SCIE DOI: 10.14744/scie.2024.69320
South. Clin. Ist. Euras. 2024;35(1):65-69

Original Article

Subcoracoid Effusion in Subscapularis Tears Is it a Radiological Marker?

Ersin Şensöz, Engin Eceviz

Department of Orthopedics and Traumatology, Dr. Lutfi Kirdar Kartal City Hospital Clinic İstanbul, Türkiye

Submitted: 08.11.2023
Revised: 04.01.2024
Accepted: 14.01.2024

Correspondence: Ersin Şensöz, Dr. Lutfi Kirdar Kartal City Hospital Clinic İstanbul, Türkiye
E-mail: ersinsensozes@gmail.com

Keywords: Subcoracoid; effusion; subscapularis; rotator cuff tear.

This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.

ABSTRACT

Objective: Diagnosing subscapularis tendon rupture in preoperative MRI slices can be challenging. This study investigated whether subcoracoid effusion (SE) is more common in subscapularis tendon injuries and whether it can serve as a marker.

Methods: Patients with subscapularis tendon rupture were categorized as Group 1, consisting of 26 patients, while patients with intact subscapularis tendon but other cuff pathologies were classified as Group 2, consisting of 116 patients. We evaluated the presence of effusion in the subcoracoid bursa, effusion in the subscapular bursa, acromiohumeral distance, and coracohumeral distance. We examined retrospectively 208 patients who underwent shoulder arthroscopy in the same clinic between January 2021 and August 2023. We included 142 patients in the study who underwent surgery due to rotator cuff rupture. cuff rupture. We reviewed preoperative MRI images and surgical notes of the patients. Patients with subscapularis rupture were categorized as Group 1, consisting of 26 patients, while patients with intact subscapularis but other cuff pathologies were classified as Group 2, consisting of 116 patients.

Results: No statistically significant differences were observed between the groups regarding sex, age, and gender. Of 142 patients, 26 (18%) had arthroscopically confirmed Ssc tears. Among these, 22 were repaired, and 4 underwent debridement. There was no significant difference between the groups regarding acromiohumeral distance (p=0.253) and coracohumeral distance (p=0.12). No significant difference was found in subscapular bursa effusion between the groups (p=0.81). The difference in SE between the groups was statistically significant (p=0.0003).

Conclusion: In our study, we showed the relationship between the sub finding and Ssc tears. We found no relationship between coracohumeral and acromiohumeral distance and subscapularis tears.

INTRODUCTION

However, in recent years, with an understanding of its biomechanical significance and advancements in surgical techniques, there has been an increased focus on diagnosis and treatment.[1,2] Subscapularis tendon (Ssc) ruptures are injuries that can quickly go unnoticed. Diagnosing Ssc rupture in preoperative MRI slices can be challenging.[3] As a result, indirect indicators such as biceps dislocation and subscapularis muscle atrophy are used to estimate whether a tear is present.[4] Cases where the rupture goes undetected in preoperative MRI slices but is identified and repaired during surgery can also occur. Establishing an accurate preoperative diagnosis is crucial for surgical planning.

In the anterior shoulder, there are two bursae: subcoracoid and subscapular bursae. The subscapular bursa is between the subscapularis muscle and the shoulder capsule, and effusion in this region can be physiological. The subcoracoid bursa is beneath the inferior aspect of the coracoid process on the anterior surface of the subscapularis muscle, and effusion in this area can be associated with intra-articular pathologies.[5] This study investigated whether subcoracoid effusion (SE) is more common in Ssc injuries and whether it can serve as a marker.

MATERIALS AND METHODS

We obtained ethical approval from the local ethics committee (Decision No: 2023/514/258/33 Date: 27.09.2023). We examined retrospectively 208 patients who underwent shoulder arthroscopy in the same clinic between January 2021 and August 2023. Patients who were operated on due to rotator cuff pathology, whose MRI sections were taken completely and appropriately, and whose subscapu-

laris evaluation during the operation was clearly stated in the operating note were included in the study. Patients with inadequate or inappropriate preoperative MRI images, those with instability, and those with a history of previous shoulder surgery were excluded. Among them, we included 142 patients in the study who underwent surgery due to rotator cuff rupture. We reviewed preoperative MRI images and surgical notes of the patients. Patients with Ssc rupture were categorized as Group 1, consisting of 26 patients, while patients with intact Ssc but other cuff pathologies were classified as Group 2, consisting of 116 patients. There were no isolated Ssc ruptures. We examined all patients' preoperative MRI images. We evaluated the presence of effusion in the subcoracoid bursa, effusion in the subscapular bursa, acromiohumeral distance, and coracohumeral distance. We assessed the presence of Ssc tears from the surgical notes. We performed the measurements by an orthopaedic surgeon with seven years of arthroscopic surgical experience. With the assistance of a particular shoulder device, MRI images were evaluated with the patient in a supine position using a 1.5 Tesla MRI machine. We evaluated axial, sagittal, and coronal sections in oblique coronal MRI. The normality of distributions was assessed using the Shapiro-Wilk test and found to be normally distributed. The data were analyzed using SPSS version 22.0 software (IBM Corporation, Armonk, NY, United States). Independent t-tests and Chi-Square tests were conducted for demographic data and measurement results.

RESULTS

No statistically significant differences were observed between the groups regarding sex, age, and gender (Table 1). Of 142 patients, 26 (18%) had arthroscopically confirmed Ssc tears. Among these, 22 were repaired, and 4 underwent debridement. There was no significant difference between the groups regarding acromiohumeral distance (p=0.253) and coracohumeral distance (p=0.12). In 8 out of the 26 patients with Ssc tears (30.7%), preoperative MRI evaluations failed to detect the Ssc tear. Among the 26 patients with Ssc ruptures, 17 (65.3%) had effusion in the subscapular bursa, while among the 116 patients without Ssc tears, 73 (62.9%) had subscapular bursa effusion. No significant difference was found in subscapular bursa effusion between the groups (p=0.81). In 14 out of the 26 patients with Ssc tears (53.8%), SE was observed, whereas 23 out of the 116 patients without Ssc tears (19.8%) had SE. The difference in SE between the groups was statistically significant (p=0.0003) (Table 2).

Table 1. Demographic comparison of groups

	Group 1 n: 26	Group 2 n:116	p value
Age	57.73	55.38	0.95
Sex			0.59
Male	9	34	-
Female	17	82	-

DISCUSSION

With this study, we demonstrated the effectiveness of seeing SE on MRI images taken in the preoperative period in diagnosing Ssc tears. Although we observed SE in some rotator cuff patients with intact Ssc, we found it to be significantly more frequent in patients with Ssc tears. Ssc tears were injuries not previously considered a major cause of shoulder problems. Orthopaedic surgeons generally treat partial tears conservatively and open repaired total tears.[6] However, in recent years, subscapular tears have begun to be diagnosed and treated more frequently.[1] In a study published in 2005 with 84 patients, patients with isolated Ssc rupture were treated. Open repair was applied. It has been demonstrated that Ssc repair provides a functional contribution in selected patient.[7] Arthroscopic interventions on the Ssc began in the early 2000s. In 2001, the Ssc was visualized arthroscopically, and it was stated that not all lesions could be seen arthroscopically.[8] Then, arthroscopic repair methods of the Ssc began to be applied, and their clinical benefits were demonstrated.[9-11] We performed a surgical intervention on all patients. We detected Ssc tears, including debridement in 4 and repair in the others. As a result of biomechanical and clinical studies, the effectiveness of repairing the Ssc tear on shoulder functions, especially in forward elevation, has been demonstrated. For this reason, more studies have begun to be conducted on the diagnosis and treatment of Ssc rupture. In order not to miss Ssc tears that are difficult to diagnose, new examination techniques[12] and new indirect findings in MRI sections and arthroscopic images were stated.[13-17] In another study dated 2006, it was stated that out of 1345 patients who underwent rotator cuff repair,

Table 2. Radiological measurements of the groups

	Group 1 n: 26 (%)	Group 2 n:116 (%)	p value
Subcoracoid effusion	14	23	0.000355
Subscapular effusion	17	73	0.81
Acromiohumeral distance (mm.)	8.01	8.26	0.25
Coracohumeral distance (mm.)	6.13	6.58	0.12

isolated or combined Ssc tear was detected in only 73 patients. Open surgery was applied to these patients, and it was stated that there was an improvement in constant scores.[18] Arai R et al. found a Ssc tear in 19 (27.4%) of 435 patients in whom they performed rotator cuff surgery.[19]

Siddhant K. Mehta detected Ssc tear in 14% of 354 asymptomatic patients with rotator cuff rupture due to USG and physical examination.[20] However, since it was performed with asymptomatic patients and there was no surgical confirmation, Ssc tear was detected in patients with rotator cuff syndrome who presented symptomatically. It should be kept in mind that tears may occur more frequently than this.

Ismail Turkmen et al. detected Ssc rupture in 44 (38%) of 114 patients to whom they performed arthroscopic rotator cuff repai.[5] In the literature, the rate of Ssc tear in patients with rotator cuff pathology varies between 14-38%. In our study, we found Ssc tears in 26 (18%) of 142 patients. In this respect, this rate is compatible with the literature.

Burkhart et al. performed repair on 25 patients with Ssc tears, 8 of whom were isolated, and reported excellent results after 11 months of follow-up.[9] Adams et al. operated on 40 Ssc tears, 7 of which were isolated, and published their mid-term results. They achieved satisfactory clinical results after five years.[21] Denard et al. published the long-term results of 79 patients. ASES reported improvements in UCLA scores and forward flexion.[22]

As recent studies have shown, repairing subscapularis muscle ruptures provides significant clinical improvement and has been accepted by orthopaedic surgeons. In our study, we applied debridement (partial tear) to 4 of 26 Ssc tears and repair to 22.

In Ssc tears, MRI is not as practical as it is for posterosuperior tears. In studies, writers found MRI sensitivity low in subscapular tears.[2,23] Pfirrmann et al. found it more effective to evaluate subscapular tears with MR arthrography: 95%-100% sensitivity and 55%-62% specificity for detecting Ssc tears using MRA.[24] Furukawa et al. reported that sensitivity and specificity increased by using MRI sections from different angles.[3] Large retracted tears are more accessible to spot on MRI, and there is a lack of tendon continuity in axial sections. Fat infiltration may be visible in sagittal sections. However, it is more challenging to detect non-retracted tears on MR.[23]

Meyer et al. stated in their study that an increase in tendon length in axial MRI sections may indicate a tear.[25] In their study, Shi et al. examined the relationship between Ssc tears and biceps luxation. They stated there is a high probability of an Ssc tear if the biceps are luxated, but there is also an Ssc tear when the biceps are in place.[26]

The comma sign is a known finding in patients with retracted supraspinatus and Ssc tear in arthroscopic view.[27,28] There are studies in the literature that evaluate comma signs in MRI sections. Zappia Marcello, in his study, examined the MRI with comma sign findings of 110 patients who underwent arthroscopy. Jung et al. similarly mentioned the MRI finding and found it useful in full-thickness supraspinatus and Ssc ruptures.[29,30]

As the literature shows, many studies have shown that detecting Ssc tears is more accessible on MRI. We stated in our study that the finding of SE would help diagnose an Ssc tear.

Yamamoto et al. discussed the findings of Neer and Hawkins. They reported that there were different compression findings in both findings. They stated that there is compression under the subscapularis and coracoacromial arch in the Hawkins manoeuvre.[31] From this, there may be a relationship between the decrease in acromiohumeral distance and the Ssc tear. However, in our study, we did not detect any difference in acromiohumeral distance between the Ssc torn and intact groups (p=0.25).

Studies show that correlating decreased coracohumeral distance and subcoracoid impingement with Ssc tears. The narrowing of the coracohumeral distance may be related to the anterior translation of the humeral head.[32] There are opinions that superior migration of the humeral head due to a supraspinatus tear puts the Ssc at risk and narrows the coracohumeral space. However, some patients have a narrow coracohumeral distance and an intact Ssc.[33] In our study, we did not detect any difference between the groups in terms of coracohumeral distance (p=0.12). The effectiveness of coracoplasty is controversial. Therefore, the relationship between coracohumeral distance and Ssc tear is unclear.[32,34]

Studies have revealed the importance of diagnosis and treatment of Ssc tear. Indirect findings, especially on MRI scans, come to the fore in the preoperative period regarding these injuries, which are difficult to diagnose. In our study, we showed the relationship between the SE finding and Ssc tears. We found no relationship between coracohumeral and acromiohumeral distance and Ssc tears.

Our limitations include the retrospective nature of the study and the limited number of patients. New studies on this subject are necessary, with more patients prospectively correlating with arthroscopic images.

Conclusion

Diagnosing Ssc tears is challenging, and neglecting them causes insufficient clinical results. Detection of SE in MRI images taken in the preoperative period makes diagnosis easier.

Ethics Committee Approval

This study approved by the Dr. Lutfi Kirdar Kartal City Hospital Ethics Committee (Date: 27.09.2023, Decision No: 2023/514/258/33).

Informed Consent

Retrospective study.

Peer-review

Externally peer-reviewed.

Authorship Contributions

Concept: E.Ş., E.E.; Design: E.Ş., E.E.; Supervision: E.E.; Fundings: E.Ş.; Materials: E.Ş.; Data: E.Ş.; Analysis: E.Ş.; Literature search: E.Ş.; Writing: E.Ş., E.E.; Critical revision: E.Ş., E.E.

Conflict of Interest

None declared.

REFERENCES

1. Lee J, Shukla DR, Sanchez-Sotelo J. Subscapularis tears: Hidden and forgotten no more. JSES Open Access 2018;2:74-83. [CrossRef]
2. Foad A, Wijdicks CA. The accuracy of magnetic resonance imaging and magnetic resonance arthrogram versus arthroscopy in the diagnosis of subscapularis tendon injury. Arthroscopy 2012;28:636-41. [CrossRef]
3. Furukawa R, Morihara T, Arai Y, Ito H, Kida Y, Sukenari T, et al. Diagnostic accuracy of magnetic resonance imaging for subscapularis tendon tears using radial-slice magnetic resonance images. J Shoulder Elbow Surg 2014;23:e283-90. [CrossRef]
4. Tung GA, Yoo DC, Levine SM, Brody JM, Green A. Subscapularis tendon tear: Primary and associated signs on MRI. J Comput Assist Tomogr 2001;25:417-24. [CrossRef]
5. Turkmen I, Altun G, Celik H, Bilsel K. Can subcoracoid cyst formation be a sign of anterosuperior rotator cuff tears and biceps pulley lesions? A prospective radiologic and arthroscopic correlation study. J Shoulder Elbow Surg 2020;29:1665-70. [CrossRef]
6. Lyons RP, Green A. Subscapularis tendon tears. J Am Acad Orthop Surg 2005;13:353-63. [CrossRef]
7. Edwards TB, Walch G, Sirveaux F, Molé D, Nové-Josserand L, Boulahia A, et al. Repair of tears of the subscapularis. J Bone Joint Surg Am 2005;87:725-30. [CrossRef]
8. Wright JM, Heavrin B, Hawkins RJ, Noonan T. Arthroscopic visualization of the subscapularis tendon. Arthroscopy 2001;17:677-84. [CrossRef]
9. Burkhart SS, Tehrany AM. Arthroscopic subscapularis tendon repair: Technique and preliminary results. Arthroscopy 2002;18:454-63. [CrossRef]
10. Lo IK, Burkhart SS. Subscapularis tears: Arthroscopic repair of the forgotten rotator cuff tendon. Tech Shoulder Elb Surg 2002;3:282-91. [CrossRef]
11. Lafosse L, Lanz U, Saintmard B, Campens C. Arthroscopic repair of subscapularis tear: Surgical technique and results. Orthop Traumatol Surg Res 2010;96:S99-108. [CrossRef]
12. Rhee SM, Youn SM, Park JH, Chang GW, Rhee YG. The scissors sign: A provocative test for detecting the leading-edge tear of subscapularis tendon: A diagnostic study. BMC Musculoskeletal Disorders 2022;23:1-9. [CrossRef]
13. Scheibel M, Magosch P, Pritsch M, Lichtenberg S, Habermeyer P. The belly-off sign: A new clinical diagnostic sign for subscapularis lesions. Arthroscopy 2005;21:1229-35. [CrossRef]
14. Barth JR, Burkhart SS, De Beer JF. The bear-hug test: A new and sensitive test for diagnosing a subscapularis tear. Arthroscopy 2006;22:1076-84. [CrossRef]
15. Lo IK, Burkhart SS. The comma sign: An arthroscopic guide to the torn subscapularis tendon. Arthroscopy 2003;19:334-7. [CrossRef]
16. Koo SS, Burkhart SS. Subscapularis tendon tears: Identifying mid to distal footprint disruptions. Arthroscopy 2010;26:1130-4. [CrossRef]
17. Walch G, Nové-Josserand L, Boileau P, Levigne C. Subluxations and dislocations of the tendon of the long head of the biceps. J Shoulder Elbow Surg 1998;7:100-8. [CrossRef]
18. Flury MP, John M, Goldhahn J, Schwyzer HK, Simmen BR. Rupture of the subscapularis tendon (isolated or in combination with supraspinatus tear): When is a repair indicated? J Shoulder Elbow Surg 2006;15:659-64. [CrossRef]
19. Arai R, Sugaya H, Mochizuki T, Nimura A, Moriishi J, Akita K. Subscapularis tendon tear: An anatomic and clinical investigation. Arthroscopy 2008;24:997-1004. [CrossRef]
20. Mehta SK, Teefey SA, Middleton W, Steger-May K, Sefko JA, Keener JD. Prevalence and risk factors for development of subscapularis and biceps pathology in shoulders with degenerative rotator cuff disease: A prospective cohort evaluation. J Shoulder Elbow Surg 2020;29:451-8. [CrossRef]
21. Adams CR, Schoolfield JD, Burkhart SS. The results of arthroscopic subscapularis tendon repairs. Arthroscopy 2008;24:1381-9. [CrossRef]
22. Denard PJ, Jiwani AZ, Lädermann A, Burkhart SS. Long-term outcome of a consecutive series of subscapularis tendon tears repaired arthroscopically. Arthroscopy 2012;28:1587-91. [CrossRef]
23. Adams CR, Schoolfield JD, Burkhart SS. Accuracy of preoperative magnetic resonance imaging in predicting a subscapularis tendon tear based on arthroscopy. Arthroscopy 2010;26:1427-33. [CrossRef]
24. Pfirrmann CW, Zanetti M, Weishaupt D, Gerber C, Hodler J. Subscapularis tendon tears: Detection and grading at MR arthrography. Radiology 1999;213:709-14. [CrossRef]
25. Meyer DC, Zimmermann SM, Wieser K, Bensler S, Gerber C, Germann M. Lengthening of the subscapularis tendon as a sign of partial tearing in continuity. J Shoulder Elbow Surg 2016;25:31-7. [CrossRef]
26. Shi LL, Mullen MG, Freehill MT, Lin A, Warner JJ, Higgins LD. Accuracy of long head of the biceps subluxation as a predictor for subscapularis tears. Arthroscopy 2015;31:615-9. [CrossRef]
27. Dilisio MF, Neyton L. Comma sign-directed repair of anterosuperior rotator cuff tears. Arthrosc Tech 2014;3:e695–8. [CrossRef]
28. Garofalo R, Flanagin BF, Castagna A, Krishnan SG. Subscapularis tear: Intraoperative evaluation and treatment. In Gumina S, editors. Rotator Cuff Tear. New York City: Springer; 2017. p. 345–51. [CrossRef]
29. Zappia M, Ascione F, Romano AM, Di Pietto F, Nastrucci G, Collina A, et al. Comma sign of subscapularis tear: Diagnostic performance and magnetic resonance imaging appearance. J Shoulder Elbow Surg 2021;30:1107-16. [CrossRef]
30. Jung JY, Yoon YC, Cha DI, Yoo JC, Jung JY. The "bridging sign": An MR finding for combined full-thickness tears of the subscapularis tendon and the supraspinatus tendon. Acta Radiologica 2013;54:83-8. [CrossRef]
31. Yamamoto N, Muraki T, Sperling JW, Steinmann SP, Itoi E, Cofield RH, et al. Impingement mechanisms of the Neer and Hawkins signs. J Shoulder Elbow Surg 2009;18:942-7. [CrossRef]
32. Suenaga N, Minami A, Kaneda K. Postoperative subcoracoid impingement syndrome in patients with rotator cuff tear. J Shoulder Elbow Surg 2000;9:275-8. [CrossRef]
33. Cetinkaya M, Ataoglu MB, Ozer M, Ayanoglu T, Kanatli U. Subscapularis tendon slip number and coracoid overlap are more related parameters for subcoracoid impingement in subscapularis tears: A magnetic resonance imaging comparison study. Arthroscopy 2017;33:734-42. [CrossRef]
34. Kim SJ, Choi YR, Jung M, Yoon YK, Chun YM. Concomitant coracoplasty during arthroscopic subscapularis repair does not yield better clinical outcomes and structural integrity. Knee Surg Sports Traumatol Arthrosc 2018;26:56-62. [CrossRef]

Subkorakoid Efüzyon, Subskapularis Yırtıklarında Radyolojik Bir Belirteç Midir?

Amaç: Ameliyat öncesi MR kesitlerinde subscapularis tendon rüptürünün teşhis edilmesi zor olabilir. Bu çalışmada subscapularis tendon yaralanmalarında subkorakoid efüzyonun (SE) daha sık görülüp görülmediği ve bunun bir belirteç olarak kullanılıp kullanılamayacağı araştırıldı.

Gereç ve Yöntem: Çalışmada rotator manşet yırtığı nedeniyle ameliyat edilen 142 hastayı retrospektif olarak inceledik. Subskapularis tendon yırtığı olan hastalar 26 hastadan oluşan Grup 1 olarak sınıflandırılırken, subskapularis tendonu sağlam ancak diğer manşet patolojileri olan hastalar 116 hastadan oluşan Grup 2 olarak sınıflandırıldı. Tüm hastaların ameliyat öncesi MR kesitleri incelendi. Subkorakoid bursada efüzyon varlığını, subskapular bursada efüzyonu, akromiohumeral mesafeyi ve korakohumeral mesafeyi değerlendirdik.208 hastayı retrospektif olarak inceledik. Çalışmaya rotator manşet yırtığı nedeniyle ameliyat edilen 142 hastayı dahil ettik. Hastaların ameliyat öncesi MR görüntülerini ve ameliyat notlarını inceledik. Subskapularis rüptürü olan hastalar 26 hastadan oluşan Grup 1 olarak sınıflandırılırken, subskapularis sağlam ancak diğer manşet patolojileri olan hastalar 116 hastadan oluşan Grup 2 olarak sınıflandırıldı.

Bulgular: Gruplar arasında cinsiyet, yaş ve cinsiyet açısından istatistiksel olarak anlamlı bir fark gözlenmedi. 142 hastanın 26'sında (%18) artroskopik olarak doğrulanmış Ssc yırtığı vardı. Bunlardan 22'si onarıldı, 4'üne debridman uygulandı. Akromiohumeral mesafe (p: 0.253) ve korakohumeral mesafe (p: 0.12) açısından gruplar arasında anlamlı fark yoktu. Gruplar arasında subskapular bursa efüzyonu açısından anlamlı fark bulunamadı (p: 0.81). Gruplar arasındaki SE farkı istatistiksel olarak anlamlıydı (p: 0.0003).

Sonuç: Bu çalışma ile ameliyat öncesi dönemde çekilen MR görüntülerinde subkorakoid efüzyon görülmesinin subskapularis yırtıklarının tanısındaki etkinliğini ortaya koyduk. Subskapularis yırtığı olan hastalarda anlamlı olarak daha sık görüldüğünü bulduk.

Anahtar Sözcükler: Efüzyon; rotator manşet yırtığı; subkorakoid; subskapularis.