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Original Article

Functional evaluation of arthroscopic repair of rotator cuff injuries in patients with pseudoparalysis☆,☆☆

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ABSTRACT

Objective: to evaluate the functional result from arthroscopic repair of rotator cuff injuries in patients with pseudoparalysis, defined as incapacity to actively raise the arm above 90°, while complete passive elevation was possible.
Methods: we reevaluated 38 patients with a mean follow-up of 51 months (minimum of 24). We analyzed the pseudoparalysis reversion rate and the functional result obtained.
Results: according to the assessment criteria of the University of California in Los Angeles (UCLA), 31 (82%) patients had good and excellent results, two (5%) had fair results and five (13%) had poor results. The mean active elevation went from 39° before the operation to 139° after the operation ($p < 0.05$); the mean active lateral rotation went from 30° to 48° ($p < 0.05$) and the mean active medial rotation went from level L3 to T12 ($p < 0.05$).
Conclusion: arthroscopic repair of rotator cuff injuries produced good and excellent results in 82% of the cases and a statistically significant improvement of active range of motion, with reversion of the pseudoparalysis in 97.4% of the cases. It is therefore a good treatment option.

Avaliação funcional do reparo artroscópico da lesão do manguito rotador em pacientes com pseudoparalisia

Palavras-chave:
Paralisia
Manguito rotador/lesões
Articulação do ombro/cirurgia

RESUMO

Objetivo: avaliar o resultado funcional do reparo artroscópico das lesões do manguito rotador em pacientes com pseudoparalisia, definida como incapacidade de elevação ativa do braço acima de 90°, com elevação passiva completa.
Métodos: reavaliamos 38 pacientes com média de seguimento de 51 meses (mínimo de 24). Analisamos a taxa de reversão da pseudoparalisia e o resultado funcional obtido.

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Resultados: pelos critérios de avaliação da Universidade da Califórnia em Los Angeles (Ucla), 31 (82%) pacientes tiveram bons e excelentes resultados; dois (5%) resultados regulares e cinco (13%) ruins. A média da elevação ativa passou de 39° no pré-operatório para 139° no pós-operatório ($p < 0,05$), a média da rotação lateral ativa passou de 30° para 48° ($p < 0,05$) e a média da rotação medial ativa passou do nível L3 para o T12 ($p < 0,05$).

Conclusão: o reparo artroscópico das lesões do manguito rotador proporcionou bons e excelentes resultados em 82% dos casos e uma melhoria, estatisticamente significativa, da amplitude de movimento (ADM) ativa, com reversão da pseudoparalisia em 97,4% dos casos. É, portanto, uma boa opção de tratamento.

Introduction

The functions of the rotator cuff are to stabilize the humeral head inside the glenoid cavity and rotate the humerus in relation to the scapula.[1] The supraspinatus muscle is responsible for the first 10° to 15° of shoulder elevation range of motion and, together with the infraspinatus, teres minor and subscapularis muscles, opposes the force of the deltoid muscle, which tends to move the humeral head upwards during elevation movements.[2,3] Rotator cuff injuries may lead to loss of these functions and consequently to chronic pain, weakness and functional incapacity.[4]

Pseudoparalysis due to rotator cuff injury (PRCI) has been defined by some authors[5–7] as incapacity to perform active elevation of the arm above 90°, with normal passive mobility of the shoulder. This deficit of active elevation is associated with rotator cuff injuries that are usually large or extensive.[8,9] The results from repairing large or extensive rotator cuff injuries have generally been reported in the literature as satisfactory.[10–12] However, the functional recovery of patients with PRCI who undergo arthroscopic surgical repair is still known only a little.

The objective of the present study was to evaluate the results from arthroscopic repair of rotator cuff injuries in PRCI patients.

Sample and methods

Between January 1996 and October 2011, the Shoulder and Elbow Group of the Department of Orthopedics and Traumatology, School of Medical Sciences, Santa Casa de São Paulo, performed arthroscopic operations on 38 patients with PRCI.

All cases with these characteristics were included in this study. Patients with rotator cuff injuries without paralysis and cases with follow-ups shorter than 24 months were excluded.

There were 21 male patients (55%); the age range was from 49 to 81 years (mean of 68 years); and the dominant limb was operated in 30 cases. All the patients except for one reported having had a well-define episode of trauma to the joint or traumatic muscle effort that led to loss of active elevation of the affected limb. The time that had elapsed between the injury and the surgical treatment ranged from two to 740 days, with a mean of 83 days. None of the patients had undergone any previous surgery on the affected shoulder (Table 1).

The range of active motion before the operation, as measured using the standardization of the American Academy of Orthopaedic Surgeons (AAOS),[13] was from 0° to 90° of elevation (mean of 39°); the range of lateral rotation was from 0° to 80° (mean of 30°); and the range of medial rotation was between the greater trochanter and T7 (mean at L3) (Table 2).

The presence of a rotator cuff injury was confirmed in all the patients by means of magnetic resonance imaging (Fig. 1).

All the patients underwent the surgical procedure in the "deckchair" position, under general anesthesia combined with anesthetic block of the brachial plexus. The joint was arthroscopically inspected before the rotator cuff repair was performed. Next, the subacromial space was entered, with debridement of the bursa, mobilization of the tendons and opening of the bone bed of the femoral head, followed by repair of the rotator cuff injury (Fig. 2). Ten large lesions and 28 extensive lesions were found, in accordance with the classification proposed by Cofield[8] (Fig. 3). Regarding the tendons affected, 26 patients had injuries to the supraspinatus and infraspinatus and 12 had injuries to the supraspinatus, infraspinatus and subscapularis. None of the patients had injuries to just one tendon alone (Table 1). In relation to the tendon of the long head of the biceps brachii muscle, 12 patients underwent tenotomy, seven underwent tenotomy plus tenodesis and seven did not undergo these procedures. Acromioplasty was performed on 32 of the 38 patients. Resection of the lateral portion of the clavicle was performed in eight of the 38 patients. Arthrex® material was used on all our patients.

During the postoperative period, the patients were immobilized for six weeks, in a sling with the arm abducted and

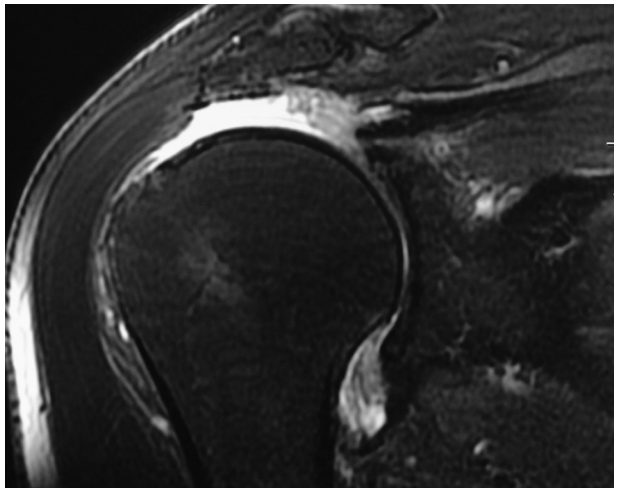

Fig. 1 – Magnetic resonance image (coronal slice) of the right shoulder showing extensive injury to the rotator cuff.

Table 1 – Data on the patients.

No.	Sex	Age (years)	Dominance	ΔT (days)	Follow-up (months)	Pre-op active ROM: EL, LR, MR	Tendon	Size	Post-op active ROM: EL, LR, MR	UCLA
1	F	75	+	21	24	50, 45, T7	SS + IS	L	130, 45, T7	16
2	F	61	–	7	24	80, 40, T7	SS + IS	L	140, 45, T12	31
3	M	68	+	2	35	30, 45, L2	SS + IS	EXT	140, 30, T12	32
4	F	71	+	4	74	0, 30, L5	SS + IS	EXT	140, 30, T10	18
5	M	72	+	30	116	80, 45, L3	SS + IS	EXT	150, 45, L1	32
6	F	78	–	7	65	0, 0, L3	SS + IS	EXT	150, 60, L1	34
7	F	81	+	30	26	60, 30, T7	SS + IS	EXT	140, 40, T7	34
8	F	73	+	20	49	0, 30, TR	SS + IS + SUB	EXT	150, 60, L3	34
9	F	76	+	3	48	0, 10, L5	SS + IS + SUB	EXT	130, 60, L1	34
10	F	75	+	20	38	80, 30, L1	SS + IS + SUB	EXT	120, 40, L1	10
11	M	72	+	4	72	30, 60, GL	SS + IS	EXT	160, 60, T8	34
12	M	60	+	14	94	45, 30, L3	SS + IS	EXT	150, 45, T10	34
13	M	67	–	14	45	30, 10, T7	SS + IS + SUB	EXT	150, 60, T8	34
14	M	64	+	7	87	0, 30, L3	SS + IS + SUB	EXT	150, 45, L1	32
15	F	67	+	30	74	60, 0, T8	SS + IS	EXT	140, 45, L1	34
16	F	81	+	3	26	45, 20, T7	SS + IS + SUB	EXT	45, 30, T7	15
17	F	79	+	10	25	80, 0, T10	SS + IS	EXT	150, 60, L1	29
18	F	79	–	4	24	30, 30, L1	SS + IS	EXT	150, 45, L1	32
19	M	62	+	45	75	90, 60, L1	SS + IS	L	150, 60, L1	34
20	M	66	+	60	73	30, 60, L5	SS + IS	L	140, 60, L1	34
21	M	74	+	1	29	30, 0, T7	SS + IS	EXT	120, 20, L1	33
22	M	49	+	740	26	80, 50, GL	SS + IS + SUB	EXT	140, 60, L3	33
23	M	74	–	14	56	0, 0, T7	SS + IS	L	150, 50, T7	34
24	M	68	+	15	51	60, 0, L1	SS + IS	L	150, 45, L5	34
25	M	56	+	15	25	70, 20, L1	SS + IS + SUB	EXT	150, 50, T7	34
26	F	79	+	30	53	80, 60, T7	SS + IS	EXT	120, 45, L2	29
27	F	69	+	4	50	30, 80, T12	SS + IS	EXT	120, 80, T12	34
28	M	65	+	32	24	60, 45, L3	SS + IS	EXT	150, 45, L1	34
29	M	71	+	30	33	20, 70, L3	SS + IS + SUB	EXT	150, 60, T8	32
30	M	70	–	20	37	0, 60, T10	SS + IS	EXT	120, 60, L1	34
31	M	81	+	15	24	0, 0, T8	SS + IS + SUB	EXT	150, 45, L1	32
32	M	55	+	10	24	0, 0, T7	SS + IS	L	150, 45, T7	32
33	M	74	+	60	25	30, 0, T10	SS + IS	EXT	150, 0, T8	32
34	M	74	+	60	26	80, 80, L5	SS + IS + SUB	EXT	150, 60, T10	34
35	M	53	–	2	24	0, 80, T10	SS + IS	L	160, 60, T10	34
36	F	72	+	150	45	70, 45, T7	SS + IS	L	120, 45, T7	27
37	F	57	–	600	26	90, 35, T10	SS + IS + SUB	EXT	120, 45, T9	19
38	F	62	+	330	48	90, 20, GL	SS + IS	L	140, 50, T9	22

Source: hospital medical files.
ΔT, time elapsed between diagnosis and operation; ROM, range of motion measured in degrees; Pre-op, before operation; EL, elevation; LR, lateral rotation; MR, medial rotation; Tendon, tendons affected, as seen during operation; Post-op, after operation; SS, supraspinatus; IS, infraspinatus, SUB, subscapularis; EXT, extensive; L, large; T, measurement according to height of the thoracic vertebra; L, measurement according to height of the lumbar vertebra; GL, measurement according to height of the gluteus; UCLA, score on the scale of the University of California in Los Angeles.

Table 2 – Patients' preoperative and postoperative mobility.

	Pre-op active ROM (mean)	Post-op active ROM (mean)	Δ mobility
EL	39	139	100
LR	30	48	18
MR	L3	T12	3 levels

Source: hospital medical files.
ROM, range of motion; Pre-op, before operation; Post-op, after operation; Δ mobility, difference in active ROM from before operation to after operation.

in neutral rotation. After this period, the sling was withdrawn and elevation, lateral rotation and medial rotation were allowed, both passively and actively. Four months after the operation, muscle strengthening was started (Fig. 4). The results were evaluated in accordance with the UCLA method[14] and the range of motion was measured in accordance with the standardization of the AAOS.[13]

Student's *t* test was used for the statistical evaluation. The means and standard deviations of the variables of elevation, lateral rotation and medial rotation relating to before and after

Fig. 2 – Arthroscopic surgical image (subacromial view) showing complete closure of an extensive rotator cuff injury.

the operation were analyzed, taking the significance level to be 5% ($p < 0.05$).

The length of follow-up for these patients ranged from 24 to 116 months (mean of 51).

Results

The mean active elevation after the operation was 139° (range: 45° to 160°) ($p < 0.05$), the mean lateral rotation was 48° (range: 0° to 80°) ($p < 0.05$) and the mean medial rotation was at the level of the 12th thoracic vertebra (range: from the sacrum to T7) ($p < 0.05$) (Table 2).

The mean score using the UCLA method in the final evaluation was 27 points (range: 10 to 34). Nineteen patients (50%) were classified as having excellent results, 12 (32%) good, two (5%) fair and five (13%) poor. Among the five cases that were considered to have poor results, only one needed to be reoperated.

Discussion

PRCI is associated with inability to perform simple arm movements of day-to-day life, such as raising the hand to the mouth, brushing teeth and combing hair, because of the loss of active elevation of the arm. The treatment options for pseudoparalysis include strengthening of the anterior portion of the anterior deltoid,[15] reverse total arthroplasty with or without associated muscle transfer,[6,7] repair of the rotator cuff injury[10,16] and transfer of the latissimus dorsi muscle to the greater tubercle.[17]

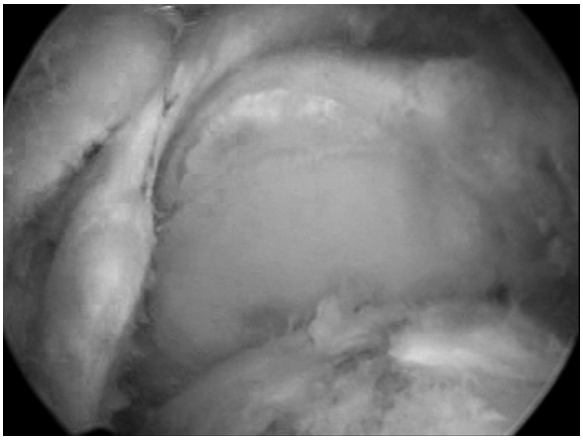

Fig. 3 – Arthroscopic surgical image (subacromial view) showing an extensive rotator cuff injury.

Fig. 4 – Clinical image of a patient after functional rehabilitation.

Levy et al.[15] prospectively evaluated 17 patients with extensive irreparable rotator cuff injuries that were treated through a rehabilitation program for the anterior portion of the deltoid muscle because they were not in a suitable clinical condition to undergo surgical treatment. Their mean age was 80 years. Their active elevation increased from 40° to 160° after the rehabilitation program, with a minimum follow-up of nine months. However, their muscle strength did not improve.

Gerber et al.[17] proposed transfer of the latissimus dorsi muscle to the greater tubercle as a treatment option for patients with extensive irreparable injuries to the rotator cuff. Among these patients, the mean elevation before the surgery was 62° and it became 150° after the muscle transfer.

Other authors have indicated reverse total arthroplasty for patients with PRCI. Werner et al.[7] reported using reverse total arthroplasty on 58 patients with a mean follow-up of 38 months. Among these, 17 had not had previous surgery on the shoulder and the anterior active elevation increased from 43° to 103° ($p < 0.001$). However, the complication rates in their study were high (50%). Boileau et al.[6] prospectively evaluated 11 patients who presented PRCI in association with loss of active lateral rotation and underwent reverse total

arthroplasty together with transfer of the latissimus dorsi teres major muscles. The anterior active elevation increased from 70° to 148°, lateral rotation increased from −18° to 18° and medial rotation decreased from L1 to S3. On the other hand, Mulieri et al.[18] reported a complication rate of around 20% after reverse arthroplasty, over the course of a mean follow-up period of 52 months among 60 patients with pseudoparalysis without arthrosis of the shoulder joint. Among these patients, 34 had not had previous surgery on the shoulder and, in this group, the anterior active elevation increased from 54° to 136° ($p < 0.001$).

We believe that arthroscopic repair of rotator cuff injuries in patients with PRCI presented a lower complication rate than that of reverse total arthroplasty of the shoulder. We also observed that there was a significant improvement in all shoulder movements of elevation, lateral rotation and medial rotation after the rotator cuff injuries had been repaired (Table 2).

More recently, Oh et al.[10] showed that there was pseudoparalysis reversion rate of 76% among 29 patients. These authors did not consider that a diminished interval between the acromion and the humerus or fatty infiltration of the tendons of the rotator cuff were contraindications against repair. They recommended that the first-line treatment for patients with PRCI without arthropathy due to rotator cuff injury should be primary arthroscopic repair.

Denard et al.[16] reported a pseudoparalysis reversion rate of 90% among a group of 39 patients who underwent primary arthroscopic repair of rotator cuff injuries. In another group of 14 patients who underwent revision of renewed tearing of the rotator cuff, the reversion rate was 43%. Our study corroborates the data in the literature on arthroscopic repair of rotator cuff injuries in patients with PRCI, with a reversion rate of 97.4%.

We only had one case that required reoperation (2.6%). This patient continued to present intense pain, diminished strength and little movement in the affected limb, and for this reason had to undergo reverse total arthroplasty.

Conclusion

Arthroscopic repair of rotator cuff injuries in cases with PRCI provided a statistically significant improvement in active range of motion, with reversion of the pseudoparalysis in 97.4% of the patients thus treated. Good and excellent results were observed in 82% of the cases and this functional improvement was obtained with low complication rates.

Conflicts of interest

The authors declare no conflicts of interest.

REFERENCES

1. Veado MAC, Castilho RS, Maia PEC, Rodrigues AU. Estudo prospectivo e comparativo dos resultados funcionais após reparo aberto e artroscópico das lesões do manguito rotador. Rev Bras Ortop. 2011;46(5):546–52.
2. Drake GN, O'Connor DP, Edwards TB. Indications for reverse total shoulder arthroplasty in rotator cuff disease. Clin Orthop Relat Res. 2010;468(6):1526–33.
3. Checchia SL, Santos PD, Miyazaki AN, Fregoneze M, Silva LA, Leite FSF, et al. Avaliação dos resultados da artroplastia parcial de ombro para tratamento da artropatia por lesão do manguito rotador. Rev Bras Ortop. 2008;43(6):232–9.
4. Moser M, Jablonski MV, Horodyski M, Wright TW. Functional outcome of surgically treated massive rotator cuff tears: a comparison of complete repair, partial repair, and debridement. Orthopedics. 2007;30(6):479–82.
5. Berhouet J, Collin P, Benkalfate T, Le Du C, Duparc F, Courage O, et al. Massive rotator cuff tears in patients younger than 65 years. Epidemiology and characteristics. Orthop Traumatol Surg Res. 2009;95 4 Suppl. 1:S13–8.
6. Boileau P, Chuinard C, Roussanne Y, Bicknell RT, Rochet N, Trojani C. Reverse shoulder arthroplasty combined with a modified latissimus dorsi and teres major tendon transfer for shoulder pseudoparalysis associated with dropping arm. Clin Orthop Relat Res. 2008;466(3):584–93.
7. Werner CM, Steinmann PA, Gilbart M, Gerber C. Treatment of painful pseudoparesis due to irreparable rotator cuff dysfunction with the Delta III reverse-ball-and-socket total shoulder prosthesis. J Bone Joint Surg Am. 2005;87(7):1476–86.
8. Cofield RH. Subscapular muscle transposition for repair of chronic rotator cuff tears. Surg Gynecol Obstet. 1982;154(5):667–72.
9. Hawkins RJ, Misamore GW, Hobeika PE. Surgery for full-thickness rotator-cuff tears. J Bone Joint Surg Am. 1985;67(9):1349–55.
10. Oh JH, Kim SH, Shin SH, Chung SW, Kim JY, Kim SH, et al. Outcomes of rotator cuff in large-to-massive tear with pseudoparalisis. Am J Sports Med. 2011;39(7):1413–20.
11. Checchia SL, Santos PD, Miyazaki AN, Fregoneze M, Silva LA, Salim Mussi F, et al. Tratamento cirúrgico das lesões extensas do manguito rotador pela via de acesso deltopeitoral. Rev Bras Ortop. 2003;38(5):252–60.
12. Gerber C, Fuchs B, Hodler J. The results of repair of massive tears of the rotator cuff. J Bone Joint Surg Am. 2000;82(4):505–15.
13. Codsi M, McCarron J, Brems JJ. Clinical evaluation of shoulder problems. In: Rockwood Jr CA, Matsen III FA, Wirth MA, et al., editors. The shoulder. 4th ed. Philadelphia: Saunders Elsevier; 2009.
14. Oku EC, Andrade AP, Stadiniky SP, Carrera EF, Tellini GG. Tradução e adaptação cultural do Modified University of California at Los Angeles Shoulder Rating Scale para a língua portuguesa. Rev Bras Reumatol. 2006;46(4):246–52.
15. Levy O, Mullett H, Roberts S, Copeland S. The role of anterior deltoid reeducation in patients with massive irreparable degenerative rotator cuff tears. J Shoulder Elbow Surg. 2008;17(6):863–70.
16. Denard PJ, Ladermann A, Jiwani AZ, Burkhart SS. Functional outcome after arthroscopic repair of massive rotator cuff tears in individuals with pseudoparalysis. Arthroscopy. 2012;28(9):1214–9.
17. Gerber C, Vinh TS, Hertel R, Hess CW. Latissimus dorsi transfer for the treatment of massive tears of rotator cuff: a preliminary report. Clin Orthop Relat Res. 1988;232(1):51–61.
18. Mulieri P, Dunning P, Klein S, Pupello D, Frankle M. Reverse shoulder arthroplasty for the treatment of irreparable rotator cuff tear without glenohumeral arthritis. J Bone Joint Surg Am. 2010;92(15):2544–56.