First-time anterior shoulder dislocation natural history and epidemiology: immobilization versus early surgical repair

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Abstract: Traumatic anterior shoulder dislocations are a common problem. There is a high rate of recurrent instability, especially in patients <30 years of age that are involved in high level sports. The purpose of this review is to discuss the natural history after a first-time shoulder dislocation and provide a brief overview of management options. Initial nonoperative management consists of immobilization in internal rotation for 1–3 weeks. The current evidence does not support immobilization in external rotation or for longer periods of time. For those patients who are at a high risk of recurrent instability, the evidence suggests that early surgical repair to address the pathology can be undertaken. This has shown to be clinically and fiscally effective while improving patient outcomes.

Keywords: Shoulder; instability; anterior dislocation; arthroscopic stabilization

Introduction

The glenohumeral joint is the most frequently dislocated major joint in the body due to the large arc of motion. The majority of dislocations are anterior following traumatic events with the shoulder in the “at risk position” of abduction and external rotation. Anterior shoulder dislocations have an estimated general population prevalence of 2% to 8% (1-3) and overall incidence rate in the United States of 23.9 per 100,000 person-years (4). Despite traumatic first-time anterior dislocations being a common injury, there remains controversies over the best management strategy for these patients. Certain situations warrant special considerations such as dislocation in the elderly and the mid-season instability event in the young athlete.

The purpose of this review is to summarize and present the current literature on the first-time traumatic anterior shoulder dislocation focusing on the natural history, epidemiology, and current treatment recommendations.

Natural history

Given the common nature of this injury, the orthopaedic surgeon needs a thorough understanding of the natural history to be able to engage in a discussion with the patient to optimize treatment and patient outcomes. The overall goal of treatment should be to minimize the risk of recurrent instability and improve the patient’s quality of life.

The incidence of recurrent instability ranges from 14% to 100% in the literature (5). There are many factors that influence the risk of recurrent dislocations following a patient’s first traumatic anterior shoulder dislocation. Traditionally, age and gender have been identified as key factors in determining the possibility of recurrent dislocations, however, several other factors have been found to influence the rate of recurrence. Recurrent instability has been considered the main outcome measure but it is
prudent to consider others, such as continued apprehension, failure to return to work or sport, quality of life outcomes, and the development of post-traumatic osteoarthritis.

Age and gender

Young males, who are at a high risk of having a first-time dislocation, are known to be at an increased risk of recurrent instability. Robinson et al. (6) reported a survival analysis to predict recurrent instability at 1, 2, and 5 years in patient age groups 15–20 years, 21–25 years, 26–30 years and 31–35 years, and found at 5 years they were 86.6%, 73.8%, 48.8%, and 30.7%, respectively. In gender comparison at 5 years, men had a higher percent of recurrent instability when compared to women (70.4% vs. 37.5%).

Hovelius et al. (7) reported one of the longest prospective studies, a 25-year follow-up study of patients who were treated non-operatively following a primary traumatic anterior shoulder dislocation. They found a recurrence rate of 72% among patients aged 12–22 years, 56% of those 23–29 years and 27% in patients older than 30 years and noted 38% of patients aged 12–25 years underwent surgical stabilization at some point.

Level and types of sports

Contact or overhead sports were found to be associated with a higher risk for recurrence compared to non-contact or no sport participation. In a prognostic level I study, Sachs et al. (8) noted a higher re-dislocation rate (55%) following a primary traumatic anterior shoulder dislocation in patients who played contact or collision sports compared with those who did not (38%). Robinson et al. (6) found the recurrence rates for patients who played contact or overhead sports, non-contact sports, or no sports were 63.3%, 73.3%, and 46.0% at 2 years and 62.8%, 33.9%, and 43.9% at 5 years, respectively.

Bony factors

Significant bone defects of the glenoid, humeral head or both are known risk factors for recurrent instability. Isolated anterior glenoid fractures (bony Bankart lesions) involving >20% of the glenoid width are associated with a high recurrence rate even following a Bankart repair (9).

Associated Hill-Sachs lesions should not be ignored, as there is risk of engagement and dislocation of the humeral head if it extends medially over the medial margin of the glenoid track. The size of these lesions should be considered in addition to a co-existing anterior glenoid defect (10).

Soft tissue factors

Generalized ligamentous laxity has been shown as a risk factor for primary traumatic anterior shoulder dislocation and subsequent recurrences. In a prospective study on 38 patients with a primary traumatic anterior shoulder dislocation, Muhammad et al. (11) reported a higher incidence of recurrence in hypermobile patients compared to patients who did not have hypermobility (60% vs. 39%). Thirty percent of patients fulfilled the Beighton score criteria for hypermobility and 60% had a family history of laxity. Similarly, Cameron et al. (12) observed an association between generalized hypermobility and glenohumeral instability. Military cadets with hypermobility, defined as a score of ≥2 on the Beighton scale, were 2.5 times more likely to report a history of glenohumeral joint instability.

Anterior labral-periosteal sleeve avulsion (ALPSA) lesions was reported to occur in 30% of patients with primary anterior dislocation (13). Patients with ALPSA lesions present with a higher number of recurrent dislocations than those with discrete Bankart lesions. Accordingly, surgical stabilization is recommended to prevent further capsulolabral damage (14,15). Patients presenting with a primary traumatic anterior shoulder dislocation, should be counseled about the natural history and the relevant risk factors of recurrence following surgical stabilization and non-operative management, so that an informed decision can be made.

Dislocation in patients older than 40 years

Patients older than 40 years old at the time of their initial traumatic anterior shoulder dislocation require special consideration as they can present with pathology likely not seen in younger individuals. These individuals are more likely to sustain injuries to the rotator cuff, axillary nerve or brachial plexus. Rotator cuff pathologies following a dislocation is more common than nerve palsies and are more frequent with advancing age (16). Rotator cuff tears can be mistaken for nerve palsies. Therefore, when evaluating these patients, a thorough evaluation for rotator cuff lesions is mandatory. Patients older than 40 years of age have a 35% prevalence of rotator cuff tears, which increases to over 80% at 60 years and older (16). Though rotator cuff pathology is common, the lesions vary widely and
when there is extension of the tear anterosuperior into the subscapularis tendon, the prognosis is very poor. As over 20% of all dislocations occur in those over 60 years, an early MRI has been recommended for the above reasons (17). Early diagnosis and repair of the traumatic rotator cuff tear yields optimal outcomes (18).

Arthropathy following dislocation

Hovelius and Saebøe (19) looked at the presence of arthropathy after a primary anterior traumatic dislocation 25 years later. Those who experienced recurrent dislocations had a significantly higher proportion of arthropathy (40%) compared to those without recurrence (18%). They concluded that risk factors found to correlate with the development of arthropathy (moderate/severe) included age >25 years at time of initial dislocation, high energy sports activities as the dislocation etiology, recurrence and alcohol abuse. Similar results were previously reported by Buscayret et al. (20).

Nonoperative management

Traditionally, nonoperative management has been carried out for patients suffering from a primary traumatic anterior shoulder dislocation. This starts in the emergency room with a closed reduction. This can be done with premedication with intra-articular lidocaine or intravenous sedation. There are many described reduction techniques that may be used. Simple traction-counter traction is most commonly used, however, no one technique can be recommended and the physician should use whichever technique they are most comfortable with.

Following a closed reduction, the arm is immobilized for two reasons, pain control and patient satisfaction. However, immobilization has not been shown to decrease the rate of recurrence. Consideration of the length and position of immobilization are important.

Length of immobilization

Following a meta-analysis, Paterson et al. (21) reported no significant differences in recurrence rates in patients aged <30 years who were immobilized for ≤1 week (41%) compared to those patients who were immobilized for ≥3 weeks (37%). Lill et al. (22) noted length of immobilization was dependent on patient age at time of dislocation within 175 patients treated conservatively.

Patients were split into two groups, <30 years and ≥30 years. The recurrence rate was 89% in the <30 years group and 26% in the ≥30 years group (P<0.05). A relationship between the immobilization period and the recurrence rate could not be found (P=0.8). Simonet et al. (23) concluded that duration of immobilization had no effect on the risk of recurrent instability within 124 patients who suffered a traumatic anterior shoulder dislocation and were immobilized from 1 to 6 weeks. There was a positive difference noted in regards to satisfaction when patients refraining from sports, or full activities, for a longer duration of time (≥6 weeks) compared to those who returned at <6 weeks.

Currently, there is a level I study (24) and multiple level II studies that have been unable to demonstrate that longer periods of immobilization reduce the risk of recurrent instability episodes. However, it is possible that longer immobilization may improve pain and patient satisfaction in the acute setting. Currently it is recommended to immobilize patients for 1 to 3 weeks.

Position of immobilization

The concept of immobilizing the arm in external rotation for nonoperative management of a first-time shoulder dislocation was developed in the late 1990s. The rationale behind this position was to put tension on the subscapularis, thereby positioning the soft tissues in a more favorable position on the glenoid. Proponents of positioning the arm in external rotation cite both cadaveric and MRI studies that show a better positioning of soft tissues in relation to the glenoid (25-27).

Itoi et al. (28) showed immobilization in external rotation for 3 weeks to be associated with significantly less re-dislocation than when immobilized in an internal rotation position for the same length of time (29). However, subsequent studies were not able to reproduce these results and found no difference in the re-dislocation rate between immobilization in internal and external rotation (30).

Following a meta-analysis, Paterson et al. (21) reported a non-statistically significant difference in the rate of recurrent instability for those immobilized in internal rotation (40%) compared to those managed in external rotation (35%). Jordan et al. (31) performed a systematic review looking at external rotation bracing for anterior shoulder dislocation. Of the six studies assessed, five looked at labral reduction on MRI and one arthroscopically. Each study reported overall improvement in labral reduction.
with external rotation, but anatomic reduction was only achieved 35% of the time. They concluded failure to reduce the labrum may be a contraindication to external rotation bracing. A recent Cochrane review (32) also noted a lack of good evidence to make any strong recommendations to immobilize in external rotation.

To date, there are multiple level I studies, including randomized control trials (RCTs) and meta-analyses that exist, however, a significant amount of inconsistency has been found among these studies. The majority do not show a benefit to immobilization in external rotation, and most physicians continue to immobilize in internal rotation for ease and practicality.

Failure of nonoperative management is usually manifested by recurrent symptoms of instability such as dislocations, subluxations or pain despite nonoperative management. Failure to return to sport or work could be considered failure as well.

**Surgical management**

Surgical management for a first-time anterior shoulder dislocation has increased in frequency. Historically, stabilization was reserved for patients who had recurrently instability, with the goal of surgical stabilization to restore normal soft tissue anatomy and re-tensioning of the inferior glenohumeral ligament. As some populations, such as the young, active athlete have a high rate of recurrent instability, there has been an increasing role for immediate surgical stabilization.

Indications for arthroscopic anterior soft tissue stabilization after primary anterior shoulder dislocation include young patients, high demand patients, recurrent traumatic anterior instability without bone loss, and overhead athletes, especially throwing athletes where preserving motion is preferred. Open bony procedures may be considered when there are large engaging Hill-Sachs lesions or significant bony deficiencies of the glenoid (>20%).

Arciero et al. (33) and Deberardino et al. (34) showed a statistically significant difference in recurrence following primary traumatic anterior shoulder dislocation in those treated with surgical stabilization vs. conservative treatment management in a young, high demand, active population. A prospective randomized control trial performed by Kirkley et al. (1) found a significant difference between recurrent dislocations between the surgical group (19%) and the conservative group (60%) within 40 patients aged <30 years old randomized to early surgical stabilization with rehabilitation or immobilization with rehabilitation. Thus, they suggest early surgical stabilization in patients <30 years and high-level athletes is the treatment of choice.

**Risk of arthropathy**

A commonly cited reason for early surgical stabilization is prevention of future arthritis. Hovelius et al. (7) reported 11% of the primary anterior shoulder dislocations treated nonoperatively developed mild arthritis. Eighteen percent developed moderate or severe, regardless of whether there was recurrence and regardless of treatment the patient received. Ogawa et al. (35) looked at radiographs and computed tomography (CT) evidence of preoperative arthritis in patients with scheduled surgery for primary anterior shoulder dislocation. Two hundred and eighty-two shoulders were evaluated in patients younger than 40 years without previous surgery. Osteoarthritis was found in 32 joints (11.3%) (mild in 30 and moderate in 2) on the radiographs. CT revealed arthritic changes in 88 shoulders (31.2%), including all 32 radiographically osteoarthritic joints. They concluded that the development of preoperative osteoarthritis in cases with traumatic anterior instability is closely related to the total number and frequency of repeated trauma. Further long-term studies are needed to examine the effect and incidence of osteoarthritis after primary anterior shoulder dislocation and whether initial stabilization decreases the risk of osteoarthritis from recurrent instability.

**Cost effectiveness**

Crall et al. (36) examined the cost effectiveness of early surgical stabilization specifically for first-time dislocations, comparing age groups, and gender in patients aged 15 vs. 25 vs. 35 years. Primary surgery was less costly and more clinically effective for 15-year-old males, females and 25-year-old males. For the remaining scenarios, primary surgery was more effective and costly, however, it was noted to still be very cost-effective (cost per quality-adjusted life year, <$25,000). In all scenarios, surgery was less costly and more effective, even after recurrent dislocations.

**Open vs. arthroscopic**

Today, the most common procedure in North America for managing anterior shoulder instability without significant glenoid or humeral head bone loss is arthroscopic
stabilization. This is due to the continued improvements and advancements in both arthroscopic techniques and implant advancements. Analysis of data from the American Board of Orthopedic Surgery Certification Examination shows a significant trend towards arthroscopic stabilization with nearly 90% of the procedures being done arthroscopically in 2008 (37). Fabbriciani et al. (38) were among the first to show equivalent outcomes between arthroscopic stabilization with suture anchors and open repair.

**Quality of Life**

As previously mentioned, Kirkley et al. (1) evaluated recurrent instability as well as quality of life and functional outcomes. Forty patients <30 years of age were randomized to immediate anterior stabilization plus rehabilitation or immobilization followed by rehabilitation. The Western Ontario Shoulder Instability (WOSI) index scores were followed for each patient. The surgical group showed improvements in four components of the WOSI: physical symptoms, sport function, lifestyle and social function, and emotional wellbeing. This supports the notion that early surgery not only decreased recurrence rate but also improved quality of life in patients who are younger than 30 years and are high level athletes.

Treatment should be individualized with consideration of all factors affecting recurrence. Current evidence supports initial surgical stabilization in younger patients aged <30 years who participate in collision or contact sports to reduce the rate of recurrences. This can be accomplished with arthroscopic stabilization when no significant bone loss is present.

**Mid-season anterior instability in athletes**

Competitive and overhead athletes are at risk for a glenohumeral instability event, which frequently occurs during the competitive season. Returning the athlete to competition needs to be done safely and efficiently. Minimizing the time away from competition, prevention of further injury and restoring function should be the goals of treatment (38).

Generally, it is possible for athletes with an in-season instability event to have an attempt at nonoperative management and rehabilitation carried out with a return to competition that season. Nonsurgical management recommendations are similar to nonathletes and consists of immobilization (3 to 10 days) with early rehabilitation focusing on range of motion (ROM), strengthening, scapular stabilization, and sport-specific exercises. When deciding when on treating an athlete nonoperatively we can look to certain player and sport-specific characteristics described by Owens et al. (39) to help guide management.

Injury characteristics include initial shoulder dislocation, osseous defects in the glenoid <25%, and absence of fracture or soft tissue that requires surgery. Player- and sport-specific characteristics include the athlete desires to return to sports during the same season, non-overhead or non-throwing athlete, noncontact sport, and the athletes ability to complete sport-specific drills without instability. The athlete may be able to return to sport in 7 to 21 days if they demonstrate symmetric pain-free shoulder ROM and strength, the ability to perform sport-specific skills, with the absence of subjective or objective instability.

The decision to proceed with in-season surgical stabilization is made following failure of nonoperative management. Usually this presents as a failure to perform sport-specific drills. Other indications include recurrent instability episodes, athlete's eligibility for future playing time, and the timing of the instability event during the season. Early surgical stabilization can be considered in those with large bony defects, recurrent instability, inability to perform sport-specific skills and where nonsurgical management may place limitations on shoulder function that would prevent the athlete from returning to competition, such as a throwing athlete.

**Conclusions**

Following primary traumatic anterior shoulder dislocation, there is a high likelihood of recurrent instability with age, gender, level and type of sport, soft-tissue and bony factors each playing a role. Currently, nonoperative management is most often attempted, with immobilization in internal rotation for 1–3 weeks to assist in pain control and patient comfort, followed by rehabilitation focused on shoulder ROM, strengthening +/- sport-specific exercises. There is currently no evidence to suggest a clinical advantage of immobilization in external rotation nor longer duration of immobilization. Early surgical management should be considered in patients under age of 30 who are higher level athletes. It has shown to be cost-effective resulting in decreased recurrence rates and improved quality of life. However, treatment should be tailored to the individual patient, with careful consideration of the natural history,
relevant risk factors of recurrence and evaluation of patient specific goals and outcome measures.

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

References


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