Correlation of Physical Examination with Arthroscopic Findings in the Treatment of Rotator Cuff Tear

Correlação do exame físico com achados artroscópicos no tratamento da ruptura do manguito rotador

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Abstract

Objective To compare clinical data from the physical examination with arthroscopic findings in rotator cuff rupture.

Methods A total of 177 patients submitted to arthroscopic treatment of rotator cuff rupture were selected, and arthroscopic findings were compared with physical examination.

Results The impingement tests showed high sensitivity for rotator cuff rupture. Among the strength tests, the most sensitive was the Patte test (85.7%), and the one with the highest positive predictive value (PPV) was the Jobe test (95%). The Drop Sign test showed higher specificity and negative predictive value (NPV) (98.7 and 95.9%, respectively). Patients with a history of trauma were 3.5 times more likely to have a positive Lift Off test.

Conclusion The impingement tests had high sensitivity for rotator cuff ruptures. The Jobe test showed similar sensitivity among patients who had partial or total supraspinal injury. For complete lesions of the subscapularis, The Lift Off and Belly Press tests showed high sensitivity and specificity.

Keywords

- arthroscopy
- physical examination
- rotator cuff
- shoulder
- rupture

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Resumo

Objetivo Comparar dados clínicos do exame físico com os achados artroscópicos na ruptura do manguito rotador.

Métodos Foram selecionados 177 pacientes submetidos ao tratamento artroscópico de ruptura do manguito rotador e foram comparados os achados artroscópicos com o exame físico.

Resultados Os testes irritativos de impacto apresentaram alta sensibilidade para ruptura do manguito rotador. Dentre os testes de força, o de maior sensibilidade foi o teste de Patte (85,7%) e o de maior valor preditivo positivo (VPP) foi o teste de Jobe (95%). O teste Drop Sign apresentou maior especificidade e valor preditivo negativo (VPN) (98,7 e 95,9%, respectivamente). Pacientes com história de trauma possuíam 3,5 vezes mais chances de apresentarem o teste Lift Off positivo.

Conclusão Os testes irritativos tiveram alta sensibilidade para rupturas do manguito rotador. O teste de Jobe apresentou sensibilidade semelhante entre os pacientes que tinham lesão parcial ou total do supraespinhal. Para as lesões completas do subescapular, as testes Lift Off e Belly Press apresentaram alta sensibilidade e especificidade.

Palavras-chave

- artroscopia
- exame físico
- manguito rotador
- ombro
- ruptura

Introduction

From the first reports on rotator cuff ruptures by Codman, through the description of the phases of Neer Impact Syndrome[1] to the introduction of arthroscopy in its treatment, much has been published regarding rotator cuff injury, which is the most common shoulder disease. Physical examination is an important stage of clinical evaluation for the formulation of diagnostic hypotheses, definition of treatments and techniques.

The complexity of the physical examination of the shoulder may make it difficult to understand the meaning of the tests and the time when they may be useful. Many studies propose to compare the clinic of such tests with the findings during arthroscopic examination of the shoulder, which is considered the gold standard in the identification of lesions.[2] In addition, the routine inclusion of tests such as magnetic resonance imaging (MRI) in the investigation of shoulder pain leads to incidental findings and overtreatment of lesions without correlation with the clinical picture of the patient, which is generally well identified and treated based on the findings of physical examination.[3]

The aim of the present study is to evaluate the accuracy and reliability of the physical examination, considering arthroscopic findings in patients undergoing arthroscopic surgical treatment for rotator cuff rupture. Furthermore, the present study seeks to compare its results with the existing literature and to verify their validity for the Brazilian population studied.

Materials and Methods

From September to December 2019, 177 patients who underwent arthroscopic treatment for rotator cuff rupture were selected.

The present study was approved by the ethics committee of the proposing institutions under the registration number CAAE 19802819.8.0000.5122.

We included patients who agreed to participate in the study and signed the consent form, submitted to arthroscopic treatment for rotator cuff rupture, with completion of the evaluation forms.

Patients with previous surgery on the evaluated shoulder, presence of calcaneus tendinitis, acromioclavicular arthrosis, adhesive capsulitis or other associated shoulder diseases, and those who did not agree to participate in the study were excluded.

This is a cross-sectional, double-blind study in which two forms were elaborated to record physical examination and arthroscopy data. The physical examination was performed by an independent examiner of the one who evaluated the arthroscopic findings.

At the time of the evaluation and completion of the physical examination form, the evaluator did not have access to the medical records and imaging exams of the patient, and the surgeon did not have access to the physical examination data performed by the evaluator.

Those who performed the physical examination were trained and guided before the beginning of data collection, and the performance and classification of the tests were standardized. The surgeons followed the protocol inanely to reduce evaluation divergences as much as possible. All surgeons involved are from the same group and follow the same protocol.

The Jobe,[4] Lift off,[5] External Rotation Lag Sign (ERLS),[6] Bugler Signal,[7] Belly Press,[8] Patte[9] and Drop Sign[7] tests were performed to assess rotator cuff integrity, and the Neer,[10] Hawkins et al.,[11] and Yocum[12] tests were performed as impingement tests. For the evaluation of the tendon of the long head of the biceps, the Speed[13] and Yergason tests were used.[14]

The arthroscopic evaluation form was filled out by the surgeon, contemplating changes in the long biceps head tendon (LBHT), signs of impact, and integrity of the rotator cuff. Complete lesions were classified according to Boileau et al.[15] and Lafosse et al.[16]

The data were processed in the statistical program R, version 2.13.0 (R Foundation, Vienna, Austria). Quantitative analysis was performed, and the statistical results were descriptive and inferential. Demographic data were evaluated in absolute numbers and percentage. Special tests calculated sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and accuracy.

Findings

From the 177 patients evaluated, 89 (50.2%) were male. The mean age at surgery was 59.9 years old (ranging from 31 to 82 years old). A total of 135 patients (76.2%) had the right side affected, and 139 (78.5%) had the dominant side affected. From all patients, 60 (33.9%) reported a history of shoulder trauma (►**Table 1**).

IImpingement Tests

From the impingement tests analyzed for signs of impact, the test with higher sensitivity, PPV and NPV was the Neer test, presenting 76.4, 57.8, and 43.1%, respectively. The most specific test was the Yocum test, with 28.5%.

Force Tests

When comparing the evaluated strength tests, the most sensitive was the Patte test (85.7%), and the one with the highest PPV was the Jobe test (95%). The Drop Sign test showed higher specificity and NPV (98.7 and 95.9%, respectively) (►**Table 2**).

Table 1 Patient demographics

Parameters	Total ($n = 177$)
Gender	
Male	89 (50.2%)
Female	88 (49.8%)
Average age (years old)	59.9 (31–82)
Laterality of the lesion	
Right	135 (76.2%)
Left	42 (23.8%)
Dominant side affected in	139 (78.5%)
Dominance	
Right	168 (94.9%)
Left	9 (5.1%)
Origin of injury	
Traumatic	60(33.9%)
Non-traumatic	117(66.1%)

Data presented as *n* (%) or average.
Source: Author's data.

Table 2 Special tests performed and statistical analysis for rotator cuff injury

Special test	Sensitivity	Specificity	PPV	NPV
Jobe	84.9	45.4	95	16.6
Patte	85.7	82	17.2	74.3
Belly Press*	72.7	91.6	66.6	93.61
Belly Press**	35.4	91.8	77.7	63.8
Lift Off*	66.6	92.3	66.6	92.3
Lift Off**	8.7	95.2	76.9	36.5
Drop Sign	36.3	98.7	66.6	95.9
Yergason	8.8	95.2	76.9	36.5
Speed	25.4	79.3	69	37
Irritables for signs of impact on arthroscopy				
Neer	76.4	24.3	57.8	43.1
Yocun	66	28.5	54.5	39.2
Hawkins Kennedy	73.4	23	54.5	40.9
Irritables for total rotator cuff injury				
Neer	83.4	18.1	75.5	26.6
Yocun	85	21	69.3	40
Hawkins Kennedy	84.2	20.4	76.1	30

Abbreviations: NPV, negative predictive value; PPV, positive predictive value.
Data were presented as (%). Source: Author's data.
* Lift Off and Belly Press test, considering total subscapular lesions.
** Lift Off and Belly Press test, considering partial and total subscapular lesions.

Tests for subscapularis tendon

Patients with a history of trauma were 3.5 times more likely to have a positive Lift Off test. These patients were 2 times more likely to suffer lesion in the subscapularis. The Lift Off test presented an accuracy of 7.5, which is an evaluation that determines the reliability of the test.

Patients with a positive Belly Press test were 1.5 times more likely to be injured, and the test had an accuracy of 12.5.

Tests for infraspinal tendon

The Patte test showed an odds ratio (OR) of 1.7 for the occurrence of injury. The Patte test showed an accuracy of 5.6, and we observed that 23 (67.6%) patients with a positive test presented isolated supraspinal lesion.

The ERLS was positive in 9 patients, 6 (66.6%) of whom with complete supraspinal and infraspinal lesions. The other 3 (33.3%) patients presented only supraspinal lesions.

Tests for supraspinal tendon

Partial lesions were classified according to the Ellman classification[17] (►**Table 3**). The Boileau classification was used

Table 3 Classification of partial supraspinal lesions

Type of Partial Injury	Total ($n = 30$)
Articulate	
High grade	13 (43%)
Low grade	2 (6%)
Bursal	
High grade	14 (46%)
Low grade	1 (3%)

Data presented as *n* (%).
Source: Author's data.

Table 4 Classification of total rotator cuff injuries, according to Boileau

Boileau types	Total ($n = 147$)
D	85 (57.8%)
C + D	21 (14.2%)
D + E	11 (7.4%)
C + D + E	7 (4.7%)
C + D + E + F	5 (3.4%)
D + E + F	4 (2.7%)
C	3 (2%)
F	3 (2%)
B + C + D	3 (2%)
B + C + D + E + F	2 (1.3%)
E + F	1 (0.6%)
A + B + C + D	1 (0.6%)
A + B + C + D + E + F	1 (0.6%)

Data presented as *n* (%) or average.
Source: Author's data.

for complete lesions, and the main lesion found was the one in the isolated supraspinal, type D (►**Table 4**).

When we analyze the association between the Jobe test and the supraspinal lesion (partial or complete), it can be said that positivity in the test increases by almost 6 times the chance of having an injury of this tendon, either complete or partial. The accuracy of the test was 14.1. The Sensitivity was 84.9%, the specificity was 45.4%, and the PPV was 95%.

Considering the analysis of traumatic injuries in relation to degenerative injuries, there was no statistical difference between the tests for the supra and infraspinal tendons.

Discussion

In an analysis of the Neer and Hawkins Kennedy tests evaluating rotator cuff rupture performed by MacDonald et al.,[18] the sensitivity was 85 and 88% and the specificity was 50.8 and 42.6%, respectively. We found similar results for all impingement tests performed for rotator cuff rupture.

Nicoletti et al.,[19] in their series of 47 evaluated shoulders, identified that 70% of patients who had a positive Neer test had signs of impact during arthroscopy, with sensitivity and specificity of 97 and 0%, respectively. In our study, the relationship between the Neer test and signs of impact showed sensitivity and specificity of 76.4 and 24.3%, respectively.

Leroux et al.[20] evaluated the sensitivity and specificity of the Jobe and reported values of 86 and 50%, respectively, and Hertel et al.[6] reported a sensitivity of 84% and a specificity of 58%. In our series, we searched the Jobe test for partial and total lesions and found similar values for sensitivity (84.7% for complete lesions and 90% for partial lesions). We attributed positivity in the Jobe test in partial lesions to pain or irritability, and the deficit of subjective strength. Furthermore, the Jobe test showed a specificity 45.4% and a PPV of 95%. These values are also similar to those found by Nicoletti et al.[19] in their series, with sensitivity, specificity and PPV values of 78, 43, and 82%, respectively.

In 1991, Gerber et al.[5] presented the Lift Off test, present in 75% of the patients studied with isolated subscapular rupture. The sensitivity of the test was 88% and the specificity was 100%. Fowler et al.[21] also found high sensitivity in the Lift Off test (90.2%). These findings present similarity with the specificity found in our study (92.3%); however, they differ in relation to sensitivity (66.6%).

Bartsch et al.[22] evaluated the lesions and subscapular tests and observed that the association of the tests significantly increased the accuracy of the diagnosis; abdominal tests correlated with ruptures of the upper third. However, some lesions may present with all negative tests. In the present study, when we considered only complete lesions of the subscapularis identified at arthroscopy, the Lift Off and Belly Press tests present a sensitivity of 66.6 and 72.7%, respectively. However, by including partial lesions (Lafosse I and II) and longitudinal subscapular lesions, the sensitivity of the tests fall to 8.9 and 35.4%, respectively, corroborating that arthroscopy is the gold standard for the diagnosis of subscapular lesions.

Schiefer et al.[23] found a sensitivity of 25% the Lift Off test and of 45% for the Belly Press tests, and specificity of 92% for both tests. The most sensitive test (75%) was the Bear Hug test. The Belly Press test had the highest PPV (84%). Compared with our findings, we obtained specificity for the Lift Off and Belly Press tests close to the ones described (92.9 and 91.8%, respectively). Belly Press was also the best PPV test (77.7%).

Leroux et al.[20] studied the Patte test, which showed sensitivity and specificity of 83 and 61%, respectively, and no correlation was found between clinical results and the size of infraspinal rupture. In our study, we obtained a sensitivity of 85.7 and a specificity of 82% in infraspinal lesions. When we analyzed in isolation the patients who had a positive Patte test, we observed that 67.6% presented only supraspinal injury. We believe that the positivity of the test, with infraspinal integrity, can be attributed to pain, since maneuvers in abduction and lateral rotation are more painful.

Few patients had positive ERLS, limiting the validity of the test in the present study. In 33.3% of the cases, there was only supraspinal injury, suggesting that test positivity does not depend exclusively on infraspinal injury.

Evaluating lesions of LBHT, Cardoso et al.[24] found, for the Speed test, a sensitivity of 61%, and a specificity 71%, and highlight the correct interpretation of the test (pain located in topography of the intertubercular groove). The Yergason test was shown to be the most specific test. In the evaluation of the LBHT, there may be divergence between studies, because the anatomical factors involving the LBHT may confuse the examiner in the interpretation of the examination. In the present study, the Speed and Yergason tests showed, respectively, a sensitivity of 46.7 and 32.5%, and a specificity of 79.3 and 95.2%.

Among the limitations of the present study, the size of the study sample and the absence of a control group stand out; some tests, because they identified less prevalent alterations, would require a larger sample.

Conclusion

Impingement tests had high sensitivity for rotator cuff ruptures. The Jobe test showed similar sensitivity among patients who had partial or total supraspinal injury. For complete subscapularis lesions, Lift Off and Belly Press tests showed high sensitivity and specificity. Physical examination of the shoulder remains important and reliable for the diagnosis of rotator cuff injuries, provided that it is performed correctly.

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

References

1 Neer CS 2nd. Anterior acromioplasty for the chronic impingement syndrome in the shoulder: a preliminary report. J Bone Joint Surg Am 1972;54(01):41–50
2 Malhi AM, Khan R. Correlation between clinical diagnosis and arthroscopic findings of the shoulder. Postgrad Med J 2005;81 (960):657–659
3 Pompan DC. Appropriate use of MRI for evaluating common musculoskeletal conditions. Am Fam Physician 2011;83(08): 883–884
4 Jobe FW, Jobe CM. Painful athletic injuries of the shoulder. Clin Orthop Relat Res 1983;(173):117–124
5 Gerber C, Krushell RJ. Isolated rupture of the tendon of the subscapularis muscle. Clinical features in 16 cases. J Bone Joint Surg Br 1991;73(03):389–394
6 Hertel R, Ballmer FT, Lombert SM, Gerber C. Lag signs in the diagnosis of rotator cuff rupture. J Shoulder Elbow Surg 1996;5 (04):307–313
7 Walch G, Boulahia A, Calderone S, Robinson AH. The 'dropping' and 'hornblower's' signs in evaluation of rotator-cuff tears. J Bone Joint Surg Br 1998;80(04):624–628
8 Gerber C, Hersche O, Farron A. Isolated rupture of the subscapularis tendon. J Bone Joint Surg Am 1996;78(07):1015–1023
9 Debeyre J, Elmelik E, Patte D. [Shoulder injuries and ruptures of the musculo-tendinous cuff]. Presse Med 1963;71:1521–1522
10 Neer CS 2nd. Impingement lesions. Clin Orthop Relat Res 1983; (173):70–77
11 Hawkins RJ, Kennedy JC. Impingement syndrome in athletes. Am J Sports Med 1980;8(03):151–158
12 Yocum LA. Assessing the shoulder. History, physical examination, differential diagnosis, and special tests used. Clin Sports Med 1983;2(02):281–289
13 Yergason RM. Supination sing. J Bone Joint Surg Am 1931;13(01): 160–161
14 Bennett WF. Specificity of the Speed's test: arthroscopic technique for evaluating the biceps tendon at the level of the bicipital groove. Arthroscopy 1998;14(08):789–796
15 Boileau P, Brassart N, Watkinson DJ, Carles M, Hatzidakis AM, Krishnan SG. Arthroscopic repair of full-thickness tears of the supraspinatus: does the tendon really heal? J Bone Joint Surg Am 2005;87(06):1229–1240
16 Lafosse L, Jost B, Reiland Y, Audebert S, Toussaint B, Gobezie R. Structural integrity and clinical outcomes after arthroscopic repair of isolated subscapularis tears. J Bone Joint Surg Am 2007;89(06):1184–1193
17 Ellman H. Diagnosis and treatment of incomplete rotator cuff tears. Clin Orthop Relat Res 1990;(254):64–74
18 MacDonald PB, Clark P, Sutherland K. An analysis of the diagnostic accuracy of the Hawkins and Neer subacromial impingement signs. J Shoulder Elbow Surg 2000;9(04):299–301
19 Nicoletti SJ, Albertoni WM. Valor do exame físico no diagnóstico do pinçamento subacromial e das lesões do manguito rotador. Rev Bras Ortop 1993;28(09):679–682
20 Leroux JL, Thomas E, Bonnel F, Blotman F. Diagnostic value of clinical tests for shoulder impingement syndrome. Rev Rhum Engl Ed 1995;62(06):423–428
21 Fowler EM, Horsley IG, Rolf CG. Clinical and arthroscopic findings in recreationally active patients. Sports Med Arthrosc Rehabil Ther Technol 2010;2:2
22 Bartsch M, Greiner S, Haas NP, Scheibel M. Diagnostic values of clinical tests for subscapularis lesions. Knee Surg Sports Traumatol Arthrosc 2010;18(12):1712–1717
23 Schiefer M, Ching-San Júnior YA, Silva SM, et al. Clinical diagnosis of subscapularis tendon tear using the Bear Hug semiological maneuver. Rev Bras Ortop 2012;47(05):588–592
24 Cardoso A, Amaro P, Barbosa L, Coelho AM, Alonso R, Pires L. Diagnostic accuracy of clinical tests directed to the long head of biceps tendon in a surgical population: a combination of old and new tests. J Shoulder Elbow Surg 2019;28(12): 2272–2278