Occult, Incomplete, and Complete Posterior Labral Tears Without Glenohumeral Instability on Imaging Underestimate Labral Detachment

Jae-Hyung Kim, M.D., Jonghyun Ahn, M.D., and Sang-Jin Shin, M.D., Ph.D.

Purpose: To introduce a classification of posterior labral tear and describe clinical characteristics, magnetic resonance imaging (MRI)/magnetic resonance arthrography (MRA) findings, arthroscopic findings, and outcomes after arthroscopic repair for patients with posterior labral tears without glenohumeral instability. **Methods:** Sixty patients with posterior labral tear who underwent arthroscopic repair were analyzed retrospectively. Patients with shoulder instability were excluded. Tear patterns were classified into 3 types; occult (type 1), incomplete (type 2), and complete (type 3) based on MRI/MRA studies. A visual analog scale score for pain, American Shoulder and Elbow Surgeons score, Single Assessment Numeric Evaluation score for satisfaction, and return to sports were evaluated at a minimum follow-up of 2 years. Computed tomography arthrography was performed at a year follow-up for assess labral healing. The diagnosis was confirmed in arthroscopy, and arthroscopic labral repair without capsular plication was performed. **Results:** The mean patient age was 30.4 ± 6.9 years, and all patients were male. Forty-four patients (73.3%) were participating in sports. MRI/MRA studies identified 10 patients with type 1, 18 with type 2, and 32 with type 3 tears. Type 1 tear patients showed a significantly longer symptom duration than those with type 3 (32.5 ± 17.2 vs 18.2 ± 17.1 months; $P = .015$). In arthroscopic findings, 70% of type 1 tear was confirmed as incomplete or complete tears. The American Shoulder and Elbow Surgeons score improved from 79.6 ± 10.3 to 98.1 ± 3.7, and pain was relieved from 2.4 ± 0.7 to 0.2 ± 0.5 at the last follow-up visit with high labral healing rate (95%). Thirty-nine (88.6%) patients returned to sports at preinjury levels. **Conclusions:** In active young men with shoulder pain during daily activities or sports despite programmed conservative treatment, posterior labral tears should be considered even when MRI/MRA findings are ambiguous. Arthroscopic posterior labral repair without capsular plication provided satisfactory clinical outcomes and a high labral healing rate. **Level of Evidence:** Level IV, case series.

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Posterior labral tears have not received much attention as a result of their low prevalence in patients with shoulder instability. The incidence of the posterior labral tear is lower, at approximately 10% of shoulder instability compared with 47% to 90% of anterior labral tear.[1-4] However, there is a growing body of evidence that suggests that the incidence of posterior labral tears is more prevalent than previously known, especially in military and athletic populations.[4-7] Recently, retrospective studies regarding patients who underwent arthroscopic labral repair have reported that labral tears involving the posterior labrum occurred in 74% to 86.3% of patients, which was greatest compared with other labral regions, drawing attention to its importance.[8,9]

Posterior labral tears are known to be closely related with posterior instability.[10-14] However, posterior labral injuries are caused by various mechanisms. Repetitive microtrauma such as weight training, rowing, and swimming or acute traumatic events during seizures, heavy weight exercises, and acute shoulder dislocations can damage the posterior capsulolabral structure.

From the Department of Orthopedic Surgery, College of Medicine, Ewha Womans University Seoul Hospital, Seoul, Republic of Korea.

The authors report no conflicts of interest in the authorship and publication of this article. Full ICMJE author disclosure forms are available for this article online, as supplementary material.

Received January 2, 2023; accepted June 1, 2023.

Address correspondence to Sang-Jin Shin, M.D., Ph.D., Department of Orthopaedic Surgery, Ewha Womans University Seoul Hospital, 260, Gonghang-daero, Gangseo-gu, Seoul, 07804, Korea. E-mail: sjshin622@ewha.ac.kr

0749-8063/234/$36.00
https://doi.org/10.1016/j.arthro.2023.06.015

Atraumatic causes including generalized laxity or glenoid hypoplasia also can lead to a posterior labral tear.[15-19] The clinical presentations of posterior labral tear are vague due to various injury mechanism; thus, patients often do not complain of instability symptoms even if they have physical examination findings related to posterior instability.[9,20,21] In some patients with symptomatic posterior labral tear, laxity or insufficiency of the glenohumeral joint capsule is not observed on magnetic resonance imaging (MRI). Furthermore, some posterior labral lesions might not be clearly visible on magnetic resonance studies and may only be identified as incomplete tears during arthroscopic examinations.[11] Therefore, it is necessary to evaluate the clinical characteristics of posterior labral tear especially in patients without clinical evidence of glenohumeral instability.

The purpose of this study was to introduce a classification of posterior labral tear and to describe the clinical characteristics, findings on MRI/ magnetic resonance arthrography (MRA) and arthroscopy, and outcomes after arthroscopic repair for patients with posterior labral tears without glenohumeral instability. It was hypothesized that classified posterior labral tears without glenohumeral instability on imaging would underestimate labral detachment.

Methods

Patient Selection

A total of 127 patients with symptomatic posterior labral tear who underwent arthroscopic posterior labral repair from February 2014 to April 2020 were enrolled. This study was conducted at a single institution, and the patient data were collected consecutively. All the collected patient data were analyzed retrospectively using the physician practice's electronic medical record. Patients who met the following inclusion criteria were included: (1) symptomatic patients who had isolated posterior labral tear without clinical evidence of glenohumeral instability on physical examinations, including apprehension test, relocation test, posterior jerk test, load shift test, and inferior translation test; the apprehension test was used to exclude patients with both posterior and anterior instability pathologies. In the posterior jerk test, patients who felt a "clunking" sensation due to subluxation of the humeral head were defined as positive in posterior instability and excluded in this study. (2) Patients who had a confirmed posterior labral tear on arthroscopy and underwent arthroscopic posterior labral repair using suture anchors as the primary operation. (3) Patients who underwent MRI/ MRA preoperatively and computed tomography arthrography (CTA) at 1 year of follow-up. (4) Patients with outpatient at a minimum follow-up of more than 2 years. Patients who met the following criteria were excluded: (1) patients who experienced any frank dislocation or recurrent subluxation of the shoulder joint with positive physical examination for instability tests; (2) patients with multidirectional instability on physical examinations including the Beighton score, load shift test, and sulcus sign; (3) patients with posterior glenoid hypoplasia on a computed tomography (CT) scan; and (4) patients who underwent surgical treatment of the capsular component such as rotator interval closure or capsular plication. Considering both clinical features and imaging tests, patients who were suspected of having a posterior labral tear received an intra-articular corticosteroid injection and rested for a month as the primary treatment. Then, after 2 months of performing strengthening rehabilitation exercises, the patients were allowed to return to sports in stages. Patients whose symptoms were not improved despite the programmed conservative treatment for at least three months underwent operative treatment. We have received approval from the Ewha Womans University Seoul Hospital Institutional Review Board (SEUMC 2022-06-021). This study has been carried out in accordance with the ethical standards in the 1964 Declaration of Helsinki and relevant regulations of the U.S. Health Insurance Portability and Accountability Act, and informed consent was obtained from all participants.

Clinical Outcomes and Radiographic Evaluations

The patients were asked about their clinical symptoms according to a prepared questionnaire form including demographic data, events associated with injuries, duration of symptoms, and previous shoulder joint injection history. Preoperative physical examinations included Kim's test,[22] the posterior jerk test, the O'Brien test, and the forced shoulder abduction and elbow flexion test.[23] For functional assessment, a visual analog scale (VAS) for pain and the American Shoulder and Elbow Surgeons (ASES) score were assessed preoperatively and postoperatively at 3, 6, 12 months and at the last follow-up visit. Satisfaction with surgery was evaluated using the Single Assessment Numeric Evaluation (SANE) score, and return to sports was evaluated with 3 levels: preinjury, less than before, and did not return. All functional assessments were consistently evaluated by a physician assistant with 7 years of experience in orthopaedics who was not involved in this study. Physical examinations were performed by a board-certified orthopedic surgeon (S.-J.S.).

All patients underwent preoperative MRA or MRI to evaluate for the presence of a posterior labral tear. A CT scan to evaluate bony glenoid lesions also was performed preoperatively. Two orthopaedic surgeons (J.-H.K., J.A.), both currently undergoing a specialized fellowship program in shoulder surgery, evaluated the imaging tests independently inter-observer reliability were assessed. After the initial evaluation, one orthopaedic surgeon (J.-H.K.) independently re-labeled the

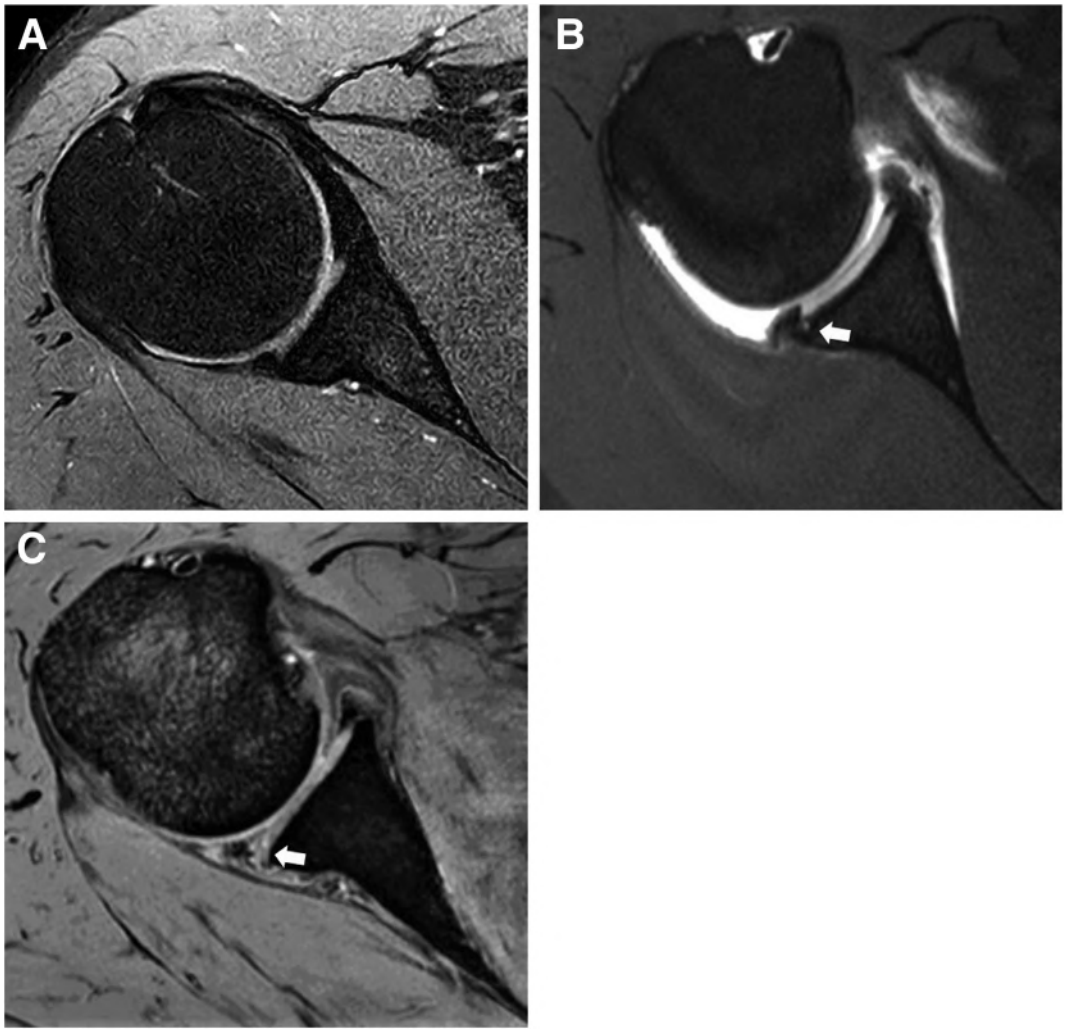

Fig 1. Three types of posterior labral tears of right shoulder in MRI/MRA. (A) Type 1, an occult tear with a normal posterior labral structure without evidence of labral detachments or cracks. (B) Type 2, an incomplete tear with a partial detachment (arrow) in superficial aspect of the posterior labrum without evidence of a complete tear or contrast leakage. (C) Type 3, a complete tear (arrow) in which the posterior labrum is detached from the glenoid. (MRA, magnetic resonance arthrography; MRI, magnetic resonance imaging.)

patients with blinded processing and shuffled the order to perform a second classification for intraobserver reliability. The MRI/MRA findings of a posterior labral tear are classified into 3 types; type 1 is an occult tear with a normal posterior labrum appearance on MRI/MRA; type 2 is an incomplete tear with partial detachment of the posterior labrum visible on MRI; and type 3 is a complete tear with a definitive detachment of the posterior labrum from the posterior glenoid (Fig 1). Patient demographic data were reanalyzed according to the MR study classification to verify whether there were any differences based on the classification. CTA scans also were reviewed to evaluate for labral healing at the 12-month follow-up visit.

The diagnosis was confirmed during arthroscopic surgery. In arthroscopic findings, occult tears appear morphologically normal with inspection by the scope, however, demonstrate a tear after probing; incomplete tears show partial detachment of the posterior labrum and can be delineated as torn with probing; and complete tears present definitive detachment of the posterior labrum from the posterior glenoid. Posterior labral tear patterns were analyzed by reassessing the type determined by the MRI/MRA to review how the tear would appear arthroscopically. The location of the tear was described by expressing the glenoid face as a clock. The number of suture anchors used during posterior labral repair also was reviewed.

Surgical Technique and Postoperative Rehabilitation

All operations were performed by a single orthopaedic surgeon (S.-J.S.). The arthroscopic surgery was performed in the lateral decubitus position with the arm at

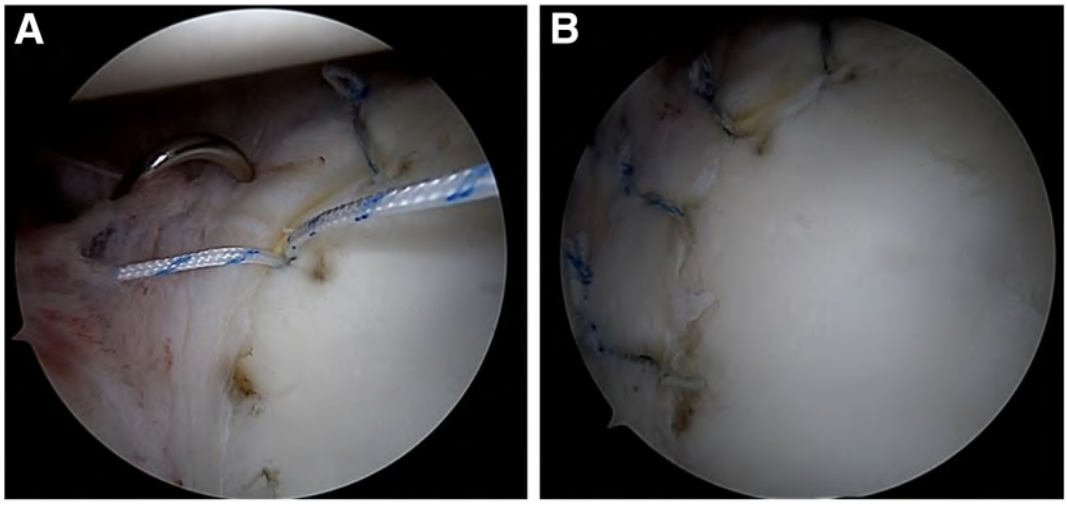

Fig 2. Arthroscopic view of left shoulder from anterosuperior portal. (A) A curved suture hook, which is introduced through posterior portal, is passed between the posterior labrum and the capsule to avoid catching posterior capsule. (B) The posterior labrum is securely fixed without capsular plication using all suture anchors.

40° abduction and 10° flexion using a traction device under an interscalene block and general anesthesia. A standard posterior portal and anteroinferior portal in the rotator interval were used for initial intra-articular structure examination. Then, an anterosuperior viewing portal was made through the musculotendinous junction of the rotator cuff posterior to the long head of the biceps tendon. When the posterior labrum had only cracks or a normal appearance, light pressure on the junction between the glenoid cartilage surface and the labrum was applied to assess for occult tears using a probe. If an occult tear is present, the labrum detaches easily from the glenoid surface with light pressure applied through the probe, while this does not occur in the case of a normal labrum. Once a posterior labral tear was identified, the labral tissue was debrided using a shaver; then, the glenoid attachment site was decorticated with a rasp. An additional posterolateral portal was created at the midportion between the posterior and anterosuperior portals for suture anchor insertion to the posterior glenoid. All suture anchors (1.4-mm ICONIX1; Stryker, Mahwah, NJ) were placed in the area of the labral lesion of the glenoid. A crescent suture hook introduced from the posterior portal was passed through the junction between the labrum and capsule to prevent the capsule tissue from being sutured together (Fig 2A). When the suture hook was passed through the labral tissue, one strand of the anchor was passed using the shuttle relay technique. The labrum was tied with a sliding locking knot to apply strong tension to the labrum. The steps were repeated until the lesion was completely repaired (Fig 2B).

The same postoperative rehabilitation protocol was applied in all patients. Shoulder immobilization supported by an abduction brace was prescribed for the first 4 weeks. At the beginning of the fifth week, passive range of motion and active-assisted exercises were encouraged after discontinuation of the immobilization. Shoulder muscle-strengthening exercises were allowed after 12 weeks postoperatively. Return to sports was allowed 6 months postoperatively when shoulder range of motion and strength had been recovered.

Statistical Analysis

A paired *t*-test was used to compare differences between the preoperative and final follow-up VAS scores for pain and ASES scores, and $P < .05$ was considered statistically significant. In addition, we evaluated the clinical significance of our results by determining whether the VAS scores for pain, ASES, and SANE scores achieved the minimal clinically important difference (MCID) at the final follow-up. The MCID values (VAS: 1.5; ASES: 8.5; SANE: 13) were based on previously published values.[24-27] The Cohen kappa coefficient (κ) was calculated to measure inter- and intraobserver reliability for evaluation of MRI/MRA.[28] The difference in demographic data between the MRI/MRA types was analyzed using the Kruskal–Wallis test, and the difference between each group was analyzed using the Mann–Whitney *U* test; according to the Bonferroni method; $P < .017$ was considered statistically significant. Proportion factors between each type were compared using the χ^2 test, but sports activities and types were compared using Fisher exact test. All statistical analyses and tests were conducted with SPSS (version 26.0.0; IBM, Armonk, NY).

Results

Of 127 patients, 18 patients with a history of posterior shoulder dislocation, 14 patients with a history of

Table 1. Demographic Data of Patients With Posterior Labral Tear

Age at surgery, y	30.4 ± 6.9
Symptom duration, mo	22.4 ± 19.8
Insidious onset/traumatic episode	39:21
Male/female ratio	60:0
Injuries on dominant shoulder, n (%)	40 (66.7)
Sports activities participant, n (%)	44 (73.3)
Types of participating sports	
Weight training	30
Overhead sports	13
Competitive sports	3
Swimming	2
Others	2
Number of steroid injections	2.9 ± 3.2

NOTE. Values are presented as mean ± standard deviation or number only.

recurrent subluxation, 24 patients with significant instability on physical examinations, and 11 patients who had undergone a capsular plication procedure were excluded. Finally, 60 patients who met the inclusion criteria were included in the study with a follow-up duration of 34.2 ± 14.1 months. The patients' preoperative demographic data and clinical findings are described in Table 1. All patients that met inclusion criteria were male, and 73.3% of patients were active participants in sports.

All patients complained of shoulder pain or discomfort that occurred during daily activities or sports activities but did not have resting pain. The most common positive test on physical examination was the forced shoulder abduction and elbow flexion test (32 patients, 56.1%), followed by the O'Brien test (23 patients, 40.4%), Kim's test (18 patients, 31.6%), and posterior jerk test (11 patients, 19.3%).

Preoperative MRI/MRA identified type 1 tears in 10 patients (16.7%), type 2 tears in 18 patients (30.0%), and type 3 tears in 32 patients (53.3%). The intra- and interobserver agreement of the MRI/MRA evaluations was almost perfect with an intraclass correlation coefficient of 0.836 (95% confidence interval 0.81-1.00, $P < .001$) for the intraobserver reliability and substantial with an intraclass correlation coefficient of 0.729 (0.61-0.80) for interobserver reliability (both $P < .001$). The demographic data for each type are described in Table 2. No significant differences in demographic data were found among the 3 posterior labral tear types except for symptom duration. The symptom duration of patients with type 1 tears was significantly longer than that of those with type 3 tears ($P = .015$). There was no statistically significant difference between type 1 and type 2 tears or between type 2 and type 3 tears ($P = .072$, $P = .283$). No posterior glenoid bone loss was found on any patient's preoperative CT scan. Sclerotic changes of the posterior glenoid rim were observed in six patients, and bone cysts were found in two patients.

The mean time between preoperative MRI/MRA and surgery was 8.0 ± 7.6 months. On arthroscopic findings, 36 patients had an isolated posterior labral tear, and the accompanying pathologic findings included type I SLAP lesions (n = 24). The most common posterior labral tear locations were at 7, 8, 9, and 10 o'clock (n = 34); followed by 8, 9, and 10 o'clock (n = 9); 7, 8, and 9 o'clock (n = 8); 9 and 10 o'clock (n = 5); and 7 and 8 o'clock (n = 4). The arthroscopic tear patterns were matched to 3 types classified on MRI studies (Fig 3). The relationship between the MRI/MRA and arthroscopic findings is summarized in Table 3. In arthroscopic findings, 7 patients (70%) of type 1 tear were confirmed as incomplete (5 patients) and complete tear (2 patients). Consequently, 3 of 10 (30%) type 1 posterior labral tears had matching preoperative MRI/MRA and arthroscopic findings. In type 2 tears, 8 of 18 (44.4%) showed a match between the imaging and arthroscopic findings. For type 3 tears, the correspondence was greater, with 30 of 32 (93.8%) posterior

Table 2. Demographic Data of Patients Sorted by MRI/MRA Findings

	Type 1 (Occult; n = 10)	Type 2 (Incomplete; n = 18)	Type 3 (Complete; n = 32)	*P* Value
Age at surgery, y	29.6 ± 5.5	30.2 ± 6.6	30.7 ± 7.5	.950
Symptom duration, mo	32.5 ± 17.2	24.1 ± 22.9	18.2 ± 17.1	.037 *
Insidious onset/traumatic episode	8:2	10:8	21:11	.427
Injuries on dominant shoulder, n (%)	6 (60)	10 (55.6)	24 (75)	.333
Sports activities participant, n (%)	8 (80)	14 (77.7)	22 (68.8)	.787
Types of participating sports				.284
Weight training	8	11	11	
Overhead sports	0	4	9	
Competitive sports	0	1	2	
Swimming	0	1	1	
Others,	0	0	2	
Number of steroid injection	2.7 ± 1.6	2.9 ± 3.4	3.0 ± 3.6	.782

NOTE. Values are presented as mean ± standard deviation or number only.
MRA, magnetic resonance arthrography; MRI, magnetic resonance imaging.
*Statistical significance is present between type 1 and 3 ($P = .015$).

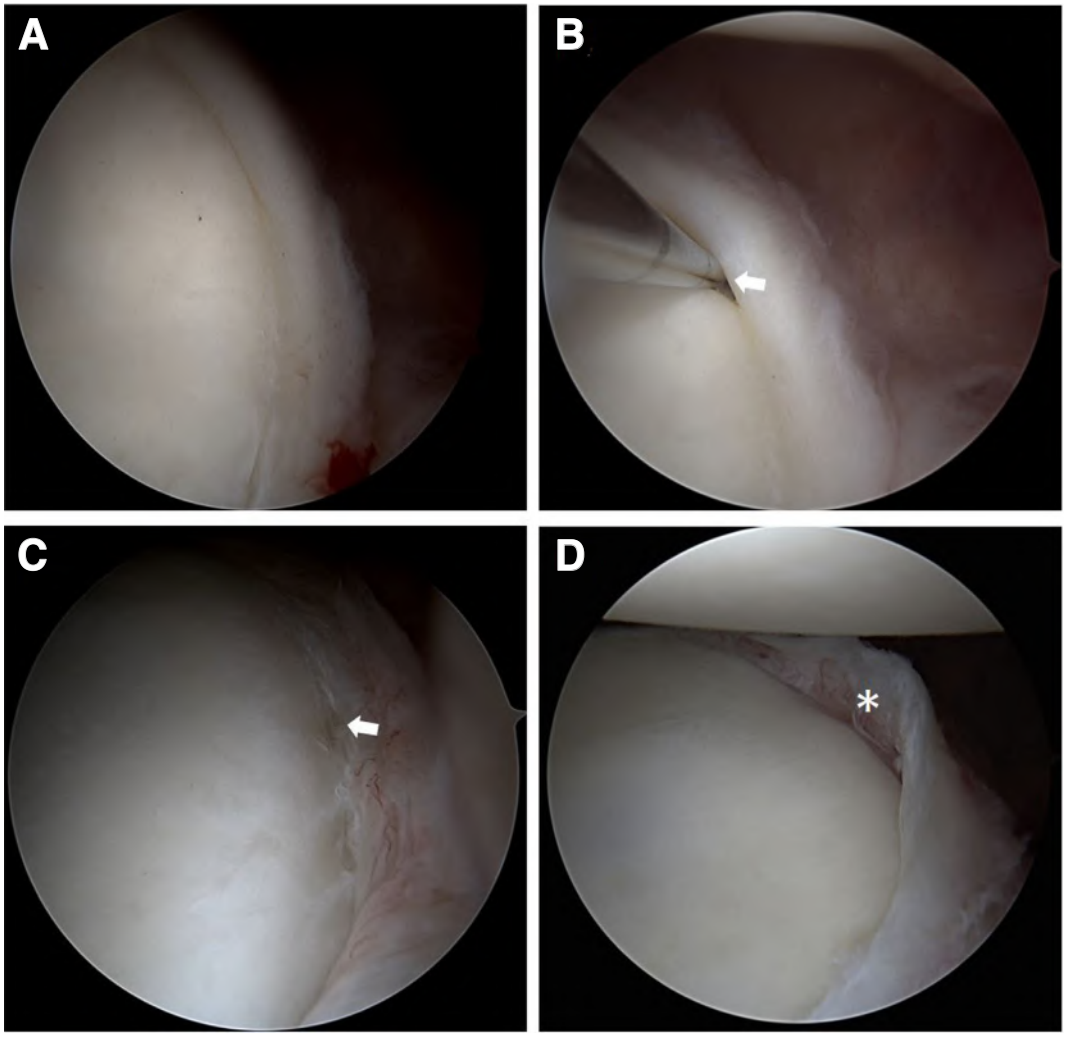

Fig 3. Arthroscopic view of right shoulder from anterosuperior portal. (A) Type 1. A normal-appearing occult tear is present in the posterior labrum that is easily overlooked during diagnosis. (B) The type 1 tear is easily penetrated by applying gentle pressure with a probe (arrow). (C) Type 2. An incomplete tear with partial detachment of the posterior labrum (arrow). (D) Type 3. A complete tear with definite detachment of the posterior labrum from the glenoid (asterisk).

labrum demonstrating a match. The average number of suture anchors used for posterior labral repair was 2.9 ± 0.7.

Statistically significant shoulder functional improvement was obtained postoperatively. The ASES score improved from 79.6 ± 10.3 preoperatively to 98.1 ± 3.7 at the last follow-up visit ($P < .001$), and pain was relieved from 2.4 ± 0.7 preoperatively to 0.2 ± 0.5 at the last follow-up visit ($P < .001$). At the last follow-up visit, the SANE score showed satisfactory results at 97.4 ± 7.2. Regarding clinically significant differences, the proportion of patients who achieved the MCID at the last follow-up was 66.6% for VAS scores for pain, 83.3% for ASES, and 78.3% for SANE score.

Thirty-nine (88.6%) of 44 patients who participate sports activities preoperatively were able to return to sports at a preinjury level, and 5 patients (11.3%) did not return to sports, 4 of whom were participated in overhead sports and, 1 in weight training. There were 3 patients (5.0%) with contrast leakage and a suspected retear on the 12-month follow-up CTA; However, since no clinical symptoms related to retear were found, it was decided to observe without revision. During the

Table 3. Correlation Between MRI/MRA Types and Arthroscopic Findings

	MRI/MRA Findings (MRI/MRA)		
Arthroscopic Findings	Type 1	Type 2	Type 3
Occult	3 (0/3)	2 (2/0)	0 (0/0)
Incomplete	5 (2/3)	8 (5/3)	2 (2/0)
Complete	2 (2/0)	8 (6/2)	30 (22/8)

NOTE. Values in parentheses indicate participants who underwent an MRI/MRA procedure.

MRA, magnetic resonance arthrography; MRI, magnetic resonance imaging.

whole follow-up period, no postoperative complications such as infection or neurovascular injury were observed.

Discussion

The important findings in the current study were that 3 types of posterior labral tears were found on MRI/MRA studies. However, the tear types observed on MRI/MRA often underestimated the actual severity of tears when confirmed during arthroscopic surgeries. Especially, an MRI occult tear looks normal on the MRI studies, even though a tear actually exists, and an arthroscopic occult tear also looks morphologically normal when inspected with the scope; however, after probing the labrum, it becomes evident that a tear actually exists. Arthroscopic posterior labral repair achieved satisfactory clinical outcomes with a high return to sports rate in patients with posterior labral tears without instability.

All patients who had posterior labral tear without instability complained of pain in the range of shoulder motion during daily activities and sports activities in this study. The patients did not have resting pain, as evidenced by the low VAS for pain score preoperatively. Alexeev et al.[9] demonstrated that a posterior labral tear that does not cross the midline of the joint is more likely to demonstrate pain than instability. Savoie et al.[29] also suggested that a posterior labral tear is not an essential lesion of instability and that a posterior labral tear itself does not induce subjective instability. One study in contact athletes with posterior labral tear without instability demonstrated the injury mechanism that the labrum could be damaged without injury to the posterior capsule due to the posterior shearing force that occurs when the shoulder musculature is already applying a compressive force to the glenohumeral joint.[30] These patients mainly complained of pain when performing movements applied in the posterior shoulder direction, such as performing a bench press and weight lifting. This pattern is also seen in rugby players and soldiers who perform many push-ups.[7,31] Arthroscopic posterior labral repair aims to secure the labrum to the glenoid, preventing pain generation caused by shearing forces. Thus, it is expected to alleviate the pain experienced by patients during movements applied in the posterior shoulder direction. In the current study, 73.3% of the patients engaged in sports activities, and 50% of the patients participated in weight training in which the force is directed to the posterior labrum. However, considering that the remaining 50% of sports participants were engaged in other kinds of sports activities and that 26.4% of the patients did not play sports, a similar posterior labral injury mechanism might also occur in other sports activities or activities of daily living.

Many studies have reported that a physical examination is highly sensitive for the diagnosis of a posterior labral tear. Kercher et al.[21] reported that the O'Brien test was positive in 71.9% of patients and that the relocation test was positive in 50% of patients with a posterior labral tear. Kim et al.[22] reported that in posterior labral lesions, the sensitivity of the test was 80%, and that of the relocation jerk test was 73%; when both tests were performed simultaneously, the sensitivity was 97%. SLAP lesion—specific tests also showed high positive rates for posterior labral tears such as in a study in which all patients were 100% positive on the modified SLAP test[17] or 71.9% positive on the O'Brien test.[21] However, none of these studies controlled for patient instability. Therefore, the accuracy of the widely used tests for posterior labral tear and SLAP lesion is low when applied in patients who had posterior labral tear without instability. We routinely used two conventional posterior labral tear tests and two SLAP lesion specific tests. The sensitivity of SLAP lesion specific tests is higher than that of conventional posterior labral tear test in patients who had posterior labral tear without instability in this study. This may be because 80% of patients had tears at the 10-o'clock area; thus, the SLAP test could stimulate the lesions directly through the biceps anchor in the immediate vicinity. In contrast, conventional posterior labral tear tests such as the test by Kim et al. or the relocation jerk test, which stimulate the lesion through the humeral head, seem to have difficulty stimulating the lesion properly when no instability is present.

The diagnosis of posterior labral tears using MRI/MRA has improved, with a sensitivity ranging from 57% to 85.7%.[9,32-34] Based on the current diagnostic rates in MRI/MRA, posterior labral tear in patients without instability are more difficult to diagnose using MRI/MRA, as a complete posterior labral tear was diagnosed only in 53.3% of the patients. However, we found that patients who showed incomplete and occult posterior labral tear on MRI/MRA also had clinical symptoms that were not relieved after thorough conservative treatment. Therefore, the current study did not classify the MR images by the presence or absence of tears alone and instead added 2 types of tears corresponding to an incomplete and a complete tear on the arthroscopic examination. Eight of 18 patients with type 2 tears on MRI/MRA showed a complete tear, and 7 of 10 patients with type 1 tears on MRI/MRA showed a complete or an incomplete tear on arthroscopy, demonstrating that posterior labral tears without instability could be underestimated on MRI/MRA. In the absence of instability, some posterior labral tears have a normal anatomical appearance superficially, however there is a loose connection or an impending tear in the deep portion of the labrum. Therefore, the joint fluid or arthrography dye, which indicates the tear

density on MRI/MRA, does not penetrate well between the glenoid cartilage and the torn labrum. This factor may contribute to the similarities in diagnostic accuracy between MRI and MRA. In our study, 19 patients underwent MRA, whereas 41 patients underwent MRI for diagnosing posterior labral tears. In line with our findings, several studies have reported that there is no substantial difference between MRI and MRA in terms of diagnosing labral lesions.[35,36] The absence of indirect findings suggesting posterior labral tear, such as posterior capsular laxity and loss of labral contour or height, also makes diagnosis of posterior labral tear without instability difficult. Although Pennington et al.[20] reported that the diagnostic accuracy was 96% when MRI was performed in conjunction with physical examination in patients with posterior labral tears when 89% of patients had instability. However, the sensitivity of physical examination is low in patients who had posterior labral tear without instability. These points make it difficult to diagnose patients with posterior labral tears, making them suffer from symptoms for a long time, as this study showed that the symptom duration tended to increase from type 3 tears to type 1 tears. It is important to recognize that posterior labral tears that are not definitively apparent on MRI/MRA can also cause persistent pain and discomfort, especially in young men who participate in sports activities. Correlation with clinical features as well as imaging studies and patient selection still should be carefully considered, and a program of conservative treatment is recommended before deciding on operative treatment.

Kim et al.[11] reported a posterior labral tear with an incomplete crack at the chondrolabral junction or a normal appearance on the arthroscopic examination as Kim's lesion in patients with symptomatic posterior labral tears. Kim's lesion requires restoration of the labral height and repair of redundant joint capsule for joint stabilization. However, in this study, satisfactory clinical outcomes were obtained only by labral repair without labroplasty or posterior capsular plication in patients who had posterior labral tear without instability. A recent study on the current management of posterior labral injuries and glenohumeral instability in overhead athletes recommended care when performing capsular plication because it can create an overconstrained shoulder.[32] Recent studies regarding posterior labral repair in overhead throwing athletes also showed successful clinical outcomes after posterior labral repair alone without capsular plication,[21,32,37] regardless of instability. Capsular plication can alter the biomechanics of the shoulder and change the natural movement of the shoulder in physically active.[38-40] Inclusion of an intact capsule tissue in repairing the labrum can induce discomfort such as loss of motion or difficulty during postoperative rehabilitation. Compared with a large systematic review summarizing posterior instability studies,[41] we obtained a high rate of labral healing and return to sports rate after surgery to repair only the torn labrum without capsular plication in patients who had posterior labral tear without instability.

Limitations

This study had several limitations. First, this study was a retrospective study with a relatively small number of patients; thus, selection bias may have occurred. In addition, the absence of female participants in the study, which limits the applicability of our findings to female patients and could potentially result in a sex-specific bias. Since the operative indications for posterior labral tear were decided after thorough conservative treatment including corticosteroid injections with controlled shoulder strengthening exercises, the number of patients who underwent surgical treatment was small. Second, MRA, which has a high diagnostic rate for labral tears, was not performed in all patients. The reason is that MRA was not used primarily because the patients' symptoms did not clearly suggest instability. Third, no control group was used to compare the clinical outcomes from different treatment methods or surgical techniques. Fourth, because the study was conducted on patients who underwent surgery, the data do not represent entire treatment outcomes in patients who had posterior labral tear without instability.

Conclusions

In active young men with shoulder pain during daily activities or sports despite programmed conservative treatment, posterior labral tears should be considered even when MRI or MRA findings are ambiguous. Arthroscopic posterior labral repair without capsular plication provided satisfactory clinical outcomes and a high labral healing rate.

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