



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

Tanner Gurney-Dunlop, Ahmed Shawky Eid, Jason Old, James Dubberley, Peter MacDonald

Section of Orthopaedics, Department of Surgery, Pan Am Clinic/University of Manitoba, Winnipeg, Manitoba, Canada

Contributions: (I) Conception and design: T Gurney-Dunlop; (II) Administrative support: All authors; (III) Provision of study materials or patients: T Gurney-Dunlop; (IV) Collection and assembly of data: T Gurney-Dunlop; (V) Data analysis and interpretation: All authors; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

Correspondence to: Tanner Gurney-Dunlop. Section of Orthopaedics, Department of Surgery, Pan Am Clinic/University of Manitoba, Winnipeg, Manitoba R3M 3E4, Canada. Email: tannerdunlop@gmail.com.

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

Received: 01 June 2017; Accepted: 18 September 2017; Published: 22 November 2017.

doi: 10.21037/aoj.2017.10.14

View this article at: <http://dx.doi.org/10.21037/aoj.2017.10.14>

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%).

Hovellius *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

Hovellius and Saeboe (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). Fabbriani *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 drills 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.

Acknowledgments

Funding: None.

Footnote

Provenance and Peer Review: This article was commissioned by the Guest Editors (Albert Lin and Jason J. Shin) for the series “Trends in Anterior Shoulder Instability” published in *Annals of Joint*. The article has undergone external peer review.

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <http://dx.doi.org/10.21037/aoj.2017.10.14>). The series “Trends in Anterior Shoulder Instability” was commissioned by the editorial office without any funding or sponsorship. The authors have no other conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Open Access Statement: This is an Open Access article distributed in accordance with the Creative Commons Attribution-NonCommercial-NoDerivs 4.0 International License (CC BY-NC-ND 4.0), which permits the non-commercial replication and distribution of the article with the strict proviso that no changes or edits are made and the original work is properly cited (including links to both the formal publication through the relevant DOI and the license). See: <https://creativecommons.org/licenses/by-nc-nd/4.0/>.

References

- Kirkley A, Werstine R, Ratjek A, et al. Prospective randomized clinical trial comparing the effectiveness of immediate arthroscopic stabilization versus immobilization and rehabilitation in first traumatic anterior dislocations of the shoulder: long-term evaluation. *Arthroscopy* 2005;21:55-63.
- Brophy RH, Marx RG. The treatment of traumatic anterior instability of the shoulder: nonoperative and surgical treatment. *Arthroscopy* 2009;25:298-304.
- Kirkley A, Griffin S, McLintock H, et al. The development and evaluation of a disease-specific quality of life measurement tool for shoulder instability. The Western Ontario Shoulder Instability Index (WOSI). *Am J Sports Med* 1998;26:764-72.
- Zacchilli MA, Owens BD. Epidemiology of shoulder dislocations presenting to emergency departments in the United States. *J Bone Joint Surg Am* 2010;92:542-9.
- Boone JL, Arciero RA. First-time anterior shoulder dislocations: has the standard changed? *Br J Sports Med* 2010;44:355-60.
- Robinson CM, Howes J, Murdoch H, et al. Functional outcome and risk of recurrent instability after primary traumatic anterior shoulder dislocation in young patients. *J Bone Joint Surg Am* 2006;88:2326-36.
- Hovelius L, Olofsson A, Sandström B, et al. Nonoperative treatment of primary anterior shoulder dislocation in patients forty years of age and younger. a prospective twenty-five-year follow-up. *J Bone Joint Surg Am* 2008;90:945-52.
- Sachs RA, Lin D, Stone ML, et al. Can the need for future surgery for acute traumatic anterior shoulder dislocation be predicted? *J Bone Joint Surg Am* 2007;89:1665-74.
- Itoi E, Lee SB, Berglund LJ, et al. The effect of a glenoid defect on anteroinferior stability of the shoulder after Bankart repair: a cadaveric study. *J Bone Joint Surg Am* 2000;82:35-46.
- Provencher MT, Bhatia S, Ghodadra NS, et al. Recurrent shoulder instability: current concepts for evaluation and management of glenoid bone loss. *J Bone Joint Surg Am* 2010;92 Suppl 2:133-51.
- Akhtar Muhammad A, Jenkins P, Ashton F, et al. Hypermobility- a risk factor for recurrent shoulder dislocations. *Br J Sports Med* 2013;47:e3.
- Cameron KL, Duffey ML, DeBerardino TM, et al. Association of generalized joint hypermobility with a history of glenohumeral joint instability. *J Athl Train* 2010;45:253-8.
- Kim DS, Yoon YS, Yi CH. Prevalence comparison of accompanying lesions between primary and recurrent anterior dislocation in the shoulder. *Am J Sports Med* 2010;38:2071-6.
- Ozbaydar M, Elhassan B, Diller D, et al. Results of arthroscopic capsulolabral repair: Bankart lesion versus anterior labroligamentous periosteal sleeve avulsion lesion. *Arthroscopy* 2008;24:1277-83.
- Lee BG, Cho NS, Rhee YG. Anterior labroligamentous periosteal sleeve avulsion lesion in arthroscopic capsulolabral repair for anterior shoulder instability. *Knee Surg Sports Traumatol Arthrosc* 2011;19:1563-9.
- Rapariz JM, Martin-Martin S, Pareja-Bezares A, et al.

- Shoulder dislocation in patients older than 60 years of age. *Int J Shoulder Surg* 2010;4:88-92.
17. Rumian A, Coffey D, Fogerty S, et al. Acute first-time shoulder dislocation. *Orthop Trauma* 2011;25:363-8.
 18. Pevny T, Hunter RE, Freeman JR. Primary traumatic anterior shoulder dislocation in patients 40 years of age and older. *Arthroscopy* 1998;14:289-94.
 19. Hovelius L, Saeboe M. Neer Award 2008: Arthropathy after primary anterior shoulder dislocation--223 shoulders prospectively followed up for twenty-five years. *J Shoulder Elbow Surg* 2009;18:339-47.
 20. Buscayret F, Edwards TB, Szabo I, et al. Glenohumeral arthrosis in anterior instability before and after surgical treatment: incidence and contributing factors. *Am J Sports Med* 2004;32:1165-72.
 21. Paterson WH, Throckmorton TW, Koester M, et al. Position and duration of immobilization after primary anterior shoulder dislocation: a systematic review and meta-analysis of the literature. *J Bone Joint Surg Am* 2010;92:2924-33.
 22. Lill H, Korner J, Hepp P, et al. Age-Dependent Prognosis Following Conservative Treatment of Traumatic Anterior Shoulder Dislocation. *Eur J Trauma* 2001;27:29-33.
 23. Simonet WT, Melton LJ 3rd, Cofield RH, et al. Incidence of anterior shoulder dislocation in Olmsted County, Minnesota. *Clin Orthop Relat Res* 1984;(186):186-91.
 24. Kuhn JE. Treating the initial anterior shoulder dislocation--an evidence-based medicine approach. *Sports Med Arthrosc* 2006;14:192-8.
 25. Itoi E, Sashi R, Minagawa H, et al. Position of immobilization after dislocation of the glenohumeral joint. A study with use of magnetic resonance imaging. *J Bone Joint Surg Am* 2001;83-A:661-7.
 26. Seybold D, Schliemann B, Heyer CM, et al. Which labral lesion can be best reduced with external rotation of the shoulder after a first-time traumatic anterior shoulder dislocation? *Arch Orthop Trauma Surg* 2009;129:299-304.
 27. Miller BS, Sonnabend DH, Hatrick C, et al. Should acute anterior dislocations of the shoulder be immobilized in external rotation? A cadaveric study. *J Shoulder Elbow Surg* 2004;13:589-92.
 28. Itoi E, Hatakeyama Y, Sato T, et al. Immobilization in external rotation after shoulder dislocation reduces the risk of recurrence. A randomized controlled trial. *J Bone Joint Surg Am* 2007;89:2124-31.
 29. Itoi E, Hatakeyama Y, Kido T, et al. A new method of immobilization after traumatic anterior dislocation of the shoulder: a preliminary study. *J Shoulder Elbow Surg* 2003;12:413-5.
 30. Liavaag S, Brox JI, Pripp AH, et al. Immobilization in external rotation after primary shoulder dislocation did not reduce the risk of recurrence: a randomized controlled trial. *J Bone Joint Surg Am* 2011;93:897-904.
 31. Jordan RW, Saithna A, Old J, et al. Does external rotation bracing for anterior shoulder dislocation actually result in reduction of the labrum? A systematic review. *Am J Sports Med* 2015;43:2328-33.
 32. Hanchard NC, Goodchild LM, Kottam L. Conservative management following closed reduction of traumatic anterior dislocation of the shoulder. *Cochrane Database Syst Rev* 2014;(4):CD004962.
 33. Arciero RA, Wheeler JH, Ryan JB, et al. Arthroscopic Bankart repair versus nonoperative treatment for acute, initial anterior shoulder dislocations. *Am J Sports Med* 1994;22:589-94.
 34. DeBerardino TM, Arciero RA, Taylor DC, et al. Prospective evaluation of arthroscopic stabilization of acute, initial anterior shoulder dislocations in young athletes. Two- to five-year follow-up. *Am J Sports Med* 2001;29:586-92.
 35. Ogawa K, Yoshida A, Ikegami H. Osteoarthritis in shoulders with traumatic anterior instability: preoperative survey using radiography and computed tomography. *J Shoulder Elbow Surg* 2006;15:23-9.
 36. Crall TS, Bishop JA, Guttman D, et al. Cost-effectiveness analysis of primary arthroscopic stabilization versus nonoperative treatment for first-time anterior glenohumeral dislocations. *Arthroscopy* 2012;28:1755-65.
 37. Owens BD, Harrast JJ, Hurwitz SR, et al. Surgical trends in Bankart repair: an analysis of data from the American Board of Orthopaedic Surgery certification examination. *Am J Sports Med* 2011;39:1865-9.
 38. Fabbriani C, Milano G, Demontis A, et al. Arthroscopic versus open treatment of Bankart lesion of the shoulder: a prospective randomized study. *Arthroscopy* 2004;20:456-62.
 39. Owens BD, Dickens JF, Kilcoyne KG, et al. Management of mid-season traumatic anterior shoulder instability in athletes. *J Am Acad Orthop Surg* 2012;20:518-26.

doi: 10.21037/aoj.2017.10.14

Cite this article as: Gurney-Dunlop T, Eid AS, Old J, Dubberley J, MacDonald P. First-time anterior shoulder dislocation natural history and epidemiology: immobilization versus early surgical repair. *Ann Joint* 2017;2:71.