

Arthroscopic repair of L-shaped tear of the anterior band of the inferior glenohumeral ligament complex in a pediatric patient: a technical note

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Abstract The present study reports on a case of a 10-year-old patient with recurrent right shoulder instability after a traumatic event leading to a mid-substance tear of the anterior band of the inferior glenohumeral ligament complex in an L-shaped pattern. Arthroscopic repair consisting of a 2.4 mm bioabsorbable suture anchor at the apex and a four PDS sutures placed through the capsulolabral junction leads to an anatomic repair with excellent short-term results similar to those found in other studies. The injury pattern is thought to be about 1% of shoulder dislocations, but tear pattern recognition is critical for a successful repair and clinical result.

Keywords Anterior instability ·
Mid-substance tear of the inferior glenohumeral ligament ·
Arthroscopic repair technique

Introduction

Pediatric instability cases have been reported as relatively rare occurrences in the literature [12]. In a study of 500 patients reporting instability, only 19.8% of them were under the age of 20 [10]. This percentage decreases if the pediatric population is reduced to include pre-adolescent children only, as was displayed by 7 in 107 (6.5%) cases being those of instability in children under 10 [6]. The most

common mechanism of injury in this patient population is traumatic sports injuries, followed by fall injuries and finally non-traumatic dislocations [3, 6]. Although the initial injury is rare, potentially due to the tendency of the growth plate to fracture before the arm would dislocate [1], the recurrence of instability after the initial injury is extremely high [3, 6, 7]. Studies report a range of persistent instability in anywhere from 75% as reported by Deitch et al. [3] to 100% in skeletally immature patients as reported by Marans et al. [5]. Most of these repeated incidences of dislocation or subluxation are due to quick movements or overhead activity [3]. At the time of traumatic dislocation cadaver studies reveal there is a great amount of deformation of the capsule and the glenohumeral joint before ultimate failure [5]. Due to the inability of spontaneous healing of the joint and the necessity of the glenohumeral ligament in shoulder stabilization, recurrent dislocation often occurs [8], which in the short-term disrupts participation in sports and work, and in the long-term leads to symptomatic osteoarthritis [1, 3–5, 11]. Nevertheless, with new arthroscopic techniques that have equal recurrence rates to open techniques and better postoperative functional outcomes, surgical intervention is a safe and effective method of treatment [2, 5, 9]. The purpose of the present article is to describe the surgical technique for the arthroscopic repair of a ruptured anterior band of the inferior glenohumeral complex in a pediatric patient.

Case report

The patient in the present case is a 10-year-old right hand dominant boy with a history of right shoulder instability. At the age of nine, the patient was skiing over a mogul and dislocated his shoulder for the first time, which required

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closed reduction with sedation in the emergency room. His second dislocation event occurred while practicing martial arts and also necessitated closed reduction. Over the summer the patient was playing pushball and suffered his third dislocation, but he was able to reduce his shoulder by himself. The patient continues to have persistent right shoulder instability. His clinical exam demonstrated 1+ sulcus sign and evidence of anterior translation with a positive apprehension test and relocation test. MRI was obtained and revealed an anterior capsular injury without evidence of bony Bankart lesion or Hill-Sachs lesion (Fig. 1), and it was determined that surgery was needed. Three months post-operatively the patient had full range of motion when compared with the other shoulder, a Constant score of 81.39, ASES of 85, SANE of 98, 90% strength when compared with the non-operative shoulder, and a negative apprehension test. The patient was also released at this time to full normal activity, including competitive soccer and tae kwon do.

Technique

The shoulder was examined under anesthesia and noted to 2+ anterior translation, 2+ inferior translation, and 1+ posterior translation. The patient was positioned in lateral decubitus, and the arm was placed in a two-point suspension using 5 pounds. A posterior portal was created, and the 30° arthroscope was inserted, and an anterior portal was created in the rotator interval. The intra-articular findings demonstrated that the labrum was intact circumferentially with mild attenuation anteriorly, and the injury pattern appeared to be an L-shaped tear with a split proceeding from the glenoid between the inferior border of the middle glenohumeral ligament and the superior border of the



Fig. 1 Magnetic resonance image (MRI) of the injury highlighting the anterior capsular injury

inferior glenohumeral complex toward the humerus (Fig. 2a), and this corner of tissue appeared to be peeled off the remainder of the labrum to the 6 o'clock position. An arthroscopic grasper was used to pull on the posterior-superior corner of the tear and reapproximate to its anatomic position at the apex of the tear at the capsulolabral junction (Fig. 2b). The first step was to place a traction stitch in the corner of the L-shaped tear with a No. 1 PDS suture. A 2.4 mm Bio-SutureTak (Arthrex, Inc., Naples, FL) was positioned at the apex of the tear which was the most superior aspect of the disruption at approximately 2 o'clock position (Fig. 3a). The previously placed traction stitch was used as a suture shuttle bringing one limb of the Fiberwire (Arthrex, Inc., Naples, FL) suture from the anchor through the corner of the capsular tissue. This was then secured down and this reduced the defect into its normal anatomic position (Fig. 3b). A PDS sutures were placed inferior to the initial anchor stabilization at 4, 6, and 7:30 o'clock positions. An additional PDS suture was placed superior to the suture anchor at the 1 o'clock position (Fig. 4). A secure and stable repair of the capsule and labrum was achieved in an anatomic fashion (Fig. 5).

Discussion

The importance of this study comes from the introduction of a new arthroscopic technique for fixing a rare injury

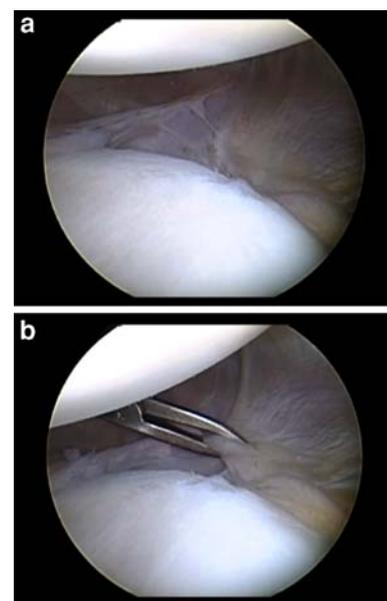


Fig. 2 Arthroscopic assessment of the capsular injury. **a** Anterior capsule is visualized with the apex of the tear at 2 o'clock with one limb extending between the middle and inferior glenohumeral ligament, and the other extending along the anterior-inferior glenoid rim. **b** An arthroscopic grasper is used to reduce the corner of the L-shaped tear back to the apex with anatomic reduction of the anterior band

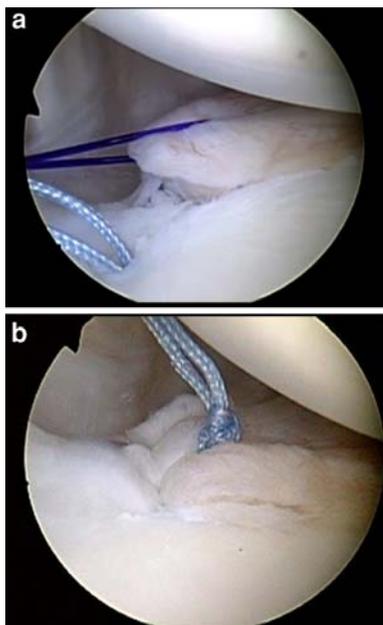


Fig. 3 **a** With traction on the PDS suture, the corner of the L-shaped tear can be reduced to the apex. **b** Arthroscopic knot is tied to fix the capsular tear back of its anatomic insertion



Fig. 4 Placement of the PDS sutures. Arthroscopic knot with PDS suture at 1 o'clock

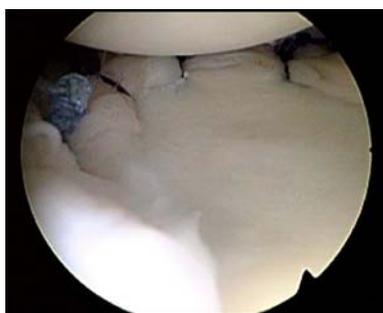


Fig. 5 Arthroscopic visualization after repair. The repair can also be visualized from the anterior portal

pattern in a pediatric patient. The study is limited by its focus on only one patient and by the short period of follow-up. The technique itself is also limited by the difficulty of

recognizing a mid-substance tear as opposed to a labral tear, the difficulty of anatomical fixation, and the difficulty of the technical aspects of this repair. Nevertheless, excellent short-term results were reported.

In a similar case study involving a 10-year-old boy with a posterior recurrent dislocation Wright et al. [12] report that after a fall injury the boy sustained a posterior dislocation of the glenohumeral joint without fracture. Recurrent posterior subluxation and dislocation occurred, leading to an open stabilization. Posterior translation over the glenoid rim and anterior translation short of the glenoid rim was noted. At two-year follow-up the patient had not had a recurrence of subluxation or dislocation.

There are few other reports focusing on youths alone. However, despite the rarity of pre-adolescent shoulder instability compared to the adult population, the pattern of injury appears to be very similar to that of older patients, allowing some comparison between the groups [6]. Mizuno et al. [8] reported on 12 instability cases due to an isolated complete capsular tear. The nine males and three females, ranging in ages from 12 to 43 years old, all had two or more reported dislocations. Eleven of the patients underwent arthroscopic repair of the tear using the side-to-side suture method, achieving capsular shift and placcation. Nine of the 12 patients returned to participation in sports at their pre-injury level, while the average Rowe scores increased from 30.4 points pre-operatively to 90.4 post-operatively. Only one patient had a recurrent tear of the capsule. Mizuno et al. [8] concluded that the side-to-side suture technique was an effective repair of the isolated complete capsular tear resulting in a stabilized shoulder.

Jones et al. [4] examined 27 adolescent patients who complained of recurring instability and then went on to have arthroscopic Bankart repairs. Of the 27, 25 returned to their previous athletic endeavors at a full capacity. Furthermore, these patients reported SANE scores averaging 92 after surgery [4]. In another study examining 12 patients ranging in ages from 13–43 years old who underwent arthroscopic repair, only one patient had a recurrence of dislocation two years later [8].

Mid-substance tears in the shoulder capsule are rare injuries and the estimated prevalence is thought to be approximately 1.0% of all shoulder dislocations. The present study is the first to describe the L-shaped capsular tear pattern of the anterior band of the inferior glenohumeral ligament in a pediatric patient. The arthroscopic assessment with tear pattern recognition is critical for the appropriate diagnosis and treatment. Once the tear pattern is recognized, arthroscopic repair begins with the anatomic reduction and the addition of capsular placcation stitches. Short-term follow-up suggests this technique leads to an excellent functional outcome that is comparable to the functional outcomes of previous studies and techniques.

Although mid-substance capsular tears are rare, the orthopedic surgeon should be aware of these injury patterns and be prepared to provide an anatomic repair with available fixation techniques.

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