Arthroscopic Treatment of Rotator Cuff Rupture in Patients Under 55 years Old versus Patients Older than 65 Years Old

Comparação do tratamento artroscópico de ruptura do manguito rotador em pacientes com menos de 55 anos versus pacientes com mais de 65 anos

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Abstract

Objective To evaluate patients submitted to arthroscopic repair of the rotator cuff (RC) comparing the results of muscle, functional strength, and pain obtained in 2 distinct groups: patients < 55 years old (G55) and patients > 65 years old (G65).

Methods Data collection was performed with 63 participants ($29 < 55$ years old and $34 > 65$ years old), in 2 moments, analyzing: A) demographic, surgical and RC lesion characteristics; B) functional variables, muscle strength, and pain.

Results Higher levels of anterior elevation force, lateral, and medial rotation of the operated shoulder were observed in group G55. However, when the difference between these forces of the operated shoulder and of the contralateral shoulder was evaluated, there was no significant difference between the groups. The other variables of function and pain were similar ($p > 0.05$). There was also no difference between the groups in the University of California at Los Angeles Shoulder Rating Scale (UCLA) ($p = 0.56$) and Constant-Murley Score ($p = 0.99$) scores.

Conclusion Arthroscopic repair of the RC in older, active, selected patients may achieve functional improvement and quality of life similar to that performed in younger patients.

Keywords
- rotator cuff break
- aged
- arthroscopy
- pain measurement
- muscle strength

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Resumo

Objetivo Avaliar os pacientes submetidos a reparo artroscópico do manguito rotador (MR) comparando os resultados de força muscular, funcionais e de dor obtidos em 2 grupos distintos: de pacientes < 55 anos (G55) e em pacientes > 65 anos (G65).

Métodos A coleta de dados foi realizada com 63 participantes (29 pacientes < 55 anos e 34 > 65 anos), em 2 momentos, analisando: A) características demográficas, cirúrgicas e das lesões de MR; B) variáveis funcionais, força muscular e dor.

Resultados Foram observados maiores níveis de na força de elevação anterior, rotação lateral e rotação medial do ombro operado no grupo G55. Porém, quando avaliada a diferença entre estas forças do ombro operado e do ombro contralateral, não se observou diferença significativa entre os grupos. As demais variáveis de função e dor foram similares ($p > 0,05$). Também não houve diferença entre os grupos nos escores University of California, Los Angeles (UCLA, na sigla em inglês) ($p = 0,56$) e Constant ($p = 0,99$).

Conclusão O reparo artroscópico do MR em pacientes mais velhos, ativos e selecionados pode obter melhora funcional e de qualidade de vida similar ao realizado em pacientes mais jovens.

Palavras-chave
- ruptura de manguito rotador
- idoso
- artroscopia
- medição da dor
- força muscular

Introduction

The incidence of rotator cuff (RC) lesions increases with the progression of the age of the population. Tempelhof et al.[1] reported that the prevalence of complete RC ruptures in asymptomatic patients is of ~ 13% in individuals between 50 and 59 years old, of 20% in those between 60 and 69 years old, of 37% in those between 70 and 79 years old, and of 51% in those > 80 years old.

Certain prognostic factors for RC repair, such as large lesions, muscle weakness, fatty cuff atrophy and degeneration, and osteoarthrosis, worsen with advancing age,[2–5] and some authors have reported poor results with repair in older patients.[2,3,6] Moreover, some studies have demonstrated a lower healing potential in older patients, with rerupture rates of up to 32% in patients > 70 years old.[6,7]

On the other hand, the greater healing potential and better muscle conditions encourage the repair of RC lesions in patients < 55 years old. Excellent functional results have been reported after arthroscopic repair in this group of patients.[8–10]

The aim of our study is to evaluate the functional outcome of arthroscopic RC repair in 2 distinct groups of patients: > 65 (G65) and < 55 years (G55) old. We hypothesize that the group of patients < 55 years old will present better functional results after surgery compared with patients > 65 years old.

Methodology

Study design and participants

This is a retrospective cohort study. From 2011 to 2018, 465 patients underwent arthroscopic RC repair. Patients < 55 and > 65 years old who agreed to participate in the study were included. Patients between 55 and 65 years old, with < 12 months of follow-up, who had extensive lesions, previous surgeries on the operated shoulder, presence of severe osteoarthrosis, incomplete medical records, and those who, for several reasons, were unable to attend or had no interest in participating in the study were excluded. After applying the inclusion and exclusion criteria, 63 patients agreed to participate in the research and to attend to the hospital to be reevaluated.

Analysis outcomes

The primary outcome were the postoperative University of California, Los Angeles (UCLA) and Constant functional scores, and the secondary outcomes were the variables of strength, range of motion (ROM), and postoperative pain.

Methods and instruments

Data collection during the postoperative follow-up was performed in two stages: 1) consultation of medical records to collect demographic, surgical, and RC lesions; and 2) clinical evaluation with collection of functional variables, muscle strength, and pain.

Demographic and characterization data of RC lesion were obtained through analysis of electronic medical records. The following variables were collected: age, gender, dominance and laterality, follow-up time, comorbidities, follow-up pain, type of rupture (complete or partial), tendons approached, type of fixation (single row [SF] or double row [DF]), and number of anchors. The complete lesions were classified, according to the measurement of their largest diameter, as small (< 1 cm), medium (1 to 3 cm), and large (3 to 5 cm),[11,12] and the extensive ones were excluded from the study. The size and classification of the lesions were obtained from preoperative magnetic resonance imaging (MRI) and/or surgical descriptions.

The second moment of evaluation was performed in person, when the strength (Kgf) and amplitude (°) of the

movements of elevation, of lateral rotation, and of medial rotation of the shoulder were measured. Strength was measured by digital dynamometry and measured in Kgf, while amplitude was measured by goniometry and measured in degrees. In addition, during this evaluation, the functional capacity scores reported on the University of California at Los Angeles Shoulder Rating Scale (UCLA)[13] and Constant-Murley Score (CONSTANT),[14] were applied, together with the data collected regarding pain, using the visual analogue scale (VAS).[15] The scales mentioned above (UCLA and CONSTANT) were translated into Portuguese and were culturally adapted to the Brazilian population,[16,17] and are frequently used to assess the function of upper limbs in patients with RC injuries.[18–20]

After tabulation of the data, the individuals were divided into 2 groups, based on age at the time of the surgical procedure: < 55 (G55) and > 65 years (G65) old.

Surgical procedure

The surgeries were performed by three specialist surgeons with extensive experience in the subject. The SF fixation technique performed was that described by Burkhart, in which the tendon is tied to the anchors arranged in a single row.[21] The technique of DF fixation performed was that described by Lo et al.,[22] which consists of a medial row of anchors tied with "U" points and another lateral row of anchors tied with single points.

Postoperative rehabilitation

All patients followed the same standardized protocol. Movement of the elbow, of the wrist, and of the hand was stimulated from the immediate postoperative period. The patients remained immobilized with a sling for 6 weeks, gradually starting, after this period, the gain of the shoulder ROM. Muscle strengthening was started only after the 12th week.

Ethical approvals

All patients signed the Informed Consent Form. The present study was submitted to the evaluation and approval of the Ethics and Research Committee with Human Beings, under the opinion number 2,444,726, CAAE: 80401317.3.0000.0023.

Statistics

The descriptive analysis presented in the form of tables the observed data, expressed by the measures of central tendency and dispersion appropriate for numerical data and by the frequency and percentage for categorical data.

The inferential analysis for comparison between groups (G55 and G65) was composed by the Mann-Whitney test for numerical variables and by the chi-squares ($\chi 2$) or the Fisher exact test for categorical data.

The normality in the distribution of the variables was evaluated by the Shapiro-Wilk test and graphical analysis of histograms. Statistical analysis was processed by IBM SPSS Statistics for Windows, version 26 (IBM Corp., Armonk, NY, USA).

Results

Demographic and Surgical Characteristics among Groups

From 2011 to 2018, 465 patients underwent arthroscopic RC repair. Of these, 147 were excluded because they had other pathologies in the operated shoulder or had undergone other procedures during surgery, 8 died, 182 had incomplete data in the medical records, refused to participate, or contact was not possible, and 65 were between 55 and 65 years old at the time of the procedure.

The sample consisted of 63 shoulders. Of these, 29 (46%) correspond to the cases of patients < 55 years old and 34 (54%) of patients > 65 years old. The mean follow-up time was 46.5 months, and there was no statistically significant difference between groups G55 and G65. When the demographic characteristics and the surgical profile were compared between the groups, there was no statistically significant difference for the operated shoulder (right or left), dominance, or comorbidities (►**Tables 1** and **2**).

Characteristics of Rotator Cuff Injuries between Groups

Regarding the type of lesion, both groups presented predominance of cases of complete ruptures (G55: 58.6 versus G65: 91.2%), but group G55 presented a proportion of complete lesions ($p = 0.002$) significantly lower than group G65. Regarding the number of anchors used in the procedure, group G55 presented a significantly lower median number of anchors compared with group G65 ($p = 0.009$). The full description of the data is shown in ►**Tables 1** and **2**.

Comparison of Muscle Strength, Functional and Pain Variables between Groups

A statistically significant difference was observed in the anterior elevation force ($p = 0.0006$), lateral rotation ($p = 0.015$), and medial rotation ($p = 0.007$) of the operated shoulder between the groups. When comparing both groups, we observed the following differences in anterior elevation (G55: 8 kg versus G65: 4.8kg), in lateral rotation (G55: 5 kg versus G65: 4kg), and in medial rotation (G55: 8.5 kg versus G65: 5 kg). When the difference in anterior elevation force, in lateral rotation, and in medial rotation in relation to the contralateral shoulder (relative delta) was evaluated, the results were similar ($p > 0.05$) (►**Table 3**). In addition, there were no significant differences between the groups in the elevation range ($p = 0.16$), in the lateral rotation ($p = 0.71$), nor in the medial rotation ($p = 0.23$).

In addition to functional results and muscle strength, pain at follow-up was an evaluated clinical outcome. There were no statistically significant differences between the groups regarding the preoperative ($p = 0.64$) and the postoperative ($p = 0.11$) level of pain., nor in the evolution of pain with the procedure ($p = 0.52$) (►**Table 2**).

Comparison of Functional Scores between Groups

According to the UCLA score, we obtained 96.6% of satisfactory results in group G55 and 94.1% in the G65 group. In

Table 1 Demographic and surgical characteristics between groups

Variable	G55		G65		*p-value*
	n	%	*n*	%	
Operated shoulder					
Right	19	65.5	17	50.0	0.21
Left	10	34.5	17	50.0	
Dominant member					
Right	27	93.1	30	88.2	0.42
Left	2	6.9	4	11.8	
Injury size					
Complete	17	58.6	31	91.2	0.002
Partial	12	41.4	3	8.8	
Subscapular tendon					
Yes	12	44.4	15	44.1	0.83
No	17	58.6	19	55.9	
Supraspinal tendon					
Yes	27	93.1	33	97.1	0.44
No	2	6.9	1	2.9	
Infraspinal tendon					
Yes	6	20.7	9	26.5	0.59
No	23	79.3	25	73.5	
Lesion classification					
Partial	13	44.8	3	8.8	0.004
Small + medium	12	41.4	21	61.8	
Large	4	13.8	10	29.4	

Categoric data were expressed by frequency (n) and percentage (%) and compared by the X^2 test or by the Fisher exact test.

relation to the Constant score, 89.6% of the patients had satisfactory results in the G55 group, against 88.2% in the G65 group. It was observed that there is no statistically significant difference, at the level of 5%, in the results of the UCLA ($p = 0.56$) and of the Constant ($p = 0.99$) scores between the groups (►**Table 4**).

Discussion

The most important finding of the present study was the absence of significant differences in clinical and functional outcomes between groups of patients < 55 years and > 65 years old after arthroscopic RC repair for, supposedly, not bringing adequate benefits to the patient. Some researchers showed no correlation between RC repair results and the age of the patients,[2,23,24] while others demonstrated poor results in older patients.[2,25]

The correlation between age and RC repair results was studied by Osti et al.,[26] in 28 patients > 65 years old and in 28 patients < 65 years old. They evaluated motion range, the UCLA score, and the SF36 questionnaire and showed no statistical differences between groups. Moraiti et al.[27] conducted a prospective multicenter study in which they evaluated the findings of arthroscopic RC repair in 40 patients < 50 years old and in another 40 patients > 70 years old, comparing them. They concluded that the group of older patients showed greater retraction of lesions and greater fatty infiltration in the preoperative evaluation, in addition to a lower rate of healing of the lesions in the postoperative period. However, there was no difference in functional outcome between groups. In our study, according to the UCLA score, we obtained 96.6% of satisfactory results in group G55 and 94.1% in the G65 group, showing no significant difference. Regarding the Constant score, we obtained 89.6% of satisfactory results in group G55 and 88.2% in the G65 group, also with no significant difference (►**Table 4**). Other studies show similar results in patients with complete RC lesions, such as the study conducted by Miyazaki et al.,[20] who evaluated 163 patients > 65 years old who showed complete RC lesions submitted to arthroscopic repair, presenting 96.4% of good and excellent results, in addition to another study, in which De Castro Veado et al.[28] evaluated 28 patients ≥ 65 years old, with 89.28% of good and excellent results.

We also evaluated the anterior elevation force, the lateral rotation, and the medial rotation of the patients. In group G55, we obtained a median of 8, 5 and 8.5 KgF, respectively. In group G65, the values were 4.8, 4 and 5 KgF, respectively. All these values were significantly higher in group G55

Table 2 Demographic and surgical characteristics between groups

Variable	G55		G65		p-value
	n	%	n	%	
Type of fixation					
Double row	13	44.8	10	29.4	0.21
Single row	16	55.2	24	70.6	
Type of lesion					
Degenerative	16	55.2	22	64.7	0.44
Traumatic	13	44.8	12	35.3	
Number of anchors					
1 or 2	12	41.4	3	8.8	0.009
3	9	31.0	14	41.2	
4, 5 or 6	8	27.6	17	50.0	
Comorbidities					
Yes	5	17.2	12	35.3	0.10
No	24	82.8	22	64.7	
Pain before surgery					
No pain	4	13.8	2	5.9	0.64
Mild	3	10.3	5	14.7	
Moderate	6	20.7	5	14.7	
Intense	16	55.2	22	64.7	
Pain after surgery					
No pain	19	65.5	16	47.1	0.11
Mild	3	10.3	12	35.3	
Moderate	5	17.2	5	14.7	
Intense	2	6.9	1	2.9	
Pain evolution					
With satisfactory improvement	21	72.4	27	79.4	0.52
Without satisfactory improvement	8	27.6	7	20.6	

Categoric data were expressed by frequency (n) and percentage (%) and compared by the X^2 test or by the Fisher exact test.

(►**Table 3**). However, when the difference between the operated shoulder and the contralateral shoulder was evaluated, there was no significant difference between the groups. Older patients have lower strength values due to progressive loss of muscle mass in both the operated and contralateral shoulder, which justifies these findings. Osti et al.[26] showed significant improvement in muscle strength between the preoperative evaluation and the last postoperative evaluation in both groups and showed no differences between groups of patients < 65 years old. They also did not obtain significant differences between these groups in relation to the ROM. In our study, the medians of the anterior elevation arch, of the lateral rotation, and of the medial rotation in group G55 were 172°, 64°, and 72°, respectively. In The G65, these values were 165°, 63°, and 64°, respectively, with no statistically significant difference between the groups (►**Table 3**).

Due to the higher prevalence of extensive RC lesions in older patients[2] and to the lower surgical results of this type of lesion when compared to smaller lesions,[4,5] we chose to exclude them from the present study, avoiding this type of bias in the results. In the group of patients < 55 years old, 44.8% of the lesions were partial, 41.4% were complete < 3 cm, and 13.8% measured between 3 and 5 cm. In the group of patients > 65 years old, 8.8% of the lesions were partial, 61.8% were complete < 3 cm, and 29.4% measured between 3 and 5 cm (►**Table 1**). This higher prevalence of complete lesions in the G65 group is due to the natural history of RC pathology, in which lesions tend to progress with advancing age and chronic involvement, resulting in progression from partial to complete lesions and in a higher rate of complete lesions in the older population.[29] Due to the higher number of complete lesions in patients in group G65, the median number of anchors in this group (3.5) was significantly higher compared with group G55 (3) (►**Table 3**).

Biomechanical studies emphasize the potential increase in the contact area in footprint and maximization of repair forces in DF, which can decrease the rate of anatomical

Table 3 Measurements of range of motion and strength according to each group

Variable	G55				G65				*p-value*
	Median	IIQ			Median	IIQ			
Clinical									
Age (years old)	51	47	–	54	70	67	–	72	NSA
Number of anchors	3	2	–	4	3.5	3	–	4	**0.021**
Operated shoulder									
Elevation ROM°	172	135	–	180	165	150	–	176	0.16
Lateral rotation ROM°	64	46	–	83	63	49	–	71	0.71
Medial rotation ROM°	72	50	–	80	64	50	–	80	0.23
High strength (KgF)	8	4.8	–	10	4.8	2.8	–	5.3	**0.0006**
Lateral rotation strength (KgF)	5	3.8	–	9	4	2.5	–	6.3	**0.015**
Medial rotation strength (KgF)	8.5	5	–	12	5	3.9	–	8	**0.007**
Contralateral shoulder									
Elevation ROM°	180	165	–	180	170	160	–	180	0.18
Lateral rotation ROM°	78	58	–	90	70.5	56	–	80	0.46
Medial rotation ROM°	75	60	–	80	69	48	–	80	0.22
High strength (KgF)	7.5	5.5	–	11.5	5	3.9	–	7	**0.0009**
Lateral rotation strength (KgF)	7	4.8	–	8.8	4.8	3.0	–	7.0	**0.010**
Medial rotation strength (KgF)	8	6.3	–	12	5	3.5	–	7.3	**0.001**
Relative Delta (%)									
Elevation ROM°	0	−9.6	–	0	0	−6	–	0	0.45
Lateral rotation ROM°	−6.3	−25	–	0	−9.3	−26	–	10	0.97
Medial rotation ROM°	−5.9	−15	–	0	0	−13	–	1	0.28
High strength (KgF)	−9.1	−23	–	0	−9.6	−31	–	11	0.85
Lateral rotation strength (KgF)	−8.3	−30	–	3	−9.5	−20	–	0	0.87
Medial rotation strength (KgF)	0	−17	–	4	0	−8	–	9	0.43

Abbreviation: ROM, range of motion.
The data were expressed by the median and interquartile range (IIQ: Q1 - Q3) and compared by the Mann-Whitney test. Relative delta corresponds to the variation of the operated shoulder in relation to the contralateral shoulder, in percentage.

failure.[27,28] However, in an analysis of clinical outcomes, controversies persist.[30,31] In the present study, SF fixation was the most used in both groups, with no significant difference between them (►**Table 2**). We also did not find differences between the groups regarding comorbidities and the percentage of traumatic injuries.

Among the limitations of the present study is its retrospective and observational study design, which, therefore,

Table 4 UCLA and Constant scores according to group

Variable	G55		G65		*p-value*
	n	%	*n*	%	
UCLA					
Satisfactory	28	96.6	32	94.1	0.56
Unsatisfactory	1	3.4	2	5.9	
Constant					
Excellent	21	72.4	25	73.5	0.99
Satisfactory	5	17.2	5	14.7	
Bad	3	10.3	4	11.8	

Abbreviation: UCLA, University of California at Los Angeles Shoulder Rating Scale.
Categoric data were expressed by frequency (n) and percentage (%) and compared by the Fisher exact test.

does not allow us to conclude on the superiority of one group or of the other, but rather to raise hypotheses that should be confirmed through clinical trials. Another limitation refers to the nonevaluation of prognostic factors in the preoperative period, such as muscle trophism and the degree of fatty infiltration, as well as the absence of evaluation of postoperative imaging tests.

Conclusion

Arthroscopic repair shows satisfactory results for the treatment of RC ruptures, both in patients < 55 and > 65 years old, without major functional differences between the 2 groups. Older, active, selected patients can achieve functional improvement and quality of life similar to those of younger patients.

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Conflict of Interests
The authors have no conflict of interests to declare.

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