RBO REVISTA BRASILEIRA DE ORTOPEDIA
www.rbo.org.br

Original article

Result from arthroscopic surgical treatment of renewed tearing of the rotator cuff of the shoulder☆

Glaydson Gomes Godinho[a,b,c], *Flávio de Oliveira França*[a,c], *José Márcio Alves Freitas*[a,b], *Flávio Márcio Lago Santos*[c], *Alexandre Prandini*[a,b,c], *André Couto Godinho*[a,b,c], *Rafael Patrocínio de Paula Costa*[a,b,c,*]

[a] *Orthopedic Hospital, Belo Horizonte, MG, Brazil*
[b] *Belo Horizonte Hospital, Belo Horizonte, MG, Brazil*
[c] *Lifecenter Hospital, Belo Horizonte, MG, Brazil*

ARTICLE INFO

Article history:
Received 31 December 2013
Accepted 13 March 2014
Available online 23 February 2015

Keywords:
Rotator cuff
Treatment failure
Arthroscopy

ABSTRACT

Objectives: To evaluate function among patients with postoperative recurrence of rotator cuff injuries that was treated arthroscopically (case series) and compare this with function in patients without recurrence (control group); and to compare function among patients with recurrence of rotator cuff injuries that were greater than and smaller than 3 cm.
Methods: This was a retrospective evaluation of patients who underwent arthroscopic revision of rotator cuff injuries using the ASES, Constant & Murley and UCLA scores and a visual analog pain scale, in comparison with patients in a control group who underwent primary rotator cuff repair.
Results: The size of the rotator cuff injury recurrence had a statistically significant influence on the result from the arthroscopic surgical treatment. The functional scores showed worse results than those from the first procedure.
Conclusion: Arthroscopic surgical treatment of renewed tearing of rotator cuff injuries showed worse functional scores than those from primary repair of the injury.

Resultado do tratamento cirúrgico artroscópico das rerrupturas do manguito rotador do ombro

Palavras-chave:
Bainha rotadora
Falha de tratamento
Artroscopia

RESUMO

Objetivos: Avaliar a função de pacientes operados por via artroscópica de recidiva pós-cirúrgica de lesão do manguito rotador (série de casos) e compará-los com aqueles sem recidiva (grupo controle). Comparar a função de pacientes com recidiva de lesões do manguito rotador (MR) maiores e menores do que 3 cm.

☆ Work developed at Lifecenter Hospital, Belo Horizonte Hospital and Orthopedic Hospital, Belo Horizonte, MG, Brazil.

* *Corresponding author.*
E-mail: Rtrauma@gmail.com (R.P.d.P. Costa).

http://dx.doi.org/10.1016/j.rboe.2015.02.007

Métodos: Avaliação retrospectiva de pacientes submetidos a revisão artroscópica das lesões do manguito rotador com o uso dos escores de ASES, Constant e Murley, UCLA e escala analógica de dor e comparação com pacientes do grupo controle submetidos a reparo primário do MR.

Resultados: O tamanho da lesão do manguito rotador na recidiva apresentou influência no resultado do tratamento cirúrgico artroscópico com significância estatística. Os escores funcionais mostraram piores resultados quando comparados àqueles do primeiro procedimento.

Conclusão: O tratamento cirúrgico artroscópico das rerrupturas de lesões do manguito rotador mostrou piores escores funcionais quando comparado ao reparo primário da lesão.

Introduction

Surgical treatment of recurrence of rotator cuff injuries is a challenge because of the diagnostic difficulties and surgical technique, and because it evolves with results that are inferior to those of primary surgery.[1] The approach needs to be careful and surgical treatment may not be the only option. The evolution of the lesions is unpredictable[2] and there may be discordance between the clinical assessment and the imaging examinations.[3] Persistence of pain and loss of function after conservative treatment may indicate the need for surgical treatment. Most studies have evaluated the results from surgical repairs performed as open revision procedures. Arthroscopic repair presents advantages, such as lower aggression in relation to the deltoid muscle, the possibility of diagnosing associated lesions and better viewing and classification of the size of the injury.[4]

Recurrences of rotator cuff injuries are a common complication. The incidence of recurrences has been estimated as 35% for small injuries[5,6] and may reach more than 94% in cases of extensive injuries.[7,8] The etiology of recurrences varies.[1] Despite the advances in treatment that have been achieved, there are no precise parameters for diagnosing recurrences of these injuries.[9] In this regard, physical examination and imaging methods are of great importance, in that they provide additional data that might guide the diagnosis.

The initial radiographic evaluation makes it possible to estimate the upward migration of the humeral head, presence of subacromial spurs, glenohumeral osteoarthritis and anchor positions. Additional information may be obtained through other methods, such as ultrasonography (US), magnetic resonance imaging (MRI) and arthro-computed tomography (arthro-CT).[10] These examinations are indicated when the postoperative recovery evolves in an unsatisfactory manner.[11] MRI is considered to be the most suitable noninvasive imaging examination.

The characteristics of the supraspinatus tendon after the operation can be assessed using MRI into five types, according to the classification system proposed by Sugaya et al.[12] This examination makes it possible to evaluate the degree of fatty infiltration of the muscle by means of the classification system of Goutallier et al.[13] and the degree of muscle trophism by means of the tangent sign proposed by Zanetti et al.[14] All of these factors have prognostic value and directly influence patient management and the results from the surgical treatment.[3]

The objectives of the present study were as follows:

1. To evaluate function among patients who underwent operations due to recurrence of rotator cuff injuries (case series) and compare them with patients without recurrences (control group).
2. To compare function among patients with rotator cuff injuries larger and smaller than 3 cm.

Materials and methods

Patients who underwent arthroscopic revision of rotator cuff injuries at the Lifecenter, Belo Horizonte and Orthopedic hospitals in Belo Horizonte, MG, performed by the four titular surgeons of the group between January 2003 and November 2012, were retrospectively evaluated.

With the aim of having a better statistical evaluation of the results, two comparative groups were used in this study: the case group, which consisted of patients with renewed tearing who were reoperated arthroscopically; and the control group, formed by patients who had been operated only once for rotator cuff repair.

Case group

This group comprised 57 patients and 58 shoulders (one patient affected bilaterally) and underwent reoperation to treat recurrences of rotator cuff injuries. Fifteen shoulders (26.3%) had traumatic etiology and 45, non-traumatic.

During the surgical procedure, the lesions were measured in the anteroposterior direction and were grouped as larger than or smaller than 3 cm. Thirty-eight shoulders (66.6%) presented lesions larger than 3 cm and 20 (35.4%), smaller. Among the lesions of traumatic origin, seven were larger than 3 cm and eight were smaller.

Fifty-three shoulders (91.4%) required only one revision procedure and five (8.7%), more than one revision.

The patients' mean age was 63.6 years (range: 42–92). Thirty-one patients (53.4%) were male and 26 (46.6%) were female. Forty-seven shoulders (82.5%) were affected on the right side and 11 (17.5%) on the left side. The dominant limb was affected in 48 (84.2%) shoulders. One patient was

Table 1 – Comparison of demographic data between the cases series and the controls.

	Cases	Controls
Mean age (years)	63.6	62.2
Male	31	14
Female	26	25
Dominance	55	39
Side affected (RS/LS)	47/1130	/9
Smoking	1	6
SAH	22	15
DM	8	6
Hypothyroidism	1	4
Dyslipidemia	12	5

SAH, systemic arterial hypertension; DM, diabetes mellitus; RS, right shoulder; LS, left shoulder.

ambidextrous and one presented bilateral recurrence of rotator cuff injuries.

Among the commonest comorbidities, 22 patients (38.6%) presented systemic arterial hypertension (SAH), seven (12.3%) hypothyroidism, eight (14%) diabetes and 12 (21%) dyslipidemia.

The scales used for evaluating the patients were the visual analog scale (VAS) for pain, American Shoulder and Elbow Surgeons (ASES) scale,[15] UCLA shoulder rating scale (UCLA)[16] and Constant and Murley scale.[17]

Control group

This was a group of 39 patients (42 shoulders) who underwent arthroscopic repair of rotator cuff injuries on a single occasion, performed by the same surgeons between May 1996 and July 2008.

Twelve shoulders (28%) presented lesions larger than 3 cm and 30 (72%), smaller.

All of these shoulders were operated only once.

The mean age among these patients was 62.2 years (range: 45–76). Eleven patients (28.2%) were male and 28 (71.8%) were female. The right side was affected in 32 shoulders (76.2%) and the left side in ten (23.8%). The dominant side presented lesions in 11 patients (28.2%). None of these patients were ambidextrous. Fifteen patients (38.5%) were hypertensive, six (15.4%) were diabetic, four (10.3%) presented hypothyroidism and five (12.8%) had dyslipidemia (Table 1).

The functional evaluation on the patients in this group was performed using the Constant and Murley score.

Statistical analysis

The Mann–Whitney test was used to evaluate the functional scores in the series of controls and cases and the sizes of the lesions were taken into consideration.

The statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) software, version 17.0. The significance level was taken to be $p < 0.05$.

Results

Comparison of the functional results between the two sizes of lesions studied showed a statistically significant difference. Patients with lesions larger than 3 cm presented worse function than those with smaller lesions. From the VAS scores for pain, these two groups did not present any statistical difference (Table 2).

In comparatively evaluating the Constant and Murley scores between the control and case groups, it was observed that the patients who underwent only one rotator cuff repair procedure had statistically better functional results (Table 3).

Discussion

Persistence of symptoms such as pain, loss of strength and limitation of movements after a rotator cuff injury has been repaired is a sign indicating a probable need for surgical revision,[1] when associated with imaging examinations demonstrating the presence of a new lesion. It needs to be taken into consideration that there is a possibility of discordance between clinical assessments and imaging examinations.[3] Jost et al.[2] evaluated 20 patients with imaging diagnoses of recurrence of rotator cuff injuries and observed that four of them were completely asymptomatic. Making this diagnosis using physical examination alone was impossible.

Certain factors need to be taken into consideration in order to distinguish which patients might benefit from a new surgical procedure. According to Montgomery et al.,[3] the best candidates are relatively young, with high functional demands, and present reparable lesions without significant muscle atrophy, with a good range of motion, an intact deltoid

Table 2 – Functional and pain evaluation in relation to the two groups of lesion size.

Variables	Lesions	*n*	Median	95% CI for difference between groups	*p*-value
VAS	<3 cm	38	2.0	[1.0] −0.0 to 3.0	0.2
	>3 cm	20	3.0		
Total ASES	<3 cm	38	80.8	[1.0] −26.7 to −0.0	0.05
	>3 cm	20	65.8		
UCLA	<3 cm	38	28.50	[1.0] −8.0 to −2.0	0.004
	>3 cm	20	23.50		
Constant	<3 cm	38	79.95	[1.0] −18.2 to −5.6	<0.001
	>3 cm	20	69.00		

The significance probabilities (*p*-values) refer to the Mann–Whitney test.

Table 3 – Functional evaluation of the cases series versus control group by means of the Constant score.

Variables	Group	N	Median	95% CI for difference between group	*p*-value
Constant	Controls	41	81.8	[1.0] 2.2–11.6	0.006
	Cases	58	74.8		

The significance probabilities (*p*-values) refer to the Mann–Whitney test.

muscle and only one previous operation. If there is a contraindication against surgery, conservative treatment may be indicated, and this has been correlated with good results.[1]

Some studies have evaluated the results from surgical treatment of recurrences of rotator cuff injuries as open procedures. In 1984, DeOrio and Cofield[18] published the first case series, evaluating the results from 24 patients who were reoperated. Among these, only four patients presented good results. After 46 months of follow-up, the pain level was moderate or severe in 63%. Bigliani et al.[19] evaluated 31 patients with recurrences of rotator cuff injuries and obtained good or excellent results in 52% of the cases. There were improvements of pain in 81% of the patients by the end of the follow-up. Poor results were attributed to deinsertion of the deltoid muscle, lateral acromionectomy and poor tissue quality. On the other hand, Djurasovic et al.[20] evaluated the largest series of reoperations described in the literature (80 patients) and found that 58% of the results were good or excellent. In that study, 86% of the patients evolved with improvement of their pain. Similarly, Neviaser and Neviaser[21] evaluated 50 patients who underwent surgical revision of the rotator cuff and reported that there were improvements in pain in 92% of the cases. In analyzing the results from the present study, we observed that the mean pain level among patients who had undergone surgical treatment of recurrences of rotator cuff injuries was 2.9 points, measured using the VAS.

Cordasco and Bigliani[19,22] believed that the main objective in revision surgery ought to be pain relief, rather than improvement of function. From evaluating function using the Constant and Murley score in the present study, it was shown that reoperated patients had worse functional results than those of the control group.

Few studies have evaluated the effects of arthroscopic repair on recurrences of rotator cuff injuries, despite the benefits of the technique. In a retrospective analysis on 30 patients who were reoperated either as open or as arthroscopic procedures, Miyasaki et al.[23] found that unsatisfactory results predominated among patients who underwent open repair, in comparison with the arthroscopic route ($p = 0.001$).

From arthroscopic revision, Lo et al.[24] found that 93% of the results were satisfactory. In their evaluation, the UCLA score increased from 13.1 ± 2.3 before the operation to 28.6 ± 7.1 after the operation. In a series of 54 patients who were reoperated arthroscopically so as to perform revision of rotator cuff injuries, Piasecki et al.[4] found that the ASES score increased from 43.8 ± 5.7 before the operation to 68.1 ± 7.2 after the operation, while there was no improvement in pain as assessed using the VAS. Keener et al.[25] used methodology similar to that of the present study and retrospectively evaluated 21 patients who underwent arthroscopic revision surgery on the rotator cuff, with a mean follow-up of 33 months. The mean Constant and Murley score was 60.7 in the case group and 76.2 in the control group, with statistical significance. The present study only took into account the results from arthroscopic repair of recurrences of rotator cuff injuries, with a sample of 58 reoperated shoulders. The functional results from the control group, as assessed using the Constant and Murley score (81.8) were superior to those from the case series (74.8).

In a series of arthroscopic revisions, Ladermann et al.[26] compared lesions that were larger than and smaller than 5 cm and did not find any functional differences between the groups. The present study showed a difference in functional results through comparing lesions larger than and smaller than 3 cm. This divergence from the previous study is due to the fact that in the first study, the lesions were grouped as large and extensive, whereas in the second, the grouping was as small and large.

The retrospective nature of the present study can be highlighted as a limitation. Thus, there was no preoperative functional evaluation.

Conclusion

Patients with recurrence of rotator cuff injuries achieved worse functional results from arthroscopic surgery than those of patients without recurrence.

Patients who presented recurrence of lesions of sizes smaller than 3 cm presented better function than that of patients with larger lesions.

Conflicts of interest

The authors declare no conflicts of interest.

REFERENCES

1. Kilinc AS, Giarreti R, Diaz L, Sauzières P, Valenti P. Recurrent rotator cuff tears: an evaluation of open re-surgery results. Eur J Orthop Surg Traumatol. 2010;20(5):373–80.
2. Jost B, Pfirrmann CW, Gerber C. Clinical outcome after structural failure of rotator cuff repairs. J Bone Joint Surg Am. 2000;82(3):304–14.
3. Montgomery SR, Petrigliano FA, Gamradt SC. Failed rotator cuff surgery, evaluation, and decision making. Clin Sports Med. 2012;31(4):693–712.
4. Piasecki DP, Verma NN, Nho SJ, Bhatia S, Boniquit N, Cole BJ, et al. Outcomes after arthroscopic revision rotator cuff repair. Arthroscopic revision rotator cuff repair outcomes. Am J Sports Med. 2010;38(1):40–6.
5. Gazielly DF, Gleyze P, Montagnon C. Functional and anatomical results after rotator cuff repair. Clin Orthop Relat Res. 1994;(304):43–53.

6. Wulker N, Melzer C, Wirth CJ. Shoulder surgery for rotator cuff tears. Ultrasonographic 3-year follow-up of 97 cases. Acta Orthop Scand. 1991;62(2):142–7.
7. Calvert PT, Packer NP, Stoker DJ, Bayley JI, Kessel L. Arthrography of the shoulder after operative repair of the torn rotator cuff. J Bone Joint Surg Br. 1986;68(1):147–50.
8. Galatz LM, Ball CM, Teefey SA, Middleton WD, Yamaguchi K. The outcome and repair integrity of completely arthroscopically repaired large and massive rotator cuff tears. J Bone Joint Surg Am. 2004;86(2):219–24.
9. Potter HG, Jawetz ST, Foo LF. Imaging of the rotator cuff following repair: human and animal models. J Shoulder Elbow Surg. 2007;16(5 Suppl):S134–9.
10. Williams G. Painful shoulder after surgery for rotator cuff disease. J Am Acad Orthop Surg. 1997;5(2):97–108.
11. George MS, Khazzam M. Revision rotator cuff repair. J Shoulder Elbow Surg. 2012;21(4):431–40.
12. Sugaya H, Maeda K, Matsuki K, Moriishi J. Functional and structural outcome after arthroscopic full-thickness rotator cuff repair: single-row versus dual-row fixation. Arthroscopy. 2005;21(11):1307–16.
13. Goutallier D, Postel JM, Bernageau J, Lavau L, Voisin MC. Fatty muscle degeneration in cuff ruptures. Pre- and postoperative evaluation by CT scan. Clin Orthop Relat Res. 1994;(304):78–83.
14. Zanetti M, Gerber C, Hodler J. Quantitative assessment of the muscles of the rotator cuff with magnetic resonance imaging. Invest Radiol. 1998;33(3):163–70.
15. Michener LA, McClure PW, Sennett BJ. American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form, patient self-report section: reliability, validity, and responsiveness. J Shoulder Elbow Surg. 2002;11(6):587–94.
16. Ellman H, Hanker G, Bayer M. Repair of the rotator cuff. End-result study of factors influencing reconstruction. J Bone Joint Surg Am. 1986;68(8):1136–44.
17. Constant CR, Murley AH. A clinical method of functional assessment of the shoulder. Clin Orthop Relat Res. 1987;(214):160–4.
18. DeOrio JK, Cofield RH. Results of a second attempt at surgical repair of a failed initial rotator cuff repair. J Bone Joint Surg Am. 1984;66(4):563–7.
19. Bigliani LU, Cordasco FA, McIlveen SJ, Musso ES. Operative treatment of failed repairs of the rotator cuff. J Bone Joint Surg Am. 1992;74(10):1505–15.
20. Djurasovic M, Marra G, Arroyo JS, Pollock RG, Flatow EL, Bigliani LU. Revision rotator cuff repair: factors influencing results. J Bone Joint Surg Am. 2001;83(12):1849–55.
21. Neviaser RJ, Neviaser TJ. Reoperation for failed rotator cuff repair: analysis of fifty cases. J Shoulder Elbow Surg. 1992;1(6):283–6.
22. Cordasco FA, Bigliani LU. The treatment of failed rotator cuff repairs. Instr Course Lect. 1998;47:77–86.
23. Miyazaki AN, Fregoneze M, Santos PD, Silva LA, Sella GV, Santos RMM, et al. Avaliação dos resultados das reoperações de pacientes com lesões do manguito rotador. Rev Bras Ortop. 2011;46(1):45–50.
24. Lo IK, Burkhart SS. Arthroscopic revision of failed rotator cuff repairs: technique and results. Arthroscopy. 2004;20(3):250–67.
25. Keener JD, Wei AS, Kim HM, Paxton ES, Teefey SA, Galatz LM, et al. Revision arthroscopic rotator cuff repair: repair integrity and clinical outcome. J Bone Joint Surg Am. 2010;92(3):590–8.
26. Ladermann A, Denard PJ, Burkhart SS. Mid-term outcome of arthroscopic revision repair of massive and non massive rotator cuff. Arthroscopy. 2011;27(12):1620–7.