Compressive Partial Neuropathy of Axillary Nerve Resulting from Antero-Inferior Paralabral Cyst in an Adolescent Overhead Athlete

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Paralabral cysts of the shoulder are rare, and there are few reports available that describe antero-inferior paralabral cysts arising from a detached antero-inferior glenoid labral tear without shoulder instability. We report an antero-inferior labral tear without shoulder instability in adolescent overhead athlete associated with paralabral cyst that leads to axillary nerve neurapraxia. Although nonoperative management of such labral lesions may provide symptoms of relief, it may not be enough for the athlete to return to the game. However, surgical treatment in this case provides successful recovery and rapid return to playing baseball play without having to worry about the progression of muscle denervation.

Keywords: Shoulder, Labrum, Paralabral cyst, Overhead athletes, Axillary nerve

Introduction

Shoulder injuries in adolescent overhead athletes are being increasingly encountered by orthopedic surgeons as early participation in throwing sports continues to grow at a rapid rate¹. Paralabral cysts of the shoulder are rare, and usually develop in the proximity of the labrum, but can be a cause of pain and disability, especially in the shoulders of overhead athletes. Paralabral cysts are most frequently reported along the posterior, superior, and anterior aspects of the glenohumeral joint and are uncommon to be located inferiorly to the joint². The underlying cause of paralabral cysts has not yet been identified. Recently the wide-spread use of magnetic resonance imaging (MRI) has increased the frequency of diagnoses of paralabral cysts of the shoulder joint.
The causal relationship of spinoglenoid cysts to suprascapular nerve neurapraxia has been well documented, and spinoglenoid cysts have also been associated with superior labral anteroposterior lesions\(^3\). However, there are few reports available that describe antero-inferior paralabral cysts resulting in axillary neuropathy, arising from a detached antero-inferior glenoid labral tear without shoulder instability.

We present a case of an antero-inferior paralabral cyst arising from a detached antero-inferior glenoid labral tear without shoulder instability resulting in a compressive partial neuropathy of the axillary nerve, thereby giving rise to a several-month history of progressive shoulder pain and mild atrophy of the teres minor muscle.

**Case Report**

A 16-year-old elite baseball player, right-hand dominant, visited our shoulder center for right shoulder pain without trauma which had occurred two months prior. Pain had been provoked by overhead activities especially during the late cocking and acceleration phases. He complained of diffuse soreness and weakness on part of the outer affected shoulder precipitated by throwing and occasionally by batting practice.

Clinical examination revealed mild type I scapular dyskinesis, with mild prominence of the inferomedial scapular border and no gross atrophy of the deltoid, trapezius, or rotator cuff musculature. The cervical spine and glenohumeral joint demonstrated full, painless active and passive range of motion. The right upper extremity was neurovascularly intact, and the acromioclavicular joint, sternoclavicular joint, and biceps tendon were not tender to palpation. A stability examination of the shoulder revealed no sulcus sign and no anterior or posterior translation of the humeral head without apprehension and relocation test. The compression rotation test and O’Brien test were positive for pain. External rotation strength testing revealed mild to moderate (grade 4 of 5) weakness compared to the unaffected left side.

On the basis of the examination and a concern for the possibility
of occult labral pathology, radiographs were made and a magnetic
resonance imaging scan of the right shoulder was acquired. Plain
radiographs revealed no abnormalities. The magnetic resonance
imaging scan of the right shoulder revealed Antero-inferior labral
tear (from the 4-o’clock to 5-o’clock position) with adjacent 13
mm×15 mm×12 mm multiloculated paralabral cyst (from the
5-o’clock to 6-o’clock position) not extending into the quadrilateral
space that is located posterior and inferior to the glenohumeral
joint (Fig. 1) and denervation edema or teres minor mild atrophy
was appreciated due to mild increased signal intensity (Fig. 2).

An electromyogram (EMG) and nerve conduction study (NCS)
of the right upper extremity findings showed at both the motor
and sensory NCS within normal limits. Needle EMG showed
demonstrated polyphasic motor unit potentials and slightly reduced
recruitment patterns are noted in right teres minor muscle. Thus
the findings are suggestive of a partial peripheral neuropathy
of the posterior branch of the axillary nerve.

Initially, we recommended nonoperative treatments - including
activity modification (three-month period of rest with cessation
of overhead sports), nonsteroidal anti-inflammatory drugs, and
physical therapy (rotator cuff and periscapular muscle strength-
ening exercises). Three months after the nonoperative treatments,
he visited our clinic. The patient’s condition improved significantly,
and he experienced no recurrence of pain. The follow-up MRI

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**Fig. 2.** Coronal T2-weighted fat-suppressed (A) and sagittal T2-weighted fat-suppressed (B) magnetic resonance images of the right shoulder. Where denervation edema or teres minor mild atrophy was appreciated due to mild increased signal intensity (white arrows).

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**Fig. 3.** Arthroscopic view of the right shoulder with use of the superior portal (lateral decubitus position). (A) Arthroscopic findings showed that the antero-inferior capsule-labral complex had partial detachment (from the 4-o’clock to 6-o’clock position) from the glenoid. (B) The cyst and its multiloculated subcompartments were thoroughly decompressed under direct vision with blunt instruments and a shaver device. Then the anteroposterior margin of the glenoid was freshened and decorticated with the use of a shaver device. (C) Anatomic arthroscopic repair of the antero-inferior labral complex to the glenoid margin was performed with the use of two Bio Mini-Revo suture anchors (ConMed Linvatec, Largo, FL, USA) with one placed at the 4:30-clock position and one placed at the 5:30-clock position. A simple suture configuration was utilized.
showed a recovered signal intensity of the teres minor although there was no change in the paralabral cyst.

Thus, we considered that repeated overhead throwing activity provokes the paralabral cyst to irritate and compress the axillary nerve. While rest reduced the pain somewhat, the symptoms immediately recurred with his return to baseball, and he then revisited our clinic. So we decided to perform an arthroscopic operation due to his desire to return to playing baseball.

1. Description of procedure

The patient was placed in the lateral decubitus position with the arm in a 7-kg traction device in 3 directions (3-point shoulder distraction system, Arthrex, Naples, FL, USA) and we performed examination under general anesthesia. The patient was examined under anesthesia to assess translation before traction. The patient had a grade I anterior translation and grade I inferior translation and grade 0 posterior translation.

Arthroscopic findings showed that antero-inferior capsulo-labral complex had partial detachment (from the 4-o’clock to 6-o’clock position) from the glenoid (Fig. 3A). Then capsulo-labral complex was detached using a liberator device, the subcapsular area showed a multiloculated cyst and cystic fluid drainage at the 5-o’clock position. The cyst and its multiloculated subcompartments were thoroughly decompressed under direct vision with blunt instruments and a shaver device. The anteroinferior margin of the glenoid was freshened and decorticated with the use of a shaver device (Fig. 3B). Anatomic arthroscopic repair of the antero-inferior labral complex to the glenoid margin was performed with the use of two Bio Mini-Revo suture anchors (ConMed Linvatec, Largo, FL, USA) with one placed at 4:30-clock position and one placed at 5:30-clock position (Fig. 3C).

2. Postoperative rehabilitation and return to play

Postoperatively, the patient maintained his operated arm in a sling with 15° of abduction for 6 weeks. He started rehabilitation exercises after the first 6 weeks. Rehabilitation exercises started with gentle passive forward flexion using a pulley for 3 weeks. After the pulley period, patients started external rotation exercises with a stick for 3 weeks. A follow-up CT arthrogram was performed at 3 months postoperatively, and strengthening exercises were allowed, followed by a formal throwing program at six months after full, painless range of motion had been achieved. He was allowed to return to competitive sports at nine months postoperatively and was pain-free and without any complaints.

Although electromyography was not repeated postoperatively, twelve-month follow-up demonstrated complete resolution of all shoulder symptoms with no limitation on shoulder function and he regained full external rotational strength. There were no signs of laxity or instability, and there was no evidence of recurrence of the paralabral cyst. The twelve-month follow-up MRI showed complete resolution of the paralabral cyst (Fig. 4).

Discussion

A paralabral cyst of the shoulder joint can be observed in 2% to 4% of the general population, particularly in men during the third and fourth decades. Paralabral cysts of the shoulder joint usually develop in the proximity of the labrum. On average,
these cysts measure 10 to 20 mm in diameter and they are preferentially located on the postero-superior aspect of the glenoid. Only rarely do they occur anteriorly and it is uncommon for them to be located inferiorly to the joint. The symptoms of a paralabral cyst may be the result of rotator cuff disease, labral disease, entrapment syndrome from compression of the suprascapular nerve or axillary nerve, instability or a combination of these conditions. A few reports show that the paralabral cyst of the shoulder is associated with glenohumeral instability. Dietz et al. reported that an anterior-inferior labral cyst with an anterior labral tear was related to non-traumatic shoulder instability, and Ferrick and Marzo reported that suprascapular entrapment neuropathy with a ganglion is related to posterior shoulder instability. Yukata et al. also reported that a paralabral cyst of the shoulder was associated with recurrent anterior dislocation.

Our case report is that of a rare case of antero-inferior paralabral cyst combined with antero-inferior glenoid labral tear without shoulder instability. The patient had initially performed nonoperative treatments and three months after nonoperative treatments (three-month period of rest with cessation of overhead sports and rotator cuff and periscapular muscle strengthening exercise), the patient’s symptoms improved significantly, and he experienced no recurrence of pain. The follow up MRI (3 months after nonoperative treatments) showed no atrophy of teres minor due to a recovered signal intensity, although there was no change in the paralabral cyst. However, the symptoms immediately recurred with his return to playing baseball. This cyst was just near the axillary nerve, but it was not located in the quadrilateral space that is located posterior and inferior to the glenoid rim and contains the axillary nerve and posterior humeral circumflex artery.

Quadrilateral space syndrome is a rare condition with symptoms caused by axillary nerve compression in the quadrilateral space infero-posterior to the glenohumeral joint. The syndrome typically occurs in young athletic adults in the age range of 25 to 35 years without a history of significant trauma. Fibrous bands extending through the quadrilateral space compress the axillary nerve. These bands appear to be related to repeat overhead activity such as throwing. Patients typically present shoulder pain exacerbated by abduction and external rotation.

In contrast, in our case, we suspected that repetitive microtrauma (overhead throwing) was the main cause of the antero-inferior labral tear, that may cause shoulder instability or not, and the paralabral cyst. In our opinion, we considered repeated overhead throwing activity (abduction and external rotation of the humerus) provokes for the paralabral cyst to irritate and dynamically compresses the axillary nerve. We considered that there was the cyclic correlation of repetitive overhead throwing, antero-inferior labral tear and adjacent paralabral cyst. The repetitive overhead throwing (abduction and external rotation of the humerus) may lead the paralabral cyst to dynamic compression nearby axillary nerve cause axillary nerve neurapraxia.

So, we performed arthroscopic anteroinferior labral repair with paralabral cyst de-compression. The axillary nerve is closest to the glenoid rim at the 6 o’clock position, and it lays about 12 mm from the inferior glenoid rim and is adjacent to the capsule. Thus the axillary nerve may be at risk when manipulating tissue at the inferior aspect of the glenoid rim. Therefore, caution is required when performing arthroscopic inferior labral cyst decompression with labral tear repair. In order to avoid the axillary nerve injury, suture anchors should not be placed in a 6 o’clock position and the liberator device should be kept closest to the glenoid rim to the extent possible when the capsulo-labral complex is detaching.

To our knowledge, our case study is the first to report an antero-inferior labral tear without shoulder instability associated with antero-inferior paralabral cyst that leads to axillary nerve neurapraxia in adolescent overhead athlete. Nonoperative management of such antero-inferior labral lesions with pathologic paralabral cysts may not be successful in achieving long-term pain relief or consistent restoration of shoulder function in the throwing athlete, and there is a further risk of progression of muscle denervation to an irreversible level. In our patient, anatomic arthroscopic antero-inferior labral repair with paralabral cyst decompression achieved substantial pain relief and allowed for a rapid return to baseball at the previous level of competition.

In conclusion, we report an antero-inferior labral tear without shoulder instability in adolescent overhead athlete associated with paralabral cyst that leads to axillary nerve neurapraxia. Although nonoperative management of such labral lesions may provide symptoms of relief, it may not be enough for the athlete to return to the game. However, surgical treatment in this case provides...
successful recovery and rapid return to playing baseball play without having to worry about the progression of muscle denervation. Thus surgical approach could be a good choice for future cases.

References