

Review of Arciero's article (1994) on arthroscopic Bankart repair versus non-operative treatment for acute, initial anterior shoulder dislocations: does the same hold true in 2016?

T David Luo, Gary G Poehling, Michael T Freehill

Department of Orthopaedic Surgery, Wake Forest Baptist Medical Center, Medical Center Blvd, Winston-Salem, North Carolina, USA

Correspondence to

Dr Michael T Freehill, Department of Orthopaedic Surgery, Wake Forest Baptist Medical Center, Medical Center Blvd, Winston-Salem, NC 27157, USA; freehill@wakehealth.edu

Received 15 September 2016

Revised 1 October 2016

Accepted 3 October 2016

ABSTRACT

This classic reexamines the landmark publication 'Arthroscopic Bankart repair versus non-operative treatment for acute, initial anterior shoulder dislocations' by Arciero *et al*, published in 1994 in *The American Journal of Sports Medicine*. The authors provided pertinent evidence to support the use of arthroscopy to repair associated Bankart lesions found after acute, initial anterior shoulder dislocations in the young, athletic patient population. The recommendations put forth were a departure from the established teachings at the time. The article demonstrated a significantly reduced rate of recurrence after arthroscopic stabilisation compared with non-operative management in US Military Academy cadets. The majority of patients who failed non-operative treatment required subsequent open repair. At the time of arthroscopy, a Bankart lesion was diagnosed in all patients, which the authors postulated are consistently present after acute first-time dislocations. The authors concluded that in young athletes, particularly in this case, military cadets, return to previous levels of activity and training is imperative. These findings remain relevant today and provided the impetus for the evolution in surgical techniques and implants over the past 20 years. Subsequent randomised controlled trials have largely supported the use of arthroscopic stabilisation in the young, high-demand population. Other subsequent studies have further reviewed the risk factors for failure after surgery to continue to refine the treatment algorithm. The treatment of initial anterior dislocations of the shoulder remains a challenging endeavour, with an ever-expanding list of options. This classic work challenged the established treatment approach in a particular patient group, the young athlete. The teachings imparted in the article, and reiterated in subsequent research studies, have taught us treatment decisions should be personalised and formulated on an individual basis.

INTRODUCTION

Rationale for selecting this article

The classic work by Arciero *et al*,¹ published in 1994, provided significant evidence to support the use of arthroscopy to repair associated Bankart lesions found after acute, initial anterior shoulder dislocations in the young, athletic patient population. A commonly cited statistic of shoulder dislocations in adults is the 1.7% incident rate reported in the Swedish population, with men three times more likely to sustain the injury compared with women.² A more recent study of the US population

found an incidence of 23.9 per 100 000 person-years, with a similar ratio of male to female incidence of 2.64.³ Previously published literature on this debilitating injury demonstrated that younger age significantly correlated with higher rate of recurrence with conservative therapy.⁴⁻⁸ This article was chosen secondary to the paradigm-shifting, yet still debated, care for these injuries in the young, active population.

The use of arthroscopy to treat an initial acute anterior shoulder dislocation was quite novel at the time. Prior to the study's publication, these injuries were treated almost entirely with non-operative modalities. Previous studies in chronic shoulder subluxations revealed the role of arthroscopy as a diagnostic tool to accurately describe the subtle pathological glenohumeral lesions, which help guide treatment.⁹ This steered the effort for more research in arthroscopic evaluation and characterisation of the associated pathoanatomy after an acute, first-time dislocation.¹⁰⁻¹³ The application of arthroscopy as a treatment medium for an initial dislocation gained significant traction as a result of the findings by Arciero *et al*.¹ The study demonstrated a consistent capsulolabral avulsion of the inferior glenohumeral ligament complex after the initial dislocation, which the authors believed were amenable to arthroscopic repair. These important findings remain relevant today, particularly for high-risk patients such as young athletes, and the reduction in recurrent instability after arthroscopic repair has since been corroborated by several subsequent, higher level-of-evidence studies.¹⁴⁻¹⁸

Summary of the classic

Thirty-six cadet-athletes at the US Military Academy met inclusion criteria after sustaining a first-time acute traumatic anterior shoulder dislocation without previous history of subluxation or concomitant neurological injury. All dislocations were manually reduced on the field or in the emergency department under sedation. Fifteen patients chose non-operative treatment (Group I, mean age 19.5 years, range 18-21), and 21 patients underwent arthroscopic Bankart repair (Group II, mean age 20.5 years, range 18-24) within 10 days of injury. In Group I, the patients' shoulders were immobilised for 4 weeks before initiating a supervised rehabilitation regimen to strengthen the rotator cuff. Patients were cleared to resume full sporting activity at 4 months. In Group II, patients were also immobilised for 4 weeks after

To cite: Luo TD, Poehling GG, Freehill MT. *JISAKOS* Published Online First: [please include Day Month Year] doi:10.1136/jisakos-2016-000091

The Classic

arthroscopic repair and followed the same rehabilitation protocol. The cadets were assessed for recurrent shoulder instability using radiographic evidence, subjective symptoms and return to previous levels of military/athletic activity.

The two groups were well matched with respect to age, cause of initial injury from contact sports, skill level of the athletes and rate of bony avulsion of inferior glenohumeral ligament on postreduction radiograph (table 1). In Group I, 12 patients (80%) developed recurrent instability at a mean of 10 months, 7 of whom underwent open Bankart repair. In contrast, only three patients (14%) in Group II developed instability ($p=0.001$) at a mean of 17 months after surgery, including one patient who developed recurrent subluxations and required subsequent open Bankart repair. A grade III Bankart lesion, defined as complete detachment of the inferior glenohumeral ligament–labral complex, was diagnosed in all 21 patients at the time of arthroscopy, while a Hill-Sachs lesion was seen in 19 patients.

In this study, young, active patients were given the choice of treatment (immobilisation or arthroscopic Bankart repair), due to the investigational nature of arthroscopic treatment in this specific patient population. In comparison to conservative treatment, arthroscopic treatment resulted in a significantly lower rate of recurrent instability, which is considered imperative in this patient population. Furthermore, based on their findings, they postulated that Bankart lesions are consistently present after acute first-time dislocations.

CONSIDERATION

Historic perspective

At the time of Arciero's publication,¹ the treatment approach for an initial anterior shoulder dislocation had traditionally been non-operative. Conservative therapy consisted of a period of immobilisation, a supervised rehabilitation and exercise programme and activity restriction for several months before gradual return to activity. Outcomes appeared unpredictable, while the rate of recurrence remained high.^{5 19 20}

Table 1 Summary of Arciero's results¹

	Group I (non-operative)	Group II (arthroscopic)	p Value
N	15	21	NR
Mean age (range)	19.5 years (18–21)	20.5 years (18–24)	NR
Sport of injury			
Collision	11	9	0.07
Limited contact	2	10	0.003*
Non-contact	2	2	NR
Skill level			
Varsity	10	8	0.17
Intramural	2	6	
Military training	3	7	
Presence of bony Bankart lesion (%)	4 (27%)	5 (24%)	0.72
Mean follow-up (range)	23 months (15–39)	32 months (15–45)	NR
Rate of recurrence (%)	12 (80%)	3 (14%)	0.001*
Time to recurrence (range)	10 months (5–16)	17 months (9–24)	NR
Rate of subsequent open Bankart repair (%)	7 (47%)	1 (5%)	0.005*
Recurrence in varsity athletes (%)	8/10 (80%)	1/8 (13%)	0.008*

*Statistically significant finding.
NR, not reported.

In 1956, Rowe⁵ reported a 94% rate of recurrence in patients younger than 20 years of age, in contrast to 14% in patients older than 40 years. Simonet and Cofield¹⁹ reported a 66% rate of recurrence after an initial anterior shoulder dislocation in patients <20 years old. Additionally, the rate was significantly higher in athletes compared with non-athletes in the same age group. Further research supported age as the most significant prognostic factor for recurrence regardless of the type and duration of conservative treatment protocol utilised.^{4 6–8} In 1978, Hovelius *et al*⁷ began a prospective multicentre study comparing outcomes after treatment with either immobilisation in internal rotation for 3–4 weeks versus a sling for comfort on an as-needed basis for 1 week. Five-year follow-up demonstrated no added benefit with immobilisation to reduce the rate of recurrence.⁸ Henry and Genung⁶ also compared recurrence rates with immobilisation versus no immobilisation in a young athletic cohort (mean age 19 years), and revealed no significant difference in recurrence rates (90% and 85%, respectively). Hovelius *et al*^{7 8} additionally found that after age 25, the rate of recurrence and need for stabilisation surgery decreased precipitously. Of particular historical importance, he reported the rate of having two or more recurrences in patients <22 years of age were 33% at 2-year and 55% at 5-year follow-up, respectively. As these rates were notably lower compared with other historical values,^{5 6 19} Hovelius *et al*^{7 8} justified there was no valid indication for primary repair for this lesion in patients of any age as this would predispose half the patients to a potentially unnecessary surgery.

In 1989, Wheeler *et al*²⁰ were one of the first to describe arthroscopic treatment for acute first-time anterior shoulder dislocations. They demonstrated a 92% rate of recurrence in military cadets after traditional conservative management. In contrast, out of the nine cadets who had undergone arthroscopy, only two (22%) demonstrated recurrent dislocation at minimum 14-month follow-up. Although the study was preliminary in nature, it established a potential role for early arthroscopic repair in the young and athletic first-time shoulder dislocator. Arciero's 'Classic' was a prospective cohort study undertaken at the same military institution comparing the effects of arthroscopic Bankart repair versus a non-operative therapy protocol on recurrence rates and outcomes.¹

Scientific and societal impact

Bankart²¹ originally described his experience with operative treatment of recurrent anterior shoulder dislocation in 1923. At the time, theories regarding the resultant pathology from recurrent dislocation focused on capsular laxity and muscle attenuation around the shoulder. Bankart proposed that recurrent dislocation occurs with a different mechanism compared with initial dislocation, resulting in 'detachment of the capsule from the fibro-cartilaginous glenoid ligament'. Conversely, he proposed the initial anterior dislocation results in a 'rent in the fibrous capsule', which has the capacity for spontaneous healing.²¹ A review of subsequent studies using arthroscopic or radiographic diagnosis actually found an 85% (400 of 472 patients) rate of avulsion of the anteroinferior capsulolabral complex after initial anterior shoulder dislocation.²²

The eponymous Bankart lesion can present as a soft-tissue disruption or osseous avulsion involving a fracture of the anteroinferior glenoid,²³ which can be demonstrated on initial plain radiographs (anteroposterior, Grashey, West Point and axillary views) and help determine treatment indications. High suspicion for the presence of bony Bankart and Hill-Sachs lesions can be confirmed with CT arthrography.²⁴ In high-risk patients, routine

MRI can be considered and is superior to CT arthrography; however, its diagnostic precision varies widely in the literature.^{25–27} Imaging with the arm in abduction and external rotation increases the sensitivity and specificity in evaluating injuries to the inferior glenohumeral ligament and anteroinferior labrum; however, this is not routinely performed.²⁸ In the setting of recurrent subluxations, the soft tissue lesions likely undergo partial healing and may appear subtle on MRI. MR arthrography distends the joint capsule with contrast, allowing improved visualisation. Increased signal intensity with an amorphous-appearing labrum, contrast between the glenoid and the displaced capsulolabral complex (figure 1A) and bony oedema signifying osseous pathology (figure 1B) can aid in pre-operative planning.^{24 25 29} A newer technique, multidetector CT (MDCT) arthrography, has been reported to demonstrate superior accuracy in detecting osseous, labroligamentous and chondral lesions in comparison to MR arthrography.³⁰

In the study by Arciero *et al*,¹ Bankart lesions were found in every patient in the arthroscopic group and in all seven patients who failed initial conservative management and required subsequent open repair. Bankart originally argued that the only reasonable treatment is to reattach this capsulolabral complex to the glenoid, whereas mere plication of the capsule prevents

movement of the humeral head at the cost of limiting motion and does not address the underlying pathology.²¹ More recently, variations of Bankart lesions, including anterior labroligamentous periosteal sleeve avulsion (ALPSA) and humeral avulsion of the glenohumeral ligament (HAGL), have been described, which can be accurately identified on MR and MDCT arthrography.^{31 32} Occult lesions of these labroligamentous structures further predispose the patient to greater frequency of recurrent dislocations and serve as indications that favour acute repair.^{30 33–35}

The successful arthroscopic outcomes reported by Arciero *et al*¹ challenged the original teachings of Hovelius *et al*,^{7 8 36} who advocated against routine primary prophylactic stabilisation even in young patients following a primary dislocation event. Initial outcomes of arthroscopic stabilisation, however, proved worse than the previously established gold standard of open Bankart repair.^{37–39} These early unsatisfactory outcomes after arthroscopy, including high rates of recurrence and persistent instability, were reported by many authors,^{40–42} likely owing to the variability in shoulder pathology surgeons were attempting to treat arthroscopically.⁴³ Advances in surgical techniques, patient selection and implant technology have improved the outcomes of arthroscopic stabilisation. The use of suture anchors has supplanted previous arthroscopic techniques using

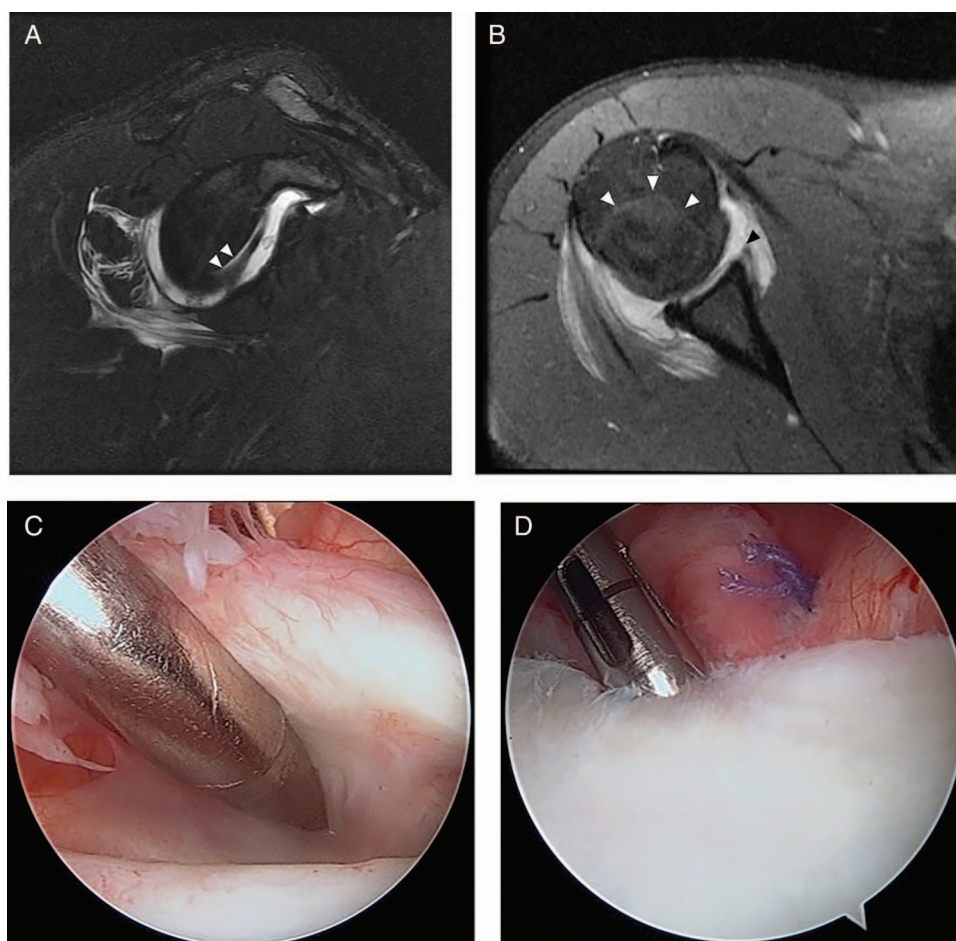


Figure 1 A right-hand-dominant male lacrosse player aged 17 years sustained a first-time traumatic anterior shoulder dislocation. He was initially treated with conservative treatment, but suffered a recurrent dislocation 5 months later. (A) Sagittal T2 MR arthrography demonstrates contrast between the edge of the glenoid and the displaced anteroinferior labrum (white arrowheads). (B) Axial image reveals bone marrow oedema within the posterior humeral head (white arrowheads) indicative of a Hill-Sachs lesion and an amorphous anteroinferior capsulolabral complex with contrast between it and the glenoid rim (black arrowhead). (C) Arthroscopic view via the posterior portal reveals the chondrolabral separation. (D) The patient underwent arthroscopic Bankart repair with suture anchors. The repair was performed in a sequential fashion beginning at the 6 o'clock position of the glenoid.

transglenoid sutures and suture tacks.⁴⁴ More recent studies demonstrate comparable recurrence rates, but better function, range of motion and short-term muscle recovery after arthroscopic repair with suture anchors than open stabilisation in the setting of traumatic anterior shoulder dislocations.^{45–47} Additional benefits of arthroscopic technique include a potentially shorter duration of surgery, decreased length of hospital stay, lower narcotic consumption, earlier return to work and improved cosmesis.^{45 46 48} As a result, a significant trend towards the use of arthroscopic stabilisation has been observed over the past decade.^{49 50}

In a prospective cohort study of 252 patients treated with immobilisation,⁵¹ younger age, male sex, ligamentous laxity, athletic participation, return to sports within 1 year were significant univariate risk factors for recurrence. A man aged 16 years had the same probability of recurrence (0.51) as a woman aged 27 years (0.50). Multivariate analysis found only younger age and male sex to be strong independent predictors of recurrent instability. Sports participation may have a minor effect as a covariate, as the majority of males < 25 years of age were athletes (120/155, 77%). Based on these findings, the authors provided recommendations for the design of clinical trials to better compare early arthroscopic intervention and conservative treatment in reducing the rate of recurrent instability and improving functional outcomes.⁵¹

The role of sporting activity as a risk factor for recurrence is also debatable. In Bankart's original description of recurrent anterior shoulder dislocation,²¹ he associated the pathology with 'powerful, healthy, athletic young men'. Although earlier studies corroborated this association in athletes^{6 19} and high-functioning military personnel,²⁰ recent data have not supported this correlation.^{51–53} One large series demonstrated that the type of sports activity categorised by shoulder strain did not influence recurrence rate, but a significant proportion of athletes switched to activities that demanded less shoulder strain after initial anterior dislocation.⁵² Indeed, involvement in sports is likely an important cofactor, which contributes to subsequent injury, and makes the young, active patient a particular difficult demographic to treat.

Current evidence as related to the original article

In the years since Arciero's publication, several prospective randomised studies^{14 15 17 18} have been performed to compare non-operative and arthroscopic repair in the treatment of first-time anterior shoulder dislocations. Kirkley *et al*¹⁴ performed the first randomised controlled trial comparing these two treatment modalities in patients <30 years of age. Two-year follow-up demonstrated significantly lower recurrence rate after surgery (n=3, 16%) than with immobilisation only (n=9, 47%). Furthermore, recurrences usually occurred within the first year in the non-operative group, but after the first year in the repair group. At follow-up after 6 years, no other patients reported of re-dislocations since the authors initially reported their results.¹⁷

A similar randomised controlled trial was conducted on young active-duty military personnel (ages 18–26),¹⁵ which more closely resembled the cohort from Arciero's original study. The arthroscopic and conservative treatment groups underwent 4 weeks of sling immobilisation followed by supervised rehabilitation. This study reviewed not only re-dislocation rates, but also considered symptomatic subluxation and inability to return to duty as failure of treatment. At the mean follow-up of 3 years, 9 of 12 (75%) non-operative patients failed, whereas 1 of 9 (11%) failed after arthroscopic repair. Kirkley *et al*¹⁴ suggested their results may be more generalisable to the population,

whereas studies with military personnel represent a higher-functioning patient with demanding activities to help explain the difference in failure rates.

In 2008, Hovelius *et al*⁵⁴ published their 25-year follow-up results from their original cohort. This represented the longest follow-up documented for anterior shoulder dislocation, providing a natural history of this condition after non-operative treatment. Of the initial 257 shoulders in 255 patients treated non-operatively, 229 shoulders in 227 living patients were available for follow-up. During the follow-up period, 43% of patients were free of subsequent dislocations, and 7% had one episode of re-dislocation. The remaining 50% had multiple recurrences: 27% required surgical stabilisation for recurrence, 14% spontaneously stabilised over time and 8% continued to have dislocations. Similar to their earlier reports,^{7 8 36} immobilisation did not affect prognosis; athletic participation and gender did not prove to be associated with recurrence, but younger age was again a significant risk factor for recurrence. Half of all patients between 12 and 16 years of age at initial dislocation underwent surgical stabilisation. More patients in the younger age groups (12–22 years 20%, 23–29 years 18%), however, stabilised over time compared with the 30–40 age group (10%), leading the authors to conclude younger age provides neither a good nor bad prognosis. Based on the stabilisation data, they further emphasised routine, immediate surgical stabilisation in young patients may lead to an unnecessary and invasive intervention in up to 50% of cases.

Surgical intervention in high-risk patients is also associated with potential complications and still may not prevent recurrence 100% of the time. Several authors have evaluated risk factors for recurrent instability after arthroscopic repair. One study demonstrated that age <28 years, ligamentous laxity and return to contact or overhead sports were independent risk factors on multivariate analysis when significance was set at $p < 0.15$.⁵⁵ Fractures of the anterior glenoid rim involving > 15% of articular surface had the highest OR for recurrence; however, due to the limited sample size, this finding was not statistically significant. In another study, a cohort of 18 collision or contact athletes <20 years of age was evaluated after arthroscopic stabilisation with the mean follow-up of 3 years.⁵⁶ All patients had returned to previous levels of competition by 10 months with improved objective outcome scores. Two patients (11%) had sustained a recurrence during the follow-up period, but did not require further intervention. More recently, a recurrence rate of 21% has been shown after arthroscopic capsulolabral repair in overhead or contact athletes aged 13–18 years.⁵⁷ Postoperative outcome scores did not correlate with recurrence. In a comparison of collision and non-collision athletes after arthroscopic stabilisation, Cho *et al*⁵⁸ found a 29% rate of recurrent dislocation or subluxation in collision athletes compared with 7% in non-collision athletes. The study, however, was underpowered, as this finding did not reach statistical significance. In a separate study, the same group reported a 25% rate of postoperative instability in young collision athletes, and demonstrated lower failure rate after primary open repair.⁵⁹

Boileau *et al*⁶⁰ found that age, gender and sports participation did not contribute to recurrent instability after arthroscopic stabilisation. On multivariate analysis, anterior laxity, attenuation of the inferior glenohumeral ligament and >25% bone loss of the glenoid surface led to 75% rate of recurrence. Furthermore, they found that the presence of a Hill-Sachs lesion and the use of three or fewer suture anchors were important risk factors. These results shifted the authors' patient selection and surgical approach to use a minimum of four anchor points of fixation

and to optimise the tensioning of the lax soft tissues. The same group of authors subsequently developed the Instability Severity Index Score (ISIS).⁶¹ Various preoperative, intraoperative and postoperative factors were assessed to develop a 10-point scoring system: age ≤ 20 years at surgery (2), participation in competitive sports (2), contact or overhead activities (1), anterior or inferior shoulder laxity (1), presence of a Hill-Sachs in external rotation on AP radiograph (2) and loss of inferior glenoid contour (2). Patients who scored >6 on this scale had a recurrence rate of 70%. Conversely, recurrence rates were 10% for patients who scored ≤ 6 and 5% for patients who scored ≤ 3 . In their previous study,⁶⁰ the majority of the patients who failed initial surgical stabilisation underwent revision with a Latarjet procedure, which the authors now recommend for high-risk patients who present with ISIS >6 instead of arthroscopic Bankart repair for index surgery. In a case-control study, ISIS was retrospectively assessed on a series of patients who either had success or failure of arthroscopic stabilisation to calculate its sensitivity, specificity and positive and negative predictive values.⁶² The results demonstrated a 70% rate of failure when the ISIS was ≥ 4 . Of the patients who failed arthroscopic stabilisation, 63% sustained an episode of recurrent instability during contact or overhead sports.

The use of the Latarjet procedure has gained considerable favour in the setting of glenoid and/or humeral-sided defects not only as a salvage procedure, but also in the setting of primary stabilisation.^{50 63} Originally proposed in 1954, the procedure involves the transfer of the coracoid process along with the attached conjoint tendon to the anteroinferior glenoid through a horizontal divide in the subscapularis tendon.⁶⁴ The osteotomised coracoid provides a bony block to restore glenoid loss; the conjoint tendon provides a sling or seatbelt effect to prevent anterior subluxation of the humeral head; the coracoclavicular ligament is reattached to the medial capsule to prevent direct contact of the humeral head with the coracoid to complete the triple blocking effect of this procedure. Long-term results have demonstrated success in the prevention of recurrent instability.^{65 66} Twenty-year follow-up data revealed a recurrence rate of 5.9%, consistent with the results of Burkhart *et al*,⁶⁷ as well as high rate of patient satisfaction and return to sports.⁶⁵ In comparison to arthroscopic stabilisation, open Latarjet was found to be inferior with respect to return to sports and subjective perception of the shoulder, despite lower recurrence rates.⁶⁶ A serious concern with this procedure remains the high rate of glenohumeral arthritis, which occurred in 20% of patients who had no preoperative arthritis. A prior long-term study had described this complication to be as high as 71%.⁶⁸ Innovations in surgical technique have evolved to allow this procedure to be performed arthroscopically with minimal complications.⁶⁹ Five-year follow-up data revealed no incidence of repeat dislocation, while 1 out of the 64 shoulders (1.6%) available for follow-up reported of subluxation episodes.⁷⁰ The Latarjet procedure has demonstrated success for certain high-risk patients who are likely to fail arthroscopic stabilisation; however, high rates of infection and neurological complications remain a significant concern.^{71 72} Further research is necessary to identify and to minimise the risks of postoperative arthritis with continued efforts to decrease the complication profile.

The lessons learned

From a societal standpoint, anterior shoulder instability affects patients of various ages and walks of life. If untreated or treated improperly, the sequelae can be extremely debilitating and devastating. Historical studies have recognised that certain

characteristics (young age, athletics participation) are predisposed to high recurrence rates.^{4-8 19 20} Recent evidence suggests contact and overhead athletes are especially vulnerable for subsequent injury.⁵⁵⁻⁵⁹ Despite the success of non-operative treatment in certain patient demographics, the young and high-demand patients of today may benefit more with surgical intervention to repair the significant underlying pathoanatomic lesions associated with primary anterior shoulder dislocation (figure 1C, D).

Non-operative treatment has also evolved over the years. Rigid immobilisation has not demonstrated any significant benefits over sling treatment for 3 weeks after injury.^{6-8 36 54} More recently, immobilisation in external rotation has gained interest due to the theoretically improved shoulder position to allow healing of the capsulolabral complex.^{73 74} The disadvantage of this modality is potential patient non-compliance due to its unnatural position.

The success after arthroscopic Bankart repair demonstrated in Arciero's 'Classic' set the stage for the evolution in surgical techniques and implants over the past 20 years. Surgical treatment of first-time dislocations has become less invasive and better tolerated, leading to lower complication rates and greater success rates.⁴⁸ The development of suture anchors has improved arthroscopic outcomes to be comparable to open surgery. More than three suture anchors are currently recommended for fixation.⁶⁰ Several randomised controlled trials have demonstrated superior outcomes with arthroscopic stabilisation compared with non-operative treatment.^{14 15 17 18} Risk factors for failure after surgical repair have established the ISIS.⁶¹ While an open or arthroscopic Latarjet procedure may be indicated for more significant glenohumeral bone defects,^{63 65 69 70} it is important to recognise the complication profile of this non-anatomic technique. Currently, we prefer arthroscopic stabilisation as the index treatment in the majority of instability cases.

ADDITIONAL EXPERT OPINION

Robert A Arciero, MD

Since this original report, surgical stabilisation of the initial anterior dislocation of the shoulder has become more widely accepted. It is the author's intent that this mode of treatment is reserved for the young, active patient <25 years of age. Despite the results of this study and similar findings documented by other investigators, it remains controversial.

Proponents of non-operative treatment quote more recent literature reporting recurrent dislocation rates of 50–70%, not $>90\%$ as reported in older studies. Therefore, the conclusion is that operating on the initial dislocation would represent a very aggressive approach and surgery would not be necessary in a substantial number of patients. Also, proponents of non-operative treatment argue that allowing the patient to have another one or two dislocations has no effect on the final outcome should surgery be necessary.

Now nearly 22 years later and since leaving the military, I am more convinced than ever that primary surgical repair of the initial dislocation provides the best outcome.

In the more modern era, it is not only the parameter of dislocation with which we should measure our results of treatment for shoulder instability. Quality-of-life outcome instruments, recurrent subluxation and return to sports all should be evaluated. In this regard, there is literature to support primary operative repair as the better treatment. Recurrent instability is not benign. There is progressive labral injury, capsular deformation and bone loss, all of which influence the outcome of any surgical treatment. The issue of important bone defects is primarily

The Classic

the result of recurrent events and can change the nature of the operative reconstruction to one that involves open techniques, bone grafting and other more extensive surgery. Further, the risk of postdislocation glenohumeral arthritis is significantly increased with just one more dislocation.

The initial dislocation represents the optimum pathoanatomic condition for a successful and improved outcome with arthroscopic stabilisation.

Brian J Cole, MD MBA

Athletes who experience anterior shoulder instability and the physicians who treat them have consequential decisions to make when it comes to managing an anterior instability event. Many factors play into the decision, including the timing of the injury (early or late in the athlete's season), presence of bony injury, including acute or chronic bony Bankart or a large Hill-Sachs defect, athlete age and whether they are involved in contact sports or sports that predictably involve an arm position of risk.

It is my opinion that non-operative management be pursued for athletes experiencing a primary instability event with soft tissue injury alone and no glenoid bone loss. Since we know that many athletes will suffer a recurrent dislocation at some point after they return to play, we reserve surgical indications for after they suffer a repeat instability event assuming they wish to return to the at-risk sport. Other factors to consider include duration of season remaining and the goals for the athlete the following year. For example, in the professional athlete that suffers a dislocation event in the period prior to entering free agency, our decision algorithm will likely be altered versus the professional athlete in the midst of a long-term contract. Some athletes may choose to undergo more aggressive treatment options early on and end their current season early to position themselves for more success and enduring play without time loss the following year.

While non-operative management is usually the course of action I take in first-time dislocators meeting the aforementioned criteria, athletes experiencing glenoid bone loss with the first instability event may be considered for early surgical intervention, especially if the bone loss is significant. In addition, athletes, often professional, may seek a more aggressive treatment option inseason hoping to return to sport and avoid recurrent dislocation, which is obligatorily associated with some time loss. These are more extreme situations that are considered on a case-by-case basis.

Eiji Itoi, MD PhD

We all agree that surgical intervention is better than conservative treatment in reducing recurrence rate. Does this mean that we should do surgery in each and every one of the initial dislocators? Of course not. Initial dislocators have a risk of having recurrent dislocation or chronic instability in the future; however, we never know whether a patient sitting in front of us will have a second dislocation in the future. Thus, initial stabilisation is a preventive surgery against chronic instability. On the other hand, stabilisation in a patient with two or more dislocations is a treatment for chronic instability, not prevention. I would accept a preventive shot for the influenza, but I would decline to have a preventive surgery.

For my approach in collision or contact athletes, surgery after initial dislocation may be indicated if the patient strongly desires to do so. Otherwise, inseason athletes can go back to sports with the use of a protection brace to limit abduction and external rotation. After the season is over and if the patient still has residual instability, surgery is the treatment of choice. For off-season

athletes or non-athletes, conservative treatment with immobilisation in external rotation may be indicated. The efficacy of immobilisation in external rotation is still controversial. A new meta-analysis showed a significant relative risk reduction of 36% with this treatment (the 13th ICSES, May 2016). The outcome of conservative treatment is not as good as that of surgical treatment. However, it is not the issue of which treatment is better. It is the issue of indication. There is definitely an indication for conservative treatment, and that is the reason we are trying to find the best conservative treatment. It is up to the patient which treatment option to choose. We need to provide the best treatment options for them, both conservative and surgical.

CONCLUSION

Arciero's 'Classic' changed the treatment algorithm for first-time dislocators in the military population and lends support to early arthroscopic intervention. However, the treatment of initial anterior dislocations of the shoulder remains a challenging endeavour, with an ever-expanding list of options. The choice of treatment must be tailored specifically to the patient and not compartmentalised. The decision should take into account a multitude of factors, such as age, sports participation, competition level, ligamentous laxity and bony involvement. The patient must be properly counselled on the benefits, risks and potential complications of all the options available to him or her.

Acknowledgements The authors acknowledge and thank Drs Robert Arciero, Brian Cole and Eiji Itoi for providing their expert opinions and insightful comments.

Contributors TDL is responsible for critical analysis and interpretation of articles reviewed for manuscript, manuscript preparation, editing. GGP is responsible for manuscript design, editing. MTF is responsible for manuscript design, preparation and editing.

Competing interests None declared.

Provenance and peer review Commissioned; externally peer reviewed.

REFERENCES

- 1 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.
- 2 Hovelius L. Incidence of shoulder dislocation in Sweden. *Clin Orthop Relat Res* 1982;166:127–31.
- 3 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.
- 4 McLaughlin HL, Cavallaro WU. Primary anterior dislocation of the shoulder. *Am J Surg* 1950;80:615–21.
- 5 Rowe CR. Prognosis in dislocations of the shoulder. *J Bone Joint Surg Am* 1956;38-A:957–77.
- 6 Henry JH, Genung JA. Natural history of glenohumeral dislocation—revisited. *Am J Sports Med* 1982;10:135–7.
- 7 Hovelius L, Eriksson K, Fredin H, *et al*. Recurrences after initial dislocation of the shoulder. Results of a prospective study of treatment. *J Bone Joint Surg Am* 1983;65:343–9.
- 8 Hovelius L. Anterior dislocation of the shoulder in teen-agers and young adults. Five-year prognosis. *J Bone Joint Surg Am* 1987;69:393–9.
- 9 McGlynn FJ, Caspari RB. Arthroscopic findings in the subluxating shoulder. *Clin Orthop Relat Res* 1984;183:173–8.
- 10 Calandra JJ, Baker CL, Uribe J. The incidence of Hill-Sachs lesions in initial anterior shoulder dislocations. *Arthroscopy* 1989;5:254–7.
- 11 Baker CL, Uribe JW, Whitman C. Arthroscopic evaluation of acute initial anterior shoulder dislocations. *Am J Sports Med* 1990;18:25–8.
- 12 Norlin R. Intraarticular pathology in acute, first-time anterior shoulder dislocation: an arthroscopic study. *Arthroscopy* 1993;9:546–9.
- 13 Hintermann B, Gächter A. Arthroscopic findings after shoulder dislocation. *Am J Sports Med* 1995;23:545–51.
- 14 Kirkley A, Griffin S, Richards C, *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. *Arthroscopy* 1999;15:507–14.

- 15 Bottoni CR, Wilckens JH, DeBerardino TM, *et al.* A prospective, randomized evaluation of arthroscopic stabilization versus nonoperative treatment in patients with acute, traumatic, first-time shoulder dislocations. *Am J Sports Med* 2002;30:576–80.
- 16 Handoll HH, Almayih MA, Rangan A. Surgical versus non-surgical treatment for acute anterior shoulder dislocation. *Cochrane Database Syst Rev* 2004;(1):CD004325
- 17 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.
- 18 Jakobsen BW, Johannsen HV, Suder P, *et al.* Primary repair versus conservative treatment of first-time traumatic anterior dislocation of the shoulder: a randomized study with 10-year follow-up. *Arthroscopy* 2007;23:118–23.
- 19 Simonet WT, Cofield RH. Prognosis in anterior shoulder dislocation. *Am J Sports Med* 1984;12:19–24.
- 20 Wheeler JH, Ryan JB, Arciero RA, *et al.* Arthroscopic versus nonoperative treatment of acute shoulder dislocations in young athletes. *Arthroscopy* 1989;5:213–17.
- 21 Bankart AS. Recurrent or habitual dislocation of the shoulder-joint. *Br Med J* 1923;2:1132–3.
- 22 Lintner SA, Speer KP. Traumatic anterior glenohumeral instability: the role of arthroscopy. *J Am Acad Orthop Surg* 1997;5:233–9.
- 23 Streubel PN, Krych AJ, Simone JP, *et al.* Anterior glenohumeral instability: a pathology-based surgical treatment strategy. *J Am Acad Orthop Surg* 2014;22:283–94.
- 24 Sanders TG, Morrison WB, Miller MD. Imaging techniques for the evaluation of glenohumeral instability. *Am J Sports Med* 2000;28:414–34.
- 25 Flannigan B, Kursunoglu-Brahme S, Snyder S, *et al.* MR arthrography of the shoulder: comparison with conventional MR imaging. *AJR Am J Roentgenol* 1990;155:829–32.
- 26 Iannotti JP, Zlatkin MB, Esterhai JL, *et al.* Magnetic resonance imaging of the shoulder. Sensitivity, specificity, and predictive value. *J Bone Joint Surg Am* 1991;73:17–29.
- 27 Gusmer PB, Potter HG, Schatz JA, *et al.* Labral injuries: accuracy of detection with unenhanced MR imaging of the shoulder. *Radiology* 1996;200:519–24.
- 28 Takubo Y, Horii M, Kurokawa M, *et al.* Magnetic resonance imaging evaluation of the inferior glenohumeral ligament: non-arthrographic imaging in abduction and external rotation. *J Shoulder Elbow Surg* 2005;14:511–15.
- 29 Palmer WE, Brown JH, Rosenthal DI. Labral-ligamentous complex of the shoulder: evaluation with MR arthrography. *Radiology* 1994;190:645–51.
- 30 Acid S, Le Corroller T, Aswad R, *et al.* Preoperative imaging of anterior shoulder instability: diagnostic effectiveness of MDCT arthrography and comparison with MR arthrography and arthroscopy. *AJR Am J Roentgenol* 2012;198:661–7.
- 31 Waldt S, Burkart A, Imhoff AB, *et al.* Anterior shoulder instability: accuracy of MR arthrography in the classification of antero-inferior labroligamentous injuries. *Radiology* 2005;237:578–83.
- 32 Tirman PF, Steinbach LS, Feller JF, *et al.* Humeral avulsion of the anterior shoulder stabilizing structures after anterior shoulder dislocation: demonstration by MRI and MR arthrography. *Skeletal Radiol* 1996;25:743–8.
- 33 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.
- 34 Bernhardson AS, Bailey JR, Solomon DJ, *et al.* Glenoid bone loss in the setting of an anterior labroligamentous periosteal sleeve avulsion tear. *Am J Sports Med* 2014;42:2136–40.
- 35 Rhee YG, Cho NS. Anterior shoulder instability with humeral avulsion of the glenohumeral ligament lesion. *J Shoulder Elbow Surg* 2007;16:188–92.
- 36 Hovelius L, Augustini BG, Fredin H, *et al.* Primary anterior dislocation of the shoulder in young patients. A ten-year prospective study. *J Bone Joint Surg Am* 1996;78:1677–84.
- 37 Walch G, Boileau P, Levigne C, *et al.* Arthroscopic stabilization for recurrent anterior shoulder dislocation: results of 59 cases. *Arthroscopy* 1995;11:173–9.
- 38 Stein DA, Jazrawi L, Bartolozzi AR. Arthroscopic stabilization of anterior shoulder instability: a review of the literature. *Arthroscopy* 2002;18:912–24.
- 39 Cole BJ, L'Insalata J, Irrgang J, *et al.* Comparison of arthroscopic and open anterior shoulder stabilization. A two to six-year follow-up study. *J Bone Joint Surg Am* 2000;82-A:1108–14.
- 40 Hawkins RB. Arthroscopic stapling repair for shoulder instability: a retrospective study of 50 cases. *Arthroscopy* 1989;5:122–8.
- 41 Guanache CA, Quick DC, Sodergren KM, *et al.* Arthroscopic versus open reconstruction of the shoulder in patients with isolated Bankart lesions. *Am J Sports Med* 1996;24:144–8.
- 42 Geiger DF, Hurley JA, Tovey JA, *et al.* Results of arthroscopic versus open Bankart suture repair. *Clin Orthop Relat Res* 1997;(337):111–17.
- 43 Mologne TS, McBride MT, Lapoint JM. Assessment of failed arthroscopic anterior labral repairs. Findings at open surgery. *Am J Sports Med* 1997;25:813–17.
- 44 Petrera M, Patella V, Patella S, *et al.* A meta-analysis of open versus arthroscopic Bankart repair using suture anchors. *Knee Surg Sports Traumatol Arthrosc* 2010;18:1742–7.
- 45 Kim SH, Ha KI, Kim SH. Bankart repair in traumatic anterior shoulder instability: open versus arthroscopic technique. *Arthroscopy* 2002;18:755–63.
- 46 Fabriciani 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.
- 47 Rhee YG, Lim CT, Cho NS. Muscle strength after anterior shoulder stabilization: arthroscopic versus open Bankart repair. *Am J Sports Med* 2007;35:1859–64.
- 48 Green MR, Christensen KP. Arthroscopic versus open Bankart procedures: a comparison of early morbidity and complications. *Arthroscopy* 1993;9:371–4.
- 49 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.
- 50 Zhang AL, Montgomery SR, Ngo SS, *et al.* Arthroscopic versus open shoulder stabilization: current practice patterns in the United States. *Arthroscopy* 2014;30:436–43.
- 51 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.
- 52 Kralinger FS, Golsner K, Wischatta R, *et al.* Predicting recurrence after primary anterior shoulder dislocation. *Am J Sports Med* 2002;30:116–20.
- 53 te Slaa RL, Wiffels MP, Brand R, *et al.* The prognosis following acute primary glenohumeral dislocation. *J Bone Joint Surg Br* 2004;86:58–64.
- 54 Hovelius L, Olofsson A, Sandstrom 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.
- 55 Calvo E, Granizo JJ, Fernandez-Yruegas D. Criteria for arthroscopic treatment of anterior instability of the shoulder: a prospective study. *J Bone Joint Surg Br* 2005;87:677–83.
- 56 Mazzocca AD, Brown FM Jr, Carreira DS, *et al.* Arthroscopic anterior shoulder stabilization of collision and contact athletes. *Am J Sports Med* 2005;33:52–60.
- 57 Castagna A, Delle Rose G, Borrioni M, *et al.* Arthroscopic stabilization of the shoulder in adolescent athletes participating in overhead or contact sports. *Arthroscopy* 2012;28:309–15.
- 58 Cho NS, Hwang JC, Rhee YG. Arthroscopic stabilization in anterior shoulder instability: collision athletes versus noncollision athletes. *Arthroscopy* 2006;22:947–53.
- 59 Rhee YG, Ha JH, Cho NS. Anterior shoulder stabilization in collision athletes: arthroscopic versus open Bankart repair. *Am J Sports Med* 2006;34:979–85.
- 60 Boileau P, Villalba M, Hery JY, *et al.* Risk factors for recurrence of shoulder instability after arthroscopic Bankart repair. *J Bone Joint Surg Am* 2006;88:1755–63.
- 61 Balg F, Boileau P. The instability severity index score. A simple pre-operative score to select patients for arthroscopic or open shoulder stabilisation. *J Bone Joint Surg Br* 2007;89:1470–7.
- 62 Phadnis J, Arnold C, Elmorsy A, *et al.* Utility of the instability severity index score in predicting failure after arthroscopic anterior stabilization of the shoulder. *Am J Sports Med* 2015;43:1983–8.
- 63 Schmid SL, Farshad M, Catanzaro S, *et al.* The Latarjet procedure for the treatment of recurrence of anterior instability of the shoulder after operative repair: a retrospective case series of forty-nine consecutive patients. *J Bone Joint Surg Am* 2012;94:e75.
- 64 Latarjet M. [Treatment of recurrent dislocation of the shoulder]. *Lyon Chir* 1954;49:994–7.
- 65 Mizuno N, Denard PJ, Raiss P, *et al.* Long-term results of the Latarjet procedure for anterior instability of the shoulder. *J Shoulder Elbow Surg* 2014;23:1691–9.
- 66 Blonna D, Bellato E, Caranzano F, *et al.* Arthroscopic Bankart repair versus open Bristow-Latarjet for shoulder instability: a matched-pair multicenter study focused on return to sport. *Am J Sports Med* 2016.
- 67 Burkhart SS, De Beer JF, Barth JR, *et al.* Results of modified Latarjet reconstruction in patients with antero-inferior instability and significant bone loss. *Arthroscopy* 2007;23:1033–41.
- 68 Singer GC, Kirkland PM, Emery RJ. Coracoid transposition for recurrent anterior instability of the shoulder. A 20-year follow-up study. *J Bone Joint Surg Br* 1995;77:73–6.
- 69 Boileau P, Gendre P, Baba M, *et al.* A guided surgical approach and novel fixation method for arthroscopic Latarjet. *J Shoulder Elbow Surg* 2016;25:78–89.
- 70 Dumont GD, Fogerty S, Rosso C, *et al.* The arthroscopic Latarjet procedure for anterior shoulder instability: 5-year minimum follow-up. *Am J Sports Med* 2014;42:2560–6.
- 71 Shah AA, Butler RB, Romanowski J, *et al.* Short-term complications of the Latarjet procedure. *J Bone Joint Surg Am* 2012;94:495–501.
- 72 Delaney RA, Freehill MT, Janfaza DR, *et al.* 2014 Neer Award Paper: neuromonitoring the Latarjet procedure. *J Shoulder Elbow Surg* 2014;23:1473–80.
- 73 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.
- 74 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.



Review of Arciero's article (1994) on arthroscopic Bankart repair versus non-operative treatment for acute, initial anterior shoulder dislocations: does the same hold true in 2016?

T David Luo, Gary G Poehling and Michael T Freehill

J ISAKOS published online October 24, 2016

Updated information and services can be found at:

<http://jisakos.bmj.com/content/early/2016/10/24/jisakos-2016-000091>

These include:

References

This article cites 71 articles, 32 of which you can access for free at:

<http://jisakos.bmj.com/content/early/2016/10/24/jisakos-2016-000091>
#BIBL

Email alerting service

Receive free email alerts when new articles cite this article. Sign up in the box at the top right corner of the online article.

Notes

To request permissions go to:

<http://group.bmj.com/group/rights-licensing/permissions>

To order reprints go to:

<http://journals.bmj.com/cgi/reprintform>

To subscribe to BMJ go to:

<http://group.bmj.com/subscribe/>