, Elman et al.[8] modified this scoring system by applying it to patients submitted to shoulder arthroscopy, evaluating pre- and postoperative periods.

Data normality was verified by means of the Kolmogorov-Smirnov test. For the data that presented normal distribution, the Student's t-test and the Wilcoxon test were used for the nonparametric data, in the pre- and postoperative UCLA scoring comparison. The significance level adopted was 5% and the software used for analysis was SAS version 9.2. The calculations for the Deltas were: Delta (post-pre variation) = post-pre; Deltap (percentage variation of post in relation to pre) = 100x(post-pre)/pre.

RESULTS

Of the 79 patients studied, seven presented small lesions, 55 medium lesions and 17 large lesions. Of the 17 large lesions, five presented reruptures and were reoperated using the modified Mason-Allen suture technique once again.

The mean, median and delta values of the scores obtained in UCLA in the pre and postoperative periods are presented in Table 1. The comparison of the scores in the pre- and postoperative periods showed a significant increase in the values regardless of the lesion size. The clinical improvement found was 142.3%. (Table 1)

Table 2 presents the preoperative and postoperative values according to lesion size. The results obtained showed 73.3% of clinical improvement in the lesions smaller than 1 cm, 140.7% in the lesions between 1 and 3 cm, 204.3% in the lesions from 3 to 5 cm and 108.4% after the second surgery in the 5 patients who sustained reruptures. The statistical analysis of the UCLA score demonstrated clinical improvement of the patients submitted to the modified Mason-Allen suture technique, regardless of lesion size and also in the reruptures.

All the cases of RC reruptures were of patients who presented large lesions and had undergone modified Mason-Allen suturing. The same repair technique was used in the revision surgery. Therefore, of the total patients, 6.3% had reruptures and when evaluated only in the group of large lesions, this percentage was 29.4%.

The patients with rotator cuff reruptures 6 months after surgery were evaluated using UCLA and this result ranged from 10 to 12 points. After verifying the unsatisfactory UCLA result in these patients, a second arthroscopic procedure was proposed to repair these lesions.

Table 1. Comparison of UCLA values in the pre and postoperative periods, regardless of lesion size.

Measurement	N	Mean	Standard Deviation	Median	p-value
PRE	79	14,1	3,2	12,0	< 0.0001
POST	79	32,6	4,1	35,0	
DELTA	79	18,5	5,0	19,0	
DELTAP	79	142,3	62,1	118,8	

Table 2. Comparison of UCLA values in the pre and postoperative periods, according to lesion size.

Lesion	N	Mean	Standard deviation	Median	p-value
1 cm					0.0006*
PRE	7	17.6	1.3	17.0	
POST	7	30.4	5.6	32.0	
DELTA	7	12.9	5.2	12.0	
DELTA P	7	73.2	29.7	75.0	
1-3cm					< 0.0001
PRE	55	14.5	3.0	16.0	
POST	55	33.4	3.0	35.0	
DELTA	55	19.0	4.1	19.0	
DELTA P	55	140.7	55.4	118.8	
3-5cm					< 0.0001
PRE	17	10.8	1.3	11.0	
POST	17	32.7	4.2	34.5	
DELTA	17	21.8	4.0	23.0	
DELTA P	17	204.3	48.4	191.7	
Rerupture					< 0.0001
PRE	5	13.6	4.8	12.0	
POST	5	26.8	6.6	28.0	
DELTA	5	13.2	6.4	10.0	
DELTA P	5	108.4	67.4	66.7	

DISCUSSION

The RC insertion occupies a vast surface area on the greater tuberosity of the humerus. Simple sutures are unable to anatomically reproduce this insertion surface of the cuff in the humerus.[1] The improvement of repair techniques has reduced the incidence of ruptures and of revisions for cuff repair. The ideal repair has to present sufficient minimum resistance to maintain the repaired lesion, even with movement, and with mechanical stability until the tendon has bonded to the bone, without gap formation.[3]

Significant rates of rerupture after open repair and also due to arthroscopies with different repair techniques have been reported in the literature.[9] Some factors are related to RC reruptures, such as patient age, muscle and tendon quality, postoperative rehabilitation, surgical technique, implant fixation, degree and chronicity of the lesion.

Rerupture is one of the most frequent complications of RC repair and the success of the repair depends on the primary fixation of the tendon on the bone. Different suture techniques have been proposed for reinsertion of the tendon in the bone, using transosseous sutures or anchors.[5] One of the goals of these techniques is the reinsertion of the RC in the greater tuberosity, attempting to make the repair appear as anatomically perfect as possible.[4] Another goal is to achieve a more resistant and durable fixation.

The double-row repair described by Lo and Burkhart[10] is the technique that attempts to anatomically recreate the RC insertion, to reestablish the footprint and to increase the area of contact of the tendon with the bone. However, although the double-row lowers the probability of mechanical failure and promotes a better restoration of the tendon insertion in the greater tuberosity, it pre-

sents a significant rerupture rate (although lower than the single row) and clinical success rates that are similar to a single row.[9] In their study, Gerhardt et al.[11] showed that clinically and in the imaging method using Nuclear Magnetic Resonance (NMR) there was no significant improvement using double-row suture instead of the modified Mason-Allen suture.

Scheibel et al.[3] demonstrated in their study that the modified Mason Allen suture technique is easy to execute and promotes excellent initial fixation, allowing integration of the osteofibroblasts and tendon reinsertion, besides promoting mechanical stability and improving rehabilitation in the postoperative period. Our study performed a clinical comparison of the UCLA scores in the pre and postoperative period of patients who had undergone modified Mason-Allen suturing, obtaining average clinical improvement of 142.3%.

According to Duquin et al.[12] the double-row suture presented better results in lesions larger than 1cm. The double-row suture enables better biomechanical performance and better contact area, besides allowing better mobility due to the lower suture tension. In our study the patients with medium lesions between 1 and 3 cm submitted to the modified Mason-Allen suture technique, presented clinical improvement of 140.7%. In the patients with large lesions between 3 and 5 cm the rate of improvement was 204.3%. However, 29.4% of these patients with large lesions underwent surgical intervention twice.

According to Nelson et al.[13] the double-row suture compared with the modified Mason-Allen technique presented a larger tendon-bone contact surface. Biomechanically, the double-row suture and the modified Mason-Allen technique did not show any statistical difference of rupture with peak load application. Tuohti et al.[14] found a 60% larger contact area after using the double-row suture technique than with the single-row suture, yet there was no significant difference in the pressure produced by the suture at the lesion site.

Ma et al.[15] found greater resistance in the double-row suture tension in models of human cadavers, when compared with four different single-row suture techniques, including the modified Mason-Allen technique.

The modified Mason-Allen suture produces greater force and pressure of the tendon on the bone than the simple repair. Histologically this suture has not yet been studied, but according to the study of Scheibel et al.[3] no cases of aseptic necrosis of the tendon were observed. According to Burkhart,[16] the tie and knot are key elements in this suture, and when insufficient can cause space formation in the repair and weakness in the suture.

According to Nho et al.,[9] clinical studies with types of postoperative images have revealed that tendon rerupture after simple suture can affect from 22% to 94% of the cases. While other studies demonstrated that for rotator cuff (RC) lesions repaired with double row the repair failure was from 11% to 22%. In our evaluation, 6.3% of all the patients undergoing the modified Mason-Allen technique presented reruptures, all of whom had large lesions.

This case series of rotator cuff lesion repaired using the modified Mason-Allen suture technique brought about a significant improvement in the postoperative UCLA result, regardless of lesion size. A result comparable with those found in the studies of other suture techniques, such as the double-row,[10] with the advantage of requiring shorter surgical time and the use of a smaller number of anchors, consequently implying a lower surgical cost. However, 29.4% of reruptures occurred in the patients with large lesions who underwent the modified Mason-Allen technique. New strategies aim to decrease the incidence of reruptures including the use of platelet-rich plasma, stem cells, gene therapy, homologous grafts and extracellular matrices.[17] New studies are necessary to compare the clinical results and rerupture rates when using the modified Mason-Allen and double-row techniques.

CONCLUSION

The modified Mason-Allen suture technique produced significant clinical improvement in the patients, regardless of lesion size. A high rate of reruptures was found in the larger lesions.

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