

The Relationship between the Shoulder Functional Score and the Change in Labral Morphology after Arthroscopic Bankart Repair

Vztah mezi funkčním skóre ramena a změnou morfologie labra po artroskopické Bankartově reparaci

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ABSTRACT

PURPOSE OF THE STUDY

The aim of arthroscopic Bankart repair is restoration of the anterior block mechanism and regaining stability. There are few studies that have tested the adequacy of the angle made with the glenoid and the height from the glenoid level of the repaired labral tissue, but the correlation with the clinical results is not clear. The aim of this study was to define the correlation of the height and slope of the repaired labral tissue in the glenoid anterior with the clinical results.

MATERIAL AND METHODS

This prospective study included 20 patients who underwent an arthroscopic Bankart repair. To evaluate the labrum anatomy of the affected shoulder, 4 measurement parameters were defined as axial height (Ah), axial slope (As), oblique coronal height (Ch), and oblique coronal slope (Cs) on non-contrast T2 MRI. The measurements were taken preoperatively of the affected shoulder and at 1 year postoperatively of both the affected shoulder and the contralateral asymptomatic shoulder. The measured values were compared with each other and with the contralateral shoulder. Correlations of the anatomic values with the Constant-Murley scores recorded at 1, 3, 6, and 12 months postoperatively were examined with the Wilcoxon test.

RESULTS

The mean preoperative Constant score of the patients was 57.7 (32–77) and postoperative scores at 1, 3, 6, and 12 months were 63.6 (44–79), 77.8 (61–90), 89.6 (77–100), and 95.2 (79–100), respectively ($p=0.001$). There was a statistically significant difference in the preoperative MRI measurements of the axial and oblique coronal plane labral height and slope values compared to the postoperative values and those of the asymptomatic contralateral shoulder ($p < 0.05$ for all). There was no statistically significant difference between the labral height and slope values of both planes postoperatively compared to the asymptomatic contralateral shoulder ($p=0.776$, $p=0.910$, $p=0.132$, $p=0.589$, respectively). These increases in the radiological data were not found to be statistically significant in the correlation analysis with the increases in the Constant-Murley scores (Ah $p=0.935$, As $p=0.587$, Ch $p=0.078$, Cs $p=0.105$).

CONCLUSIONS

This prospective study was conducted using conventional T2 magnetic resonance imaging, which was sufficient for the measurement of labral height and slope. This study results showed no significant correlation between the radiological and clinical outcomes.

Key words: Bankart repair, labrum height, labrum slope, functional result.

INTRODUCTION

The glenohumeral joint (GHJ) biomechanics is a complex mechanism containing static and dynamic mechanisms that provide a balance between shoulder mobility and stability (11). Although the GHJ is a spheroid type joint with a high range of movement (ROM) and the ability for multiplanar movement, the congruity of osseous components is low and the congruity of soft tissue components forms the basis of stability. Both concavity compression and scapulohumeral balance are important for stabilizing mechanisms and the presence

of an intact glenoid labrum is extremely important for both mechanisms (11). Disruption of this mechanism through traumatic routes leads to dislocation in the GHJ, and 45% of all joint dislocations occur in the GHJ (17). Bankart lesions are considered the main lesions in traumatic recurrent anterior shoulder dislocations, and good results have been reported after arthroscopic surgical repair (7, 12).

There are patient and surgery-related factors that affect the clinical results just as much as the surgical repair. Surgery-related factors such as the number, placement, and angle of anchors and the presence of defect in

the humerus head can be seen in the volume and quality of repaired labral tissue (1, 8). The importance of the anatomic characteristics of the labral structure in shoulder stability has been shown in cadaver studies and in healthy adults, but the change in various anatomic characteristics after Bankart repair is still not clear. Although the importance of the labrum anatomy in shoulder stability has been emphasized in cadaver studies, the effect on clinical results of the anatomy of labrum reconstruction in patients has not yet been clarified (10). Preoperative and postoperative imaging, including MR imaging, may be obtained for arthroscopic Bankart patients to assess the integrity of the repaired tissues and orthopedic fixation hardware (19, 25).

The hypothesis of the study was that after arthroscopic Bankart repair the higher glenohumeral labral height and slope correlated with higher shoulder function score. The aim of the study was to evaluate the changes in labral height and slope following arthroscopic Bankart repair and to analyze the correlation of these changes with the clinical outcome with Constant-Murley score.

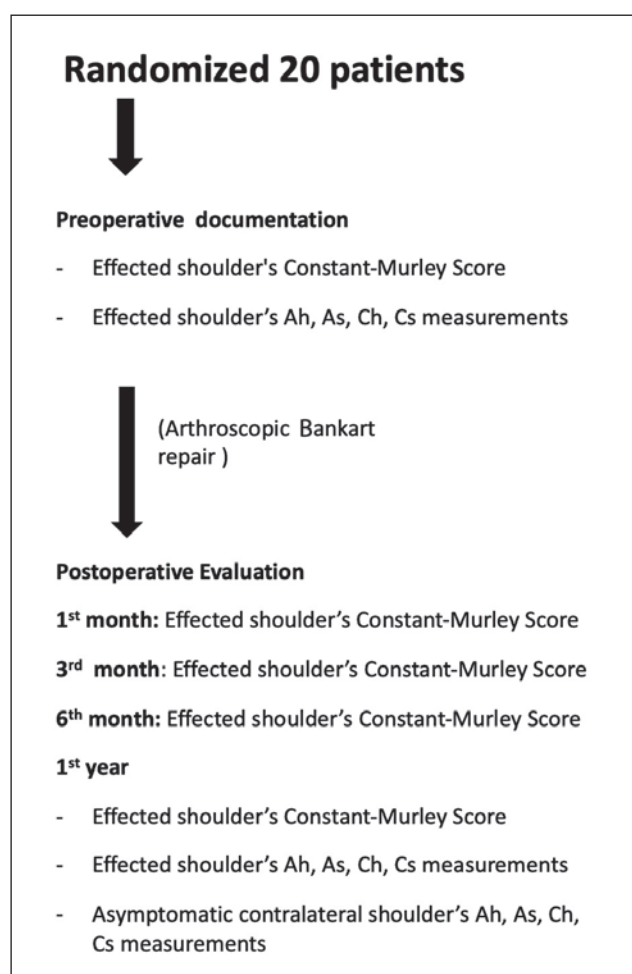


Fig. 1. CONSORT (Consolidated Standards of Reporting Trials) flow diagram.

Ah – Axial height; As – Axial slope; Ch – Coronal height; Cs – Coronal slope.

MATERIAL AND METHODS

Study design

This prospective study was conducted upon the approval of our institution's ethics committee and all patients gave written informed consent for their participation in this study (decision no: 0673-5652). This prospective study was conducted in a training and research hospital and included 20 patients who developed anterior shoulder instability following traumatic anterior glenohumeral dislocation and performed arthroscopic Bankart repair. (Fig. 1)

The study inclusion criteria were defined as patients with radiological diagnosis of anterior shoulder dislocation, age >18 years.

The study exclusion criteria were defined as (1) age <18 years, (2) multidirectional shoulder instability (AMBRI), (3) bilateral GHJ dislocation, (4) other accompanying soft tissue lesions with a role in shoulder instability (SLAP, HAGL, ALPSA), (5) an 'engaging' Hill-Sachs lesion of size (25%) and localization to cause instability, (6) recurrent dislocations after arthroscopic repair, (7) other trauma of the affected upper limb, (8) preoperative stiffness, (9) an inability to properly follow rehabilitation recommendations, (10) or a history of surgery on the affected or asymptomatic contralateral shoulder, and (11) degenerative changes affect labral tissue.

Radiological evaluation

Evaluations were made using the preoperative Magnetic resonance imaging (MRI) of the affected shoulder and the bilateral shoulder MRIs taken 12 months post-operatively. The MRIs were taken using a GE Sigma standard 1.5 Tesla device (Magnetom Aera, Siemens AG, Erlangen, Germany) at 4mm thickness and 1mm intervals (23, 28). The images were obtained with the patient positioned supine and the upper extremity in a neutral position next to the trunk. The MRIs of the asymptomatic contralateral shoulder (ACS) were used as the control group. To prevent measurement errors arising from differences in position, images taken in the neutral position of the arm next to the trunk were accepted as standard. Measurements could not be made on MRIs taken in different positions. The measurements were performed using Macintosh software based Osirix Imaging software (version 8.0, Pixmeo, Geneva, Switzerland).

For the radiological measurements, axial and oblique coronal, T2 sequence, fat suppressed images were used. Quantitative evaluation of the capsulo-labral structure was made with the 4 parameters of labral height in the axial plane (Ah), labral slope in the axial plane (As), labral height in the coronal plane (Ch), and labral slope in the coronal plane (Cs) (Fig. 2, 3, 4). The measurements were taken using the method described by Yoo et al.; at 5mm above the most inferior anchor (28). As these measurements have been shown to be intra-observer and inter-observer reliable, they were performed

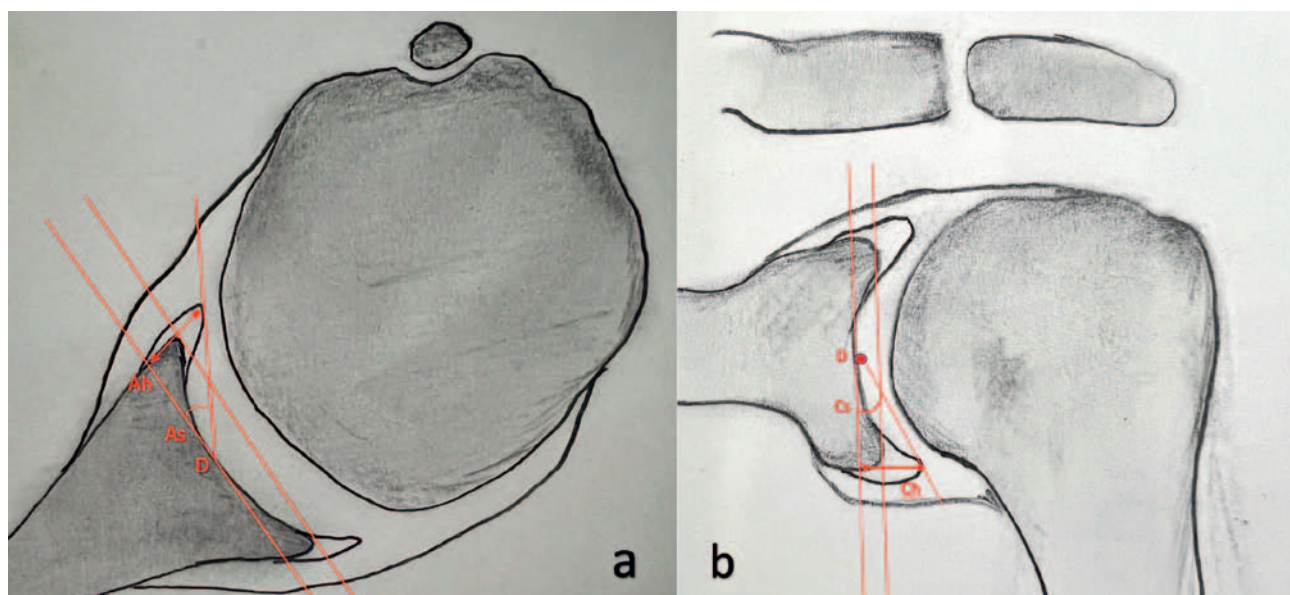


Fig. 2. a – For the axial plane measurements, the image was used which crossed 5cm above the most inferior placed anchor and was based on the capsulolabral border. A transverse line was drawn crossing the anterior and posterior ends of the glenoid concavity. By defining a second line parallel to this transverse line from the deepest point (D) of the glenoid, this was accepted as the basic axis in the measurements. The angle between the line drawn from the deepest point of the glenoid to the uppermost point of the anterior labral structure and the basic axis was defined as As and the distance of the labrum uppermost point to the basic axis as Ah. b – For the coronal plane measurements, the oblique coronal image was used, which was based on the anterior band of the inferior glenohumeral ligament. A vertical line was drawn crossing the upper and lower ends of the glenoid concavity. This line, passing parallel to the deepest point (D) of the glenoid was defined as the basic axis for coronal evaluation. Coronal slope (Cs) and height (Ch) were measured with the line drawn from the deepest point of the glenoid to the furthest point of the labral structure.

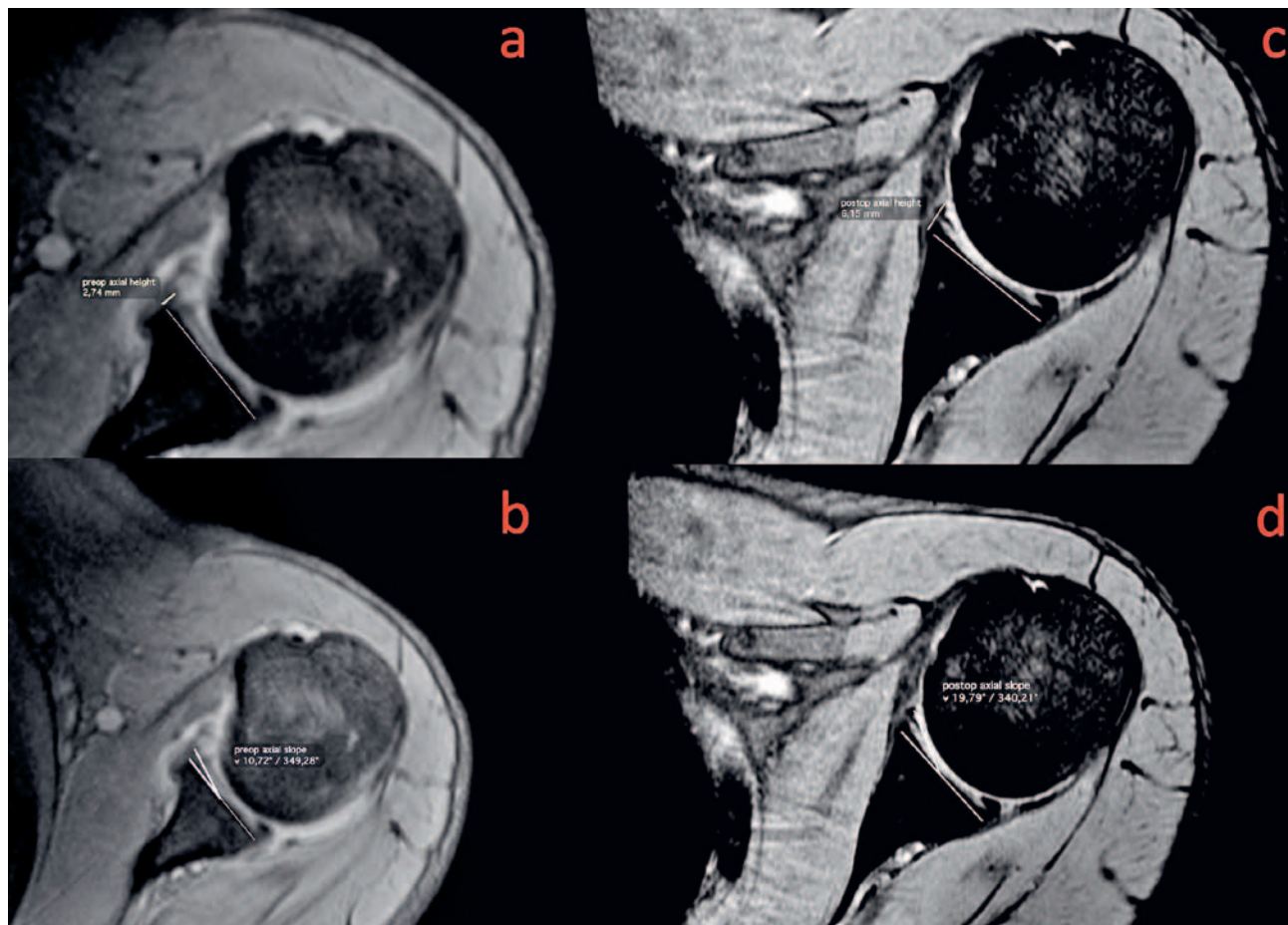


Fig. 3. The preoperative (a and b) and postoperative (c and d) images of the same patient are shown in Figures.

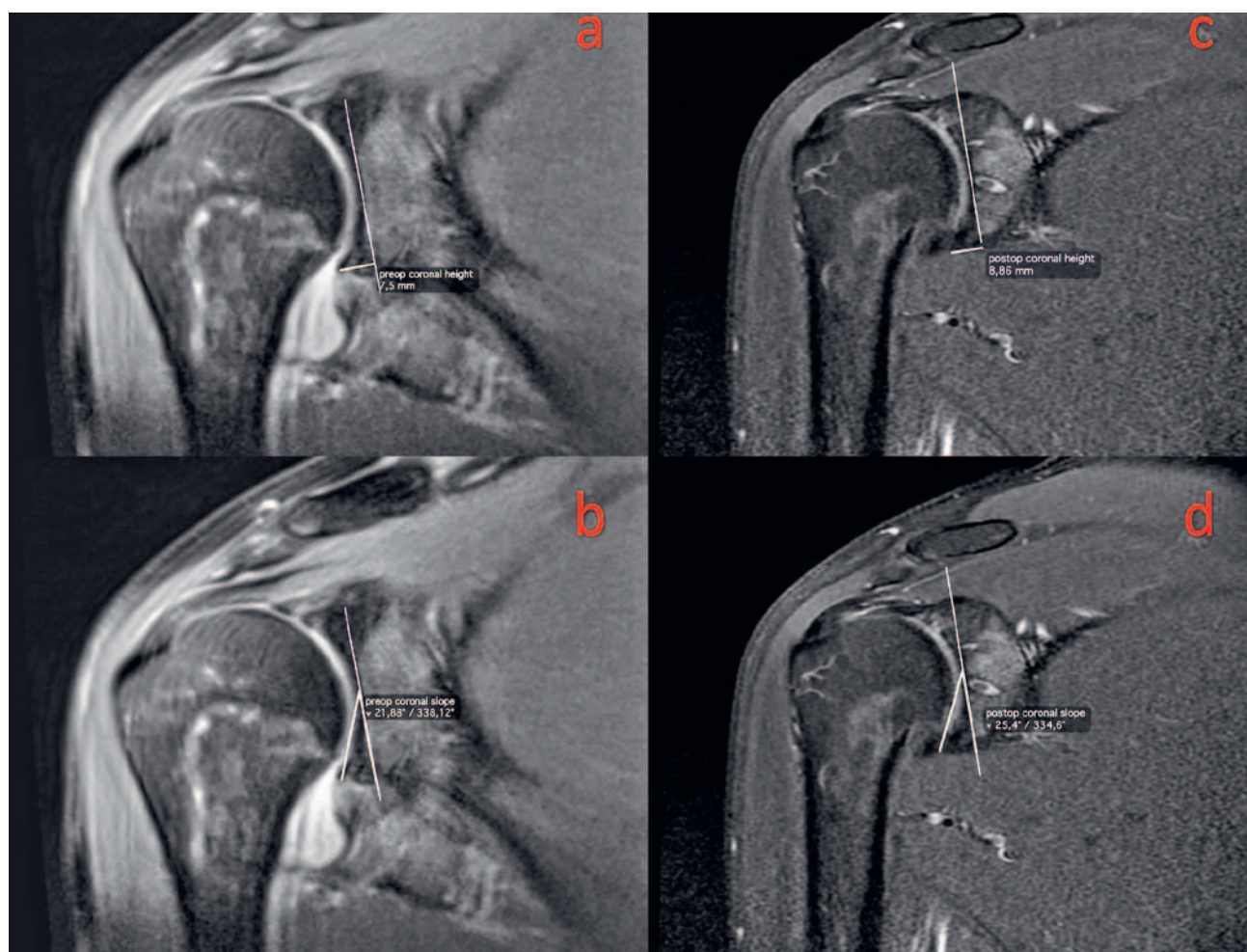


Fig. 4. The preoperative (a and b) and postoperative (c and d) images of the same patient are shown in Figures.

by an orthopaedic specialist and an orthopaedic associate professor together.

Surgical techniques

All patients were operated on by an experienced shoulder surgeon using the same technique. With the patient in the beach-chair position, the posterior portal was used for imaging. Following visualization of the Bankart lesion, an anterosuperior portal was opened for placement of the arthroscopic procedure cannula. The repair procedures were made through this portal. Soft tissue was removed from the glenoid anterior edge using a shaver with a cutting edge and rasps. Sutures reinforced with the use of a suture lasso were passed from the labral structure, which was then attached to the glenoid anterior edge with 2 knotless anchors in the 3 o'clock and 5 o'clock positions. The anteroinferior capsular shift procedure was performed as routine to every patient. For repairs in the 5 o'clock position, slope anchors were preferred.

Postoperative rehabilitation

In the first 6 weeks, the shoulder was protected in an arm sling and passive pendulum exercises were permitted for 10 minutes 4 times a day (Phase 1, immediate

phase). In the period 6-12 weeks postoperatively, the focus was on restoration of range of movement (ROM) and strengthening exercises (Phase 2, intermediate phase). Between 12 and 20 weeks, a return to sport was permitted with shoulder ROM and strengthening exercises (Phase 3, minimal protection phase). All the patients were managed with this protocol (12).

Postoperative evaluation

In the evaluation of the functional results of the patients, the Constant-Murley score (3) was used, recorded preoperatively and at 1, 3, 6, and 12 months postoperatively (Fig. 1). The clinical score was collected by an independent observer who was not involved in treatment or surgery.

Statistical analysis

Data obtained in the study were analyzed statistically using SPSS vn. 20.0 software (SPSS Inc., Chicago, IL, USA). Descriptive analyses and frequency analyses were used in the evaluation of demographic data. For distribution analysis of the groups, the Kolmogorov-Smirnov test was used. The preoperative and postoperative values of the labral height and slope data obtained from the axial and oblique coronal images were

analyzed with the non-parametric Wilcoxon Paired Samples test. In the comparison of the postoperative 4 parameters with the data of the healthy shoulder, the non-parametric Mann Whitney U-test was applied.

The preoperative and 1-year postoperative Constant-Murley scores were compared with the Wilcoxon test. Correlations between the changes in the 4 radiological parameters obtained postoperatively and the changes in the postoperative Constant-Murley scores were evaluated with Pearson correlation analysis. A value of $p < 0.05$ was accepted as statistically significant.

Power analysis was performed using G-power 3.1 statistical analysis program. The effect size, alpha and power (1-beta) were used to calculate the sample size required. These values were 0.6, 0.05, and 0.8, respectively. It was determined that at least 19 patients were required, so 20 patients were included to provide a sufficient sample size.

RESULTS

Evaluation was made of 20 patients, comprising 15 (75%) males and 5 (25%) females with a mean age of 30.4 years (range, 18–47 years). The mean follow-up period was 14.4 months (range, 12–22 months). The mean Constant-Murley score preoperatively was 57.7 (range, 32–77). The mean postoperative scores were calculated as 63.6 (44–79) at 1 month, 77.8 (61–90) at

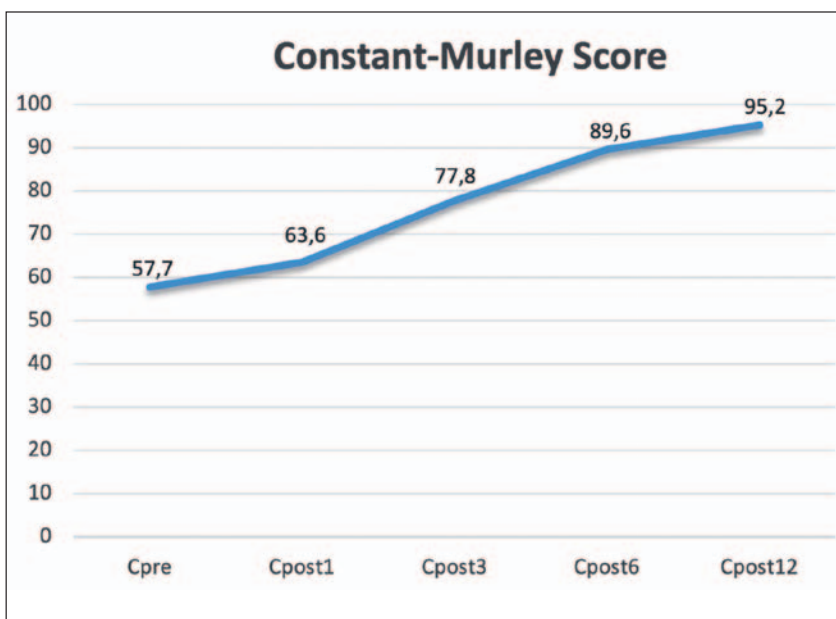


Fig. 5. Diagram shows the changes in the Constant-Murley scores of the patients.

3 months, 89.6 (77–100) at 6 months, and 95.2 (79–100) at 12 months (Fig. 5) ($p = 0.001$).

In the preoperative MRI measurements of the affected shoulder, labral axial height (Ah) was mean 4.9 mm (1.7–8 mm) and the mean labral axial slope (As) was 15.9° (3.4 – 28.9°) and at 1-year postoperatively, these values increased to Ah 8.4 mm (4.7–11.7 mm) and As 25.9° (14.6 – 34.5°) (Fig. 6). These increases were determined to be statistically significant ($p = 0.001$, $p = 0.001$, respectively). In the measurements of the asymptomatic contralateral shoulder, Ah was mean 8.3 mm (5.8–11.1 mm) and mean As was 26.4° (20.9 – 32.8°) (Fig. 6). The affected shoulders preoperative measurements and

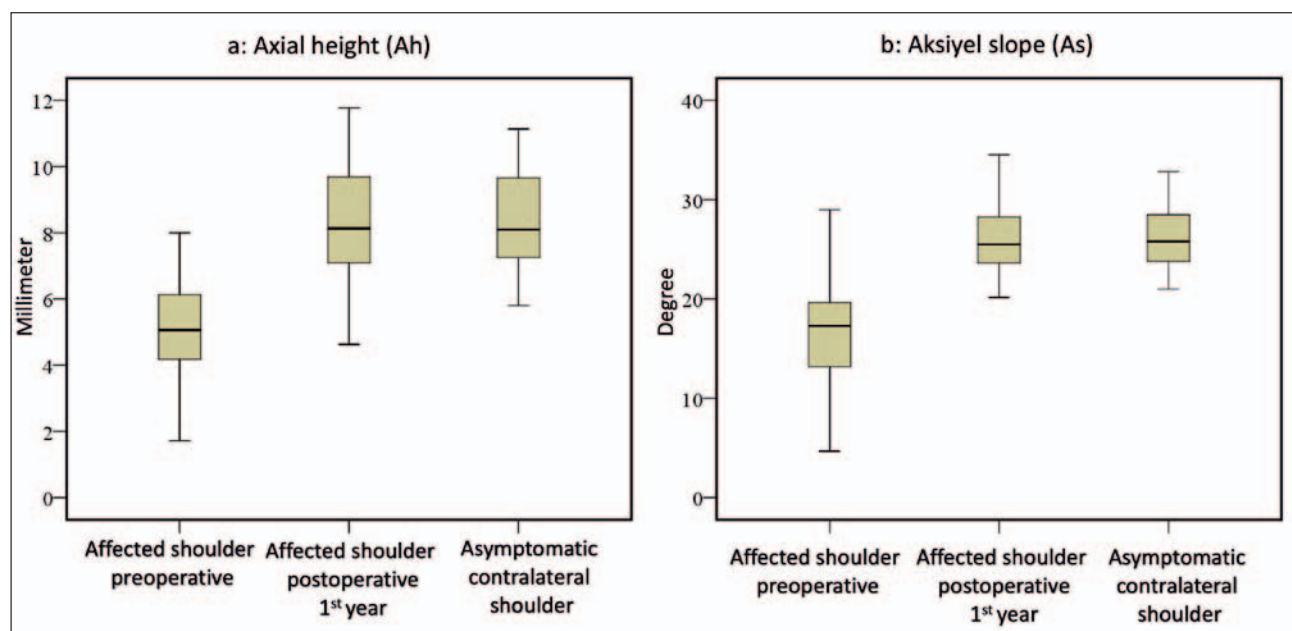


Fig. 6. Diagram shows the changes in axial slope and height. From left to right, the data shows of the affected shoulder preoperatively, at 1-year postoperatively, and the asymptomatic contralateral shoulder measurements.

asymptomatic contralateral shoulder measurements were statistically significant ($p=0.001$, $p=0.001$, respectively). No statistically significant difference was determined between the labral height and slope measurements of the two shoulders at 1-year postoperatively ($p=0.776$, $p=0.910$, respectively).

In the preoperative MRI measurements of the affected shoulder, labral oblique coronal height (Ch) was mean 7.4 mm (4.3–12.5 mm) and the mean labral oblique coronal slope (Cs) was 16.3° (10.7 – 25.7°) and at 1-year postoperatively, these values increased to Ch 11.1 mm (7.4–14.9 mm) and Cs 27.3° (21.5 – 33.9°) (Fig. 7). These increases were determined to be statistically significant ($p=0.001$ for both). In the measurements of the asymptomatic contralateral shoulder, Ch was mean 10.2 mm (9.4–11.9 mm) and mean Cs was 26.7° (22.6 – 30.3°) (Fig. 7). The affected shoulders preoperative measurements and asymptomatic contralateral shoulder measurements were statistically significant ($p=0.001$, $p=0.001$, respectively). No statistically significant difference was determined between the labral oblique coronal height and slope measurements of the two shoulders at 1-year postoperatively ($p=0.132$, $p=0.589$, respectively).

A statistically significant increase was determined in the postoperative labral height and slope values in both the axial and oblique coronal planes. In the correlation analysis of these increases in the radiological data with the increases in the Constant-Murley scores, no statistical significance was determined (Ah $p=0.935$, As $p=0.587$, Ch $p=0.078$, Cs $p=0.105$).

DISCUSSION

The glenoid labrum anatomy is of great importance in providing stability of the glenohumeral joint and

a wide joint range of movement. Expansion of the glenoid joint surface, increasing glenoid depth and the congruity of the joint surfaces, and the concavity compression mechanism provide healthy working of the labral structure (6, 10, 20). Biomechanical studies have shown that a decrease of 80% in labrum height reduces glenohumeral joint stability by 65% (10). When the role of the labrum is considered in the function of joint stability and in the pathogenesis of instability, the main aim of the treatment of Bankart lesions is the restoration of glenohumeral depth and the anterior block mechanism (28). When the treated shoulders in the current study were compared with the contralateral side, it was seen that sufficient restoration had been obtained but the numerical value of this restoration was not correlated with the shoulder function score. As there was no correlation, it was thought that the Constant-Murley score does not evaluate the glenohumeral joint alone but evaluates all the connective tendons and joints that form the shoulder joint.

It is currently known that the shoulder Constant-Murley score increases by 20–30 points, up to over 90 following arthroscopic Bankart surgery (4, 9). Similar to the data in literature, the results of the current study demonstrated a significant increase in the clinical scores of arthroscopic Bankart repair with anchors, but in the correlation analyses of the progression of the functional results and the increases in radiological data of the patients, there was no statistical significance. Park et al. reported that an increase in Rowe scores showed a correlation with the success of the restoration of labrum height, and Kim et al. stated that labrum tissue in the 5 o'clock position was more important for the functional scores (8, 16). In contrast, Stein et al. reported that labral position, height, and slope had no effect on clinical scores, and Zhu et al. also found no relationship of

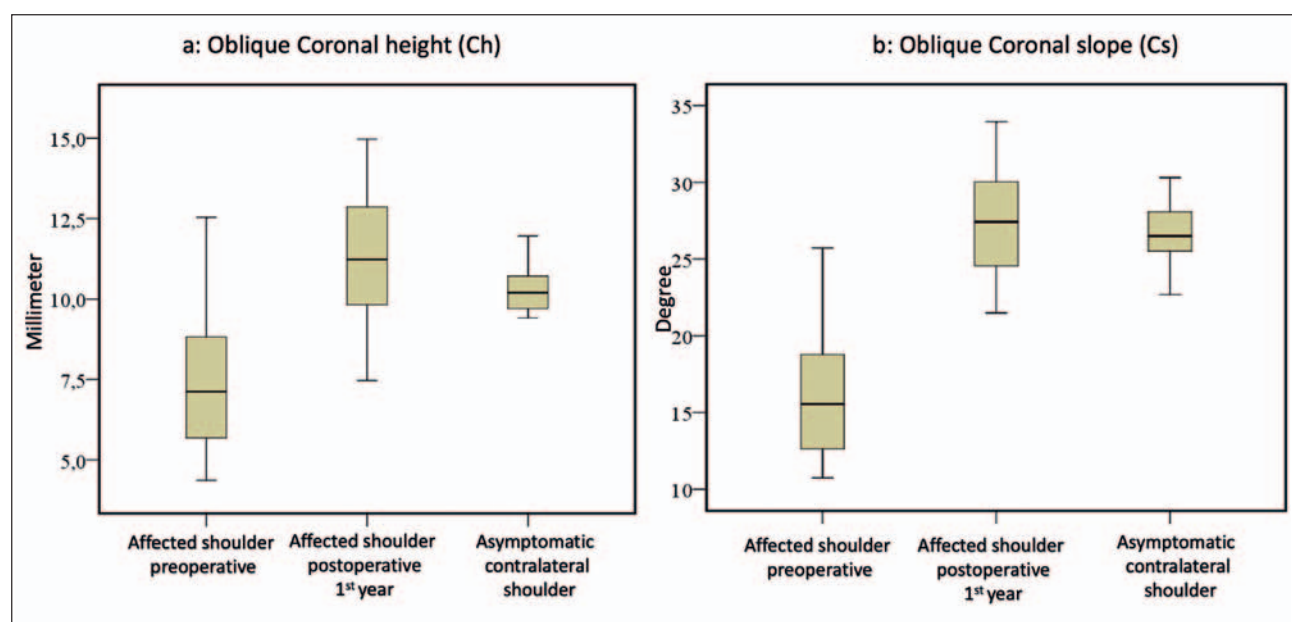


Fig. 7. Diagram shows the changes in oblique coronal slope and height. From left to right, the data shows of the affected shoulder preoperatively, at 1-year postoperatively, and the asymptomatic contralateral shoulder measurements.

labrum position and labral attachment status with treatment failure and functional results (22, 29). A possible reason for these conflicting results could be the use of different function scores in these studies.

Postoperative imaging, including MR imaging, is widely used after arthroscopic Bankart repair (8). Many authors have attempted to evaluate the radiological results following Bankart lesion repair and have used tests which are known to be superior in the evaluation of soft tissue, such as conventional MRI, MR arthrography and CT arthrography (13, 16, 22–24, 26, 27, 29). In the evaluation of the labral structure and associated lesions, MR arthrography and MR arthrography taken in the abduction external rotation (ABER) position are known to have higher sensitivity and specificity than MRI, but the use is limited because of difficulties in clinical use (21). Although the use of CT arthrography is recommended for a similar purpose, the use of CT and MR arthrography is limited as they are invasive procedures, with long acquisition time, difficulties in positioning, and high costs (2, 5, 14, 15, 18). In the current study, conventional MRI was selected as the radiological evaluation method, taken with the patient in a neutral position with the arm by the side of the trunk. The reason for this selection was for the same imaging method to be used as preoperatively. By standardising the radiological method, it was aimed to minimise potential measurement errors which could arise from the use of different methods and different upper extremity positions. When the design and results of the current study are taken into consideration, it can be recommended that by using the labral height and slope values, conventional MRI is sufficient and the results are reliable in showing that the necessary concavity has been restored for glenohumeral joint stability. Measurements were taken at 1 year postoperatively because when compared with the postoperative 3-month measurements, there could be losses in the regained labral height during the first postoperative year (16).

The Constant-Murley score was used as the clinical score in the current study but other scoring systems or re-dislocation rate were not obtained. For standardisation in the current study, only pure dislocations (not Hill-Sachs lesions) and those where 2 anchors were used were included. However, this method may not be able to be used in patients with other soft tissue and bone pathologies. Main limitation of the current study was that the number of dislocations in the period before surgery could not be accurately remembered by the patients. In addition, evaluation was made of a single slice whereas these measurements could have been evaluated separately for the 3, 4, and 5 o'clock positions.

CONCLUSIONS

In conclusion, our study demonstrated that MRI is sufficient to proof the increases in labral height and slope for patients who underwent arthroscopic Bankart repair. Labral height and slope measurements can be

used in the evaluation of glenoid depth on MR images after treatment. The labral height and slope in arthroscopic double anchor Bankart repair were not correlated with the Constant-Murley score. When other factors are considered which may affect clinical scores (number of dislocations before surgery, duration of instability before surgery, labral and capsular tissue quality, etc.), there can be seen to be a need for further studies with more parameters and longer follow-up to be able to better clarify this correlation.

Ethics approval

Authors followed the protocols dictated by the 1964 Helsinki Declaration and later Amendments. This research was approved by the Medical Research Ethics Committee of the Ankara Training and Research Hospital, Ankara, Turkey. Approval No: 5652.

Authors' contributions

Abdulaziz Temiz and Yavuz Şahbat drafted the manuscript. İsmail Murad Pepe collected the data, construction and analysis. Yavuz Şahbat and Cem Nuri Aktekin revised the manuscript for important intellectual content. İsmail Murad Pepe, Abdulaziz Temiz and Yavuz Şahbat designed the study, revised it for important intellectual content, and approved the final version.

References

- Adam M, Attia AK, Alhammoud A, Aldahamsheh O, Al Ateeq AI, Dosari M, Ahmed G. Arthroscopic Bankart repair for the acute anterior shoulder dislocation: systematic review and meta-analysis. *Int orthop* 2018; 42:2413–2422.
- Bui-Mansfield LT, Banks KP, Taylor DC. Humeral avulsion of the glenohumeral ligaments: the HAGL lesion. *Am J Sports Med.* 2007; 35:1960–1966.
- Constant C, Murley A. A clinical method of functional assessment of the shoulder. *Clin Orthop Relat Res.* 1987;214:160–164.
- Fabbricani C, Milano G, Demontis A, Fadda S, Ziranu F, Mulas PD. Arthroscopic versus open treatment of Bankart lesion of the shoulder: a prospective randomized study. *Arthroscopy* 2004; 20:456–462.
- Farber JM, Buckwalter KA. Sports-related injuries of the shoulder: instability. *Radiol Clin North Am.* 2002;40:235–249.
- Howell SM, Galinat BJ. The glenoid-labral socket: a constrained articular surface. *Clin Orthop Relat Res.* 1989;243:122–125.
- Hurley ET, Manjunath AK, Bloom DA, Pauzenberger L, Mullett H, Alaia MJ, Strauss EJ. Arthroscopic Bankart repair versus conservative management for first-time traumatic anterior shoulder instability: a systematic review and meta-analysis. *Arthroscopy.* 2020;36:2526–2532.
- Kim J-Y, Chung SW, Kwak JY. Morphological characteristics of the repaired labrum according to glenoid location and its clinical relevance after arthroscopic Bankart repair: postoperative evaluation with computed tomography arthrography. *Am J Sports Med.* 2014;42:1304–1314.
- Kim S-J, Jung M, Moon H-K, Chang WH, Kim SG, Chun YM. Is the transglenoid suture technique recommendable for recurrent shoulder dislocation? A minimum 5-year follow-up in 59 non-athletic shoulders. *Knee Surg Sports Traumatol Arthrosc.* 2009;17:1458–1462.
- Lazarus MD, Sidles JA, Harryman DT 2nd, Matsen FA 3rd. Effect of a chondral-labral defect on glenoid concavity and glenohumeral stability. A cadaveric model. *J Bone Joint Surg Am.* 1996;78:94–102.
- Lippitt S, Matsen F. Mechanisms of glenohumeral joint stability. *Clin Orthop Relat Res.* 1993;291:20–28.
- Ma R, Brimmo OA, Li X, Colbert L. Current concepts in rehabilitation for traumatic anterior shoulder instability. *Curr Rev Musculoskelet Med.* 2017;10:499–506.

13. McAdams TR, Fredericson M, Vogelsong M, Gold G. New developments in magnetic resonance imaging techniques for shoulder instability in athletes. *Open Access J Sports Med.* 2010;1:137–142.
14. Oh JH, Kim JY, Choi J-A, Kim WS. Effectiveness of multidetector computed tomography arthrography for the diagnosis of shoulder pathology: comparison with magnetic resonance imaging with arthroscopic correlation. *J Shoulder Elbow Surg.* 2010;19:14–20.
15. Palmer WE, Brown JH, Rosenthal DI. Labral-ligamentous complex of the shoulder: evaluation with MR arthrography. *Radiology.* 1994;190:645–651.
16. Park J-Y, Lee S-J, Lhee S-H, Oh JH. Change in labrum height after arthroscopic Bankart repair: correlation with preoperative tissue quality and clinical outcome. *J Shoulder Elbow Surg.* 2012;21:1712–1720.
17. Provencher MT, Midtgaard KS, Owens BD, Tokish JM. Diagnosis and management of traumatic anterior shoulder instability. *J Am Acad Orthop Surg.* 2021;29:e51–e61.
18. Saleem AM, Lee JK, Novak LM. Usefulness of the abduction and external rotation views in shoulder MR arthrography. *Am J Roentgenol.* 2008;191:1024–1030.
19. Samim M, Gyftopoulos S. Postoperative MRI of shoulder instability. *Magn Reson Imaging Clin N Am.* 2022;30:601–615.
20. Schiffern SC, Rozenzweig R, Antoniou J, Richardson ML, Matsen FA 3rd. Anteroposterior centering of the humeral head on the glenoid in vivo. *Am J Sports Med.* 2002;30:382–387.
21. Shankman S, Bencardino J, Beltran J. Glenohumeral instability: evaluation using MR arthrography of the shoulder. *Skeletal Radiol.* 1999; 28:365–382.
22. Stein T, Buckup J, Mehling A, Hoffmann R, Efe T, von Eisenhart-Rothe R, Welsch F. Restoration of joint congruency and the glenoidal labrum after arthroscopic revision Bankart repair: a MRI match-paired analysis comparing primary Bankart repair and the uninjured labrum. *Arch Orthop Trauma Surg.* 2014;134:1121–1134.
23. Stein T, Mehling A, Reck C, Buckup J, Efe T, Hoffmann R, Jäger A, Welsch F. MRI assessment of the structural labrum integrity after Bankart repair using knotless bio-anchors. *Knee Surg Sports Traumatol Arthrosc.* 2011;19:1771–1779.
24. Stein T, Mehling A, Ulmer M, Reck C, Efe T, Hoffmann R, Jäger A, Welsch F. MRI graduation of osseous reaction and drill hole consolidation after arthroscopic Bankart repair with PLLA anchors and the clinical relevance. *Knee Surg Sports Traumatol Arthrosc.* 2012;20:2163–2173.
25. Stirling P, Crighton E, Butterworth G, Elias-Jones C, Brooksbank AJ, Jenkins PJ. Glenoid track measurement using magnetic resonance imaging arthrography is predictive of recurrent instability following arthroscopic shoulder stabilisation. *Eur J Orthop Surg Traumatol.* 2022;32:1313–1317.
26. Sugimoto H, Suzuki K, Mihara K, Kubota H, Tsutsui H. MR arthrography of shoulders after suture-anchor Bankart repair. *Radiology* 2002; 224:105–111.
27. Walz DM, Burge AJ, Steinbach L. Imaging of shoulder instability. *Semin Musculoskelet Radiol.* 2015;19:254–268.
28. Yoo JC, Lee YS, Tae SK, Park JH, Park JW, Ha HC. Magnetic resonance imaging appearance of a repaired capsulolabral complex after arthroscopic Bankart repair. *Am J Sports Med.* 2008;36:2310–2316.
29. Zhu M, Young SW, Pinto C, Poon PC. Functional outcome and the structural integrity of arthroscopic Bankart repair: a prospective trial. *Shoulder Elbow* 2015;7:85–93.

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