ISAKOS Committee Report

Consensus Statement on Shoulder Instability

Klaus Bak, M.D., Ethan R. Wiesler, M.D., Gary G. Poehling, M.D., and the ISAKOS Upper Extremity Committee

Abstract: The understanding and treatment of shoulder instability comprise a rapidly evolving area of interest in orthopaedics. Evaluation methods are becoming more specific in showing the exact pathologies causing the symptoms. Magnetic resonance arthrography and arthroscopy have contributed to this development. The patient with an unstable shoulder should be thoroughly evaluated through their history and specific clinical tests of the shoulder as well as the scapulothoracic joint. Often, shoulder instability can be classified after this primary evaluation. Magnetic resonance arthrography and arthroscopy are the gold standards in soft-tissue evaluation, whereas specialized radiographic examinations and computed tomography scans are used to assess bony defects. Patients are treated according to the pathology found on preoperative or pretreatment evaluation. Multiple factors need to be considered before the treatment program is instituted, including the patient's age, activity demands, associated pathology and dysfunction, soft-tissue pathology, degree of instability, direction, frequency, and etiology. Treatment can be nonoperative or arthroscopic or open repair. Soft-tissue pathology and bony defects should be addressed, and the surgeon's preferred method and skills are important in choosing the right treatment for the patient. The patient should be informed about possible complications, restrictions during the treatment period, and the prognosis for the particular type of instability. To improve progress in shoulder orthopaedics, one of the most important factors can be a universal agreement on an outcome measurement tool that is well designed and validated.

The Upper Extremity Committee of ISAKOS (International Society of Arthroscopy, Knee Surgery and Orthopaedic Sports Medicine) met in Cancún, México, in June 2008 and formulated this consensus statement. It is the hope of the committee that it will lead to improved diagnosis and treatment of our patients with shoulder instability.

From the Department of Shoulder Service (K.B.), Parkens Private Hospital, Copenhagen, Denmark; Department of Orthopaedic Surgery (E.R.W., G.G.P.), Wake Forest University Health Sciences, Winston-Salem, North Carolina, U.S.A.; and the International Society of Arthroscopy, Knee Surgery, and Orthopaedic Sports Medicine, Upper Extremity Committee meeting held in Cancún, México, June 3-4, 2008.

The committee members who contributed to this consensus were Ethan R. Wiesler, Gary G. Poehling, Benno Enjismann, Mario Larrain, Guillermo Arce, Vicente Gutierrez, Ettore Taverna, Philippe Hardy, Eiji Etoi, Ben Kibler, Mauricio Gutiérrez, Matthew T. Provencher, Kevin Plancher, David Lintner, Alexandro Castagna, and Klaus Bak.

The authors report no conflict of interest.

Received January 2, 2009; accepted June 16, 2009.

Address correspondence and reprint requests to Klaus Bak, M.D., Parkens Private Hospital, Shoulder Service, 42 Oester Allé, Third Floor, Copenhagen 2100, Denmark. E-mail: kb@parkensprivathospital.dk

0749-8063/10/2602-0099$36.00/0

doi:10.1016/j.arthro.2009.06.022

PHYSICAL EXAMINATION

The physical examination is the first key to understanding the patient's type of instability. A thorough history is obtained, and a physical examination is carried out. The history involves a description of the initial symptoms, the degree of instability, the need for reduction, dominating symptoms (looseness, insecurity, or pain), possible associated neurologic complaints, and a list of activities that are no longer possible, as well as the desired function after treatment. Physical examination involves laxity tests, assessment of general hypermobility, instability tests, and evaluation of scapula function and associated pathology.

The classical definition of glenohumeral instability is "subluxation or dislocation of the humeral over the

glenoid rim."[1] The biomechanical definition is "lack of control of the center of rotation." At one end of the instability spectrum is the traumatic instability that leads to apprehension as the main clinical finding; at the other end of the spectrum is the instability characterized by pain on apprehension when the arm is placed in a provocative position.

There are many tests described in the literature, most of which have low specificity and acceptable sensitivity (Table 1). The most widely used tests are the apprehension test, the sulcus sign, and the load-and-shift test.[2,3] The apprehension test can be carried out with the patient standing, sitting, or supine. The apprehension test puts the anterior band of the inferior glenohumeral ligament (IGHL) and the anterior capsule under stress. In 2000 Gagey and Gagey[4] described the hyperabduction test as a test for insufficiency of the IGHL by putting both bands of the ligament under stress. If more than 105° of passive abduction with the scapula fixed can be obtained, a positive test result is noted.[4] Boileau and Coste evaluated this test and found that at least 30° difference to the healthy shoulder is required for a positive test (oral communication with Philippe Hardy, June 2008). The role of the sulcus sign is being questioned. It is always found in individuals with generalized hypermobility, and the interobserver and intraobserver reliability is low. Biomechanically, it puts the rotator interval, the coracohumeral ligament, and the superior glenohumeral ligament under stress.[5] Thus it fails to test the IGHL, which is most often involved in glenohumeral instability. The history and physical findings are critical in the surgical versus nonsurgical decision process, and instability tests in the anesthetized patient can add to the overall assessment of instability.

TABLE 1. *Evaluation of Glenohumeral Instability*

Physical examination
Symptoms
Pain
Subluxation
Dislocation
Range of motion
Apprehension test
Gagey's test
Classification
TUBS and AMBRI[1]
Rockwood classification[6]
Allen classification[7]
Gerber classification[8]
FEDS[9]
Soft-tissue evaluation
Standard radiographs with axillary view
Computed tomography arthrography
MRI
MRA (gold standard)
Bernageau view (bony defects)
SHART (P. Hardy, personal communication)
Arthroscopy (gold standard)

Abbreviations: TUBS, traumatic, unidirectional, Bankart, and usually requiring surgery; AMBRI, atraumatic, multidirectional, bilateral, rehabilitation, and occasionally requiring an inferior capsular shift; FEDS, frequency, etiology, direction, and severity; SHART, shoulder hyperabduction radiographic test.

CLASSIFICATION

Classification of shoulder instability is a difficult task, and new understanding of underlying pathologies of instability results in new approaches to the unstable shoulder. The ideal classification of a disorder should be simple and easy to apply and lead the patient through a treatment algorithm that suits his or her type of instability best. It must also provide an indication of the prognosis for the condition. Furthermore, the classification should guide the surgeon in making the optimal treatment decision. Some classifications are simple and lack the ability of categorizing specific pathology, whereas other classifications are comprehensive and leave the clinician with too many subcategories. The most widely used are the Matsen and Harryman classification TUBS (traumatic, unidirectional, Bankart, and usually requiring surgery) and AMBRI (atraumatic, multidirectional, bilateral, rehabilitation, and occasionally requiring an inferior capsular shift),[1] the Rockwood classification,[6] the Allen classification,[7] and the Gerber classification.[8] A new classification that has a high agreement with regard to the severity of instability between the examiner and the patient, as well as an intrarater agreement between 84% and 97%, has been proposed by Kuhn et al.[9] The classification consists of 4 groups: frequency, etiology, direction, and severity.

SOFT-TISSUE EVALUATION

To evaluate soft-tissue pathology, radiographic examinations with contrast (arthrography and computed tomography arthrography), magnetic resonance imaging (MRI), and magnetic resonance arthrography (MRA) can be used. A new method of radiographic evaluation based on Gagey's test seems promising (P. Hardy, oral communication, June 2008). The SHART (shoulder hyperabduction radiographic test) is a radiographic technique consisting of an anteroposterior view of the shoulder in the supine position being obtained

while the examiner carries out forced glenohumeral abduction by blocking the scapula with a force applied on the acromion, with the shoulder in neutral rotation. The results show that a difference in abduction of 15° or greater is associated with 87% severe insufficiency of the IGHL seen on arthroscopy ($P < .05$). It thereby allows a quantitative assessment of the IGHL (P. Hardy, personal communication).

Conventional MRI without the use of contrast is reported with varying results regarding diagnostic precision. Takubo et al.[10] showed specificity of 82% and sensitivity of 94% of MRI using nonarthrographic imaging in abduction and external rotation. Computed tomography arthrography has a high correlation with arthroscopic findings but involves injection and irradiation. MRA is described as the gold standard for soft-tissue evaluation before arthroscopy.

FIRST-TIME DISLOCATION

Surgical treatment of first-time dislocation is still controversial; however, recent Level I studies with medium- to long-term follow-up have found advantages of surgical treatment in the young active population (Table 2).[11-13] Larrain et al.[14] have shown that there is a high rate of redislocation in contact athletes (rugby) after nonoperative treatment. In these high-demand athletes, surgical treatment should be considered at an early stage to avoid secondary damage to articular structures. These shoulders with many recurrences have significant associated pathology, in particular, bony defects, which make surgery at a later stage more complicated, and often in these cases a simple Bankart repair is no longer sufficient. Hovelius et al.[15] have shown that "After twenty-five years, half of the primary anterior shoulder dislocations that had been treated nonoperatively in patients with an age of twelve to twenty-five years had not recurred or had become stable over time." The material is historic and the longest follow-up ever presented, but it may not reflect today's life with the evolution in high-risk activities and patients' demands for a continuing active lifestyle. More recent studies show higher recurrence rates than the study of Hovelius et al. At the same time, surgery has become less complicated and less invasive, and rehabilitation science has developed as well. These factors are in favor of primary surgical treatment of first-time dislocations in young active individuals, but every case is an individual case and the indications and prognosis should be discussed with the patient.

TABLE 2. *Treatment of Glenohumeral Instability: Highlights of Conclusions of ISAKOS Upper Extremity Committee Consensus Meeting*

First-time dislocation
Arthroscopic repair in the young active population
Collision athletes run a risk of significant associated lesions with redislocation
Consider subacute MRI in internal and external rotation[16]
No advances of fixed immobilization[15]
External rotation brace reduces risk of redislocation—be aware of low compliance[17]
In the older population, there is a high risk of associated cuff tears
Nonoperative treatment
Individually designed
Traumatic/nontraumatic etiology
Exercise program
Range of motion
Dynamic
Proprioceptive
Scapular stabilization
Success of rehabilitation
High in MDI, microinstability, and disabled thrower's shoulder
Low in post-traumatic instability
Surgical treatment
Open or arthroscopic less important
Identify pathology and fix the lesion
No single lesion responsible for the instability can be identified; Bankart lesion is most important
High failure rate in athletes is related to bony defect
Surgical treatment of recurrence
High success in traumatic cases, poor initial surgical technique, failure of the labrum to heal
Low success in MDI, atraumatic cases, or patients with associated psychological disorder
RI closure only in selected cases; loss of external rotation may be of concern
Bony defects
Many procedures exist; most widely used is Latarjet
Humeral head allograft or resurfacing
Arthroscopic bone block is a new demanding technique[29]

Nonoperative treatment has developed over the years. Spica cast immobilization has never been shown to be beneficial and should be avoided. Various braces and slings have been used to immobilize the shoulder until pain has subsided. Itoi et al.[16] have shown with MRI that the labral lesion is rolled up and away from the glenoid in the conventional immobilization position of internal rotation with the arm resting against the body/stomach, which is a suboptimal situation for anatomic healing. In the same study Itoi et al. showed that with the arm in external rotation, there was a higher rate of anatomic reduction of the labral lesion. A prospective randomized study comparing immobilization in a conventional brace versus an ex-

ternal rotation brace showed significantly less recurrence in the external rotation brace group.[17] The major limit to the use of an external rotation brace is patient compliance. The external rotation brace should be applied within the first 1 or 2 days after the dislocation to obtain anatomic "repair" (E. Itoi, oral communication, June 2008). These studies could also justify the use of subacute magnetic resonance scanning to visualize the nature of the labral lesion. Future prospective studies could have patients allocated to initial treatment groups based on the pathology shown by MRI, age, and activity level.

NONOPERATIVE TREATMENT

Nonoperative treatment of shoulder instability covers as wide a spectrum as the different types of glenohumeral instability. The nonoperative treatment of first-time dislocation was discussed previously. The remaining cases of shoulder instability can roughly be divided into recurrent dislocating shoulders with a traumatic etiology and nontraumatic shoulder instability as seen in overhead athletes. In recurrent dislocating shoulders, the passive stabilizing structures are abnormal. Stability can then only be obtained by improvement of dynamic stability and the proprioception and improvement of scapular function.[18] Rehabilitation plays a variable role depending on the cause of the instability.[18] Success of rehabilitation is highest in multidirectional instability (MDI) and athletes with microinstability or disabled throwing shoulder, and rehabilitation is less successful in post-traumatic instability. Preoperative rehabilitation should prepare for the postoperative phase by improving scapular control, rotator cuff strength, and flexibility. A nonoperative rehabilitation program aims at correcting deficits that relate to symptoms, whereas postoperative rehabilitation should be guided by surgical findings.

SURGICAL TREATMENT

The issue of choosing open or arthroscopic repair is becoming obsolete but is still controversial. The way of approaching the shoulder seems less important. The goal of surgical treatment is to identify the pathology and fix the lesion no matter the approach. Historically, open repair was recommended for recurrent instability, as well as for instability in contact athletes, whereas arthroscopic repair exhibited acceptable but high recurrence rates. A meta-analysis found that "The failure rate of arthroscopic shoulder stabilisation using staples or transglenoid suture techniques appeared to be significantly higher than that of either open surgery or arthroscopic stabilisation using suture anchors or bio-absorbable tacks. Arthroscopic anterior stabilisation using the most effective techniques has a similar rate of failure to open stabilisation after two years."[19] Techniques have changed, and fixation devices have improved together with rehabilitation protocols; prospective randomized studies show no significant difference in the failure rate.[20-22] The choice of surgical treatment must be tailored to correct the abnormality identified at the time of surgery. The techniques of open and arthroscopic repair have become similar with the evolution of suture anchors, arthroscopic technique, and equipment. No single lesion responsible for the instability can be identified, although the Bankart lesion is the most important. The following factors should be considered when handling instability in the athlete: Is the lesion of traumatic or overuse etiology? What is the risk of recurrence with regard to age and activity demand (overhead/non-overhead, collision/non-collision athlete)? There are more Level IV studies reporting low failure rates in contact athletes with arthroscopic repair.[14] A high failure rate in athletes is related to the presence of bony defects.[23] Failure of surgical treatment is related to subsequent trauma, the initial cause of instability, age, gender, bony defects, and technical failure. If the source of recurrence is trauma, poor initial surgical technique, or failure of the labrum to heal, one can expect good results with revision surgery, whereas poor results are to be expected if the source of recurrence is an atraumatic case, MDI, or tissue loss or in cases of a psychological issue.

ROTATOR INTERVAL

Recent biomechanical studies on arthroscopic rotator interval (RI) closure have shown relatively consistent findings: Anterior stability is improved (barrier effect; middle glenohumeral ligament imbrication, especially in mid ranges of motion; and middle glenohumeral ligament to superior glenohumeral ligament superior shift); posterior stability is not improved, whereas inferior stability is variably improved.[24,25] Clinical Levels II to IV studies suggest arthroscopic RI closure in certain kinds of instability. In cases of posterior instability, no improvement or necessity for RI closure has been shown.[26] In MDI patients there may be a role for those with a truly symptomatic

inferior sulcus finding that persists in external rotation to help with inferior stability. The biomechanical evidence is mixed on this, whereas the clinical evidence is variable for supporting RI closure. In anterior instability no improvement has been shown in clinical studies. Predictable losses of external rotation after RI closure are of concern.

BONY DEFECTS

Recurrent instability after surgical soft-tissue repair is often related to bony defects of the glenoid.[23,27,28] Bony defects can be divided into (1) acute glenoid fractures, (2) bony Bankart, and (3) chronic bone loss. The bony defect can be (1) glenoid bony defect, (2) a Hill-Sachs lesion, or (3) a McLaughlin lesion. Defects on both the glenoid and the humeral head side can engage and result in locked dislocations. To detect bony defects, it is suggested to evaluate the patient with anteroposterior radiographs in external and internal rotation, as well as to use the Bernageau view. Lo et al.[28] showed that a 7-mm anterior glenoid defect created bone loss of 28% of the area, and they named the defect the "inverted pear" if more than 25% of the anterior glenoid is missing as measured from the bare spot. Ongoing studies are being performed to determine the most precise way to measure the bony defect. Several techniques have been described to repair bony defects: Trillat, Patte, Hebynette, Bristow, Latarjet, and humeral head allograft (Miniaci-Baudi) procedures and resurfacing.[29] Taverna et al.[29] have presented a method for arthroscopic bone block repair that seems promising but is not without technical difficulties.

POSTERIOR INSTABILITY

Posterior shoulder instability is not so frequent but often occurs as part of MDI. In these cases nonoperative treatment provides good results. In cases of traumatic posterior labral lesions, surgical treatment may be necessary. Posterior glenohumeral instability is seen in young athletes, usually as a result of repetitive microtrauma or from a traumatic blow to the anterior shoulder. Approximately 5% of cases of glenohumeral instability are posterior instability. Studies have shown that posterior instability has several soft tissue–related causes, including capsulolabral detachment, capsular laxity, and RI lesions. Nonoperative treatment may be successful in patients with scapular dysfunction. Arthroscopic stabilization has theoretic advantages over open repair, including a better cosmetic result, less postoperative pain, and a shorter hospital stay. Arthroscopic procedures include posterior labral repair with use of techniques similar to those used in open repair, plication, superior shift, or thermal shrinkage of the posteroinferior aspect of the capsule. Patients with a Kim lesion (an incomplete and concealed avulsion of the posteroinferior aspect of the labrum) should be treated with conversion to a complete tear, which is then repaired with the posterior band of the IGHL. Studies show that the posterior band of the IGHL is an effective contributor to posterior stability, especially in internal humeral rotation in 90° of forward flexion (the jerk test position). The overall rate of recurring instability after arthroscopic stabilization for the treatment of unidirectional posterior instability ranges from 0% to 10%. Factors contributing to the failure of posterior repairs include inappropriate patient selection and surgical error. The most common surgical error is a failure to address all components contributing to instability. Failure to treat an RI lesion, a concomitant inferior or anterior component of the instability, excessive glenoid retroversion, a Kim lesion, or posterior erosion of the glenoid rim increases the likelihood of postoperative recurrence.

MULTIDIRECTIONAL INSTABILITY

Since the description of MDI by Neer and Foster,[3] the term and definition have been under continuous debate. Instability in more than 1 direction is not a precise term for the patient to report, and no diagnostic measure can classify or precisely diagnose the condition. Individuals with "true MDI" are rarely athletes. The cause of MDI in athletes can be either nontraumatic or traumatic. Clinically, MDI is characterized by having an inferior component. Neer and Foster reported that a positive sulcus sign was a prerequisite for the diagnosis. External rotation over 90° in adduction is often seen. Evaluation for scapulothoracic motion is essential in patients with MDI because this may show dysfunctions that respond well to physiotherapy. Assessment of stability is best performed in the anesthetized patient, where the degree and direction of the instability can be judged. Surgery, whether open or arthroscopic, aims at reducing volume multidimensionally, whereas physiotherapy aims at improving neuromuscular function to reduce the importance of capsular redundancy.

DISABLED THROWING SHOULDER

The disabled throwing shoulder is characterized by an injury causing an anatomic alteration that results in

a performance alteration. Anatomic alterations contributing to clinical symptoms can be local (glenohumeral internal rotation deficit [GIRD], SLAP lesions, long head of the biceps [LHB] tendinopathy, partial rotator cuff injury, and microinstability) or dysfunctions related to the kinetic chain (scapular dyskinesis, core/hip/trunk flexibility, and weakness).[30-32] The disabled throwing shoulder presents as a gradually developing injury with decreasing performance before overt clinical symptoms. The athlete complains of popping, catching, and pain while performing overhead activities, predominantly located at the posterior joint line. The pathophysiology includes GIRD from repetitive acceleration/overload, which results in increased posterior humeral head translation.[30-32] Scapular dyskinesis is seen with fatigue of the serratus anterior. With the scapula in increased protraction, a shear on posterior labrum/glenoid is created.[32] The LHB is subjected to repeated "peel back," with cocking putting the superior labrum under stress and shear. Clinical examination should address the core/hip/trunk instability, flexibility, and strength. Scapular dysfunction is evaluated in the resting position, during motion upon arm elevation, and by use of corrective maneuvers such as the scapula assistant test, which involves assisting scapular upward rotation by manually stabilizing the upper medial border and rotating the inferomedial border as the arm is abducted. The test is positive when it provides relief of symptoms of impingement, clicking, or rotator cuff weakness. The scapula retraction test involves manually positioning and stabilizing the entire medial border of the scapula. The test is positive when retesting shows increased muscle strength with the scapula in the stabilized position. GIRD is assessed with the patient supine, and tests to provoke pain in the labrum (O'Brien's, apprehension) and the LHB (Speed's and upper cut tests) are performed along with assessment of rotator cuff strength. Treatment of the disabled throwing shoulder is directed toward the dysfunctions of the scapula, core, hip, and trunk. In cases in which progress is lacking, repair of the articular lesions may be needed to return to activity.

ASSOCIATED PATHOLOGY: ROTATOR CUFF AND NERVE LESIONS

Stevens (1926) and Codman (1934) were the first to report that glenohumeral dislocation may cause a rotator cuff tear. Since then, studies have shown that there is a relation between age and the presence of a rotator cuff tear in association with a dislocation.[33] It is debated whether the cuff tear is coincidental, but Berbig et al.,[34] in their prospective study on first-time dislocations with an asymptomatic control group, found that in the age interval of 50 to 70 years, the prevalence of rotator cuff tears was greater than in the control group. In this age group the static instability is rarely symptomatic, whereas a cuff tear can result in a significant dysfunction. Patients in this age group who remain symptomatic may be offered a clinical follow-up with MRI/MRA or ultrasound. The rate of axillary nerve palsy after first-time glenohumeral dislocations has been reported to be from 9% to 64%.[35,36] Axillary nerve palsy can mask a rotator cuff tear, and vice versa. In older patients both lesions may be present. Dislocation of the shoulder associated with massive rotator cuff tear and neurologic injury, also called "the terrible triad of the shoulder," is infrequent but needs attention because early rotator cuff repair offers the best chance for a favorable outcome. It is not recommended to wait for neurologic recovery.[37]

SHOULDER SCORES

The goals of using a shoulder scoring system are to compare different forms of treatment, to compare results, to provide outcome data that will support treatment strategies, and to understand confounding factors that may affect outcomes. A number of scoring systems have been developed and are referenced in the literature.[38-40] These scores must be viewed critically because many are insensitive, unreliable, and invalidated. A standard, universally accepted shoulder scoring system for assessing the functional state of a normal, a diseased, or an operated shoulder does not exist. This may be one of the most important factors in preventing progress in clinical orthopaedics. The Western Ontario Shoulder Instability Index (WOSI) is an example of a rigorously designed and evaluated measuring tool for shoulder function in patients with instability, but it is still not widely used. The WOSI is an example of a test that can be easily integrated in the shoulder specialized unit for continuous online registration of treatment outcome.[41]

REFERENCES

1. Matsen FA III, Harryman DT II, Sidles JA. Mechanics of glenohumeral instability. *Clin Sports Med* 1991;10:783-788.
2. Gerber CH, Ganz R. Clinical assessment of instability of the shoulder with special reference to anterior and posterior draw tests. *J Bone Joint Surg Br* 1984;66:551-556.
3. Neer CS II, Foster CR. Inferior capsular shift for involuntary inferior and multidirectional instability of the shoulder. A preliminary report. *J Bone Joint Surg Am* 1980;62:897-907.

4. Gagey OJ, Gagey N. The hyperabduction test. An assessment of the laxity of the inferior glenohumeral ligament. *J Bone Joint Surg Br* 2000;82:69-74.
5. Harryman DT II, Sidles JA, Harris SL, Matsen FA III. The role of the rotator interval capsule in passive motion and stability of the shoulder. *J Bone Joint Surg Am* 1992;74:53-66.
6. Rockwood CA. Subluxation of the shoulder: The classification, diagnosis and treatment. *Orthop Trans* 1979;4:306-309.
7. Allen AA. Clinical evaluation of the unstable shoulder. In: Warren RF, Craig EV, Altchek DW, eds. *The unstable shoulder*. Philadelphia: Lippincott Raven, 1999;93-106.
8. Schneeberger AG, Hersche O, Gerber C. The unstable shoulder. Classification and therapy. *Orthopaede* 1997;26:909-914.
9. Kuhn JE, Holmes TT, Throckmorton TW, Dunn WR. Development and reliability testing of a system for classifying glenohumeral joint instability. Presented at the American Academy of Orthopaedic Surgeons 75th Annual Meeting, San Francisco, California, March 5-8, 2008.
10. Takubo Y, Horii M, Kurokawa M, Mikami Y, Tokunaga D, Kubo T. Magnetic resonance imaging evaluation of the inferior glenohumeral ligament: Non-arthrographic imaging in abduction and external rotation. *J Shoulder Elbow Surg* 2005;14:511-515.
11. 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;30:576-580.
12. Jakobsen BW, Johannsen HV, Suder P, Søjbjerg JO. Primary repair versus conservative treatment of first-time traumatic anterior dislocation of the shoulder: A randomized study with 10-year follow-up. *Arthroscopy* 2007;23:118-123.
13. Kirkley A, Werstine R, Ratjek A, Griffin S. 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.
14. Larrain MV, Montenegro HJ, Mauas DM, Collazo CC, Pavón F. Arthroscopic management of traumatic anterior shoulder instability in collision athletes: Analysis of 204 cases with a 4- to 9-year follow-up and results with the suture anchor technique. *Arthroscopy* 2006;22:1283-1289.
15. 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;90:945-952.
16. Itoi E, Sashi R, Minagawa H, Shimizu T, Wakabayashi I, Sato K. Position of immobilization after dislocation of the glenohumeral joint. A study with use of magnetic resonance imaging. *J Bone Joint Surg Am* 2001;83:661-667.
17. 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;89:2124-2131.
18. Kibler WB. Management of the scapula in glenohumeral instability. *Tech Shoulder Elbow Surg* 2003;4:89-98.
19. Hobby J, Griffin D, Dunbar M, Boileau P. Is arthroscopic surgery for stabilisation of chronic shoulder instability as effective as open surgery? A systematic review and meta-analysis of 62 studies including 3,044 arthroscopic operations. *J Bone Joint Surg Br* 2007;89:1188-1196.
20. Cole BJ, L'Insalata J, Irrgang J, Warner JJ. Comparison of arthroscopic and open anterior shoulder stabilization. A two to six-year follow-up study. *J Bone Joint Surg Am* 2000;82:1108-1114.
21. Fabbriciani C, Milano G, Demontis A, Fadda S, Ziranu F, Mulas PD. Arthroscopic versus open treatment of Bankart lesion of the shoulder: A prospective randomized study. *Arthroscopy* 2004;20:456-462.
22. Jørgensen U, Svend-Hansen H, Bak K, Pedersen I. Recurrent post-traumatic anterior shoulder dislocation—Open versus arthroscopic repair. *Knee Surg Sports Traumatol Arthrosc* 1999;7:118-124.
23. Burkhart SS, De Beer JF. Traumatic glenohumeral bone defects and their relationship to failure of arthroscopic Bankart repairs: Significance of the inverted-pear glenoid and the humeral engaging Hill-Sachs lesion. *Arthroscopy* 2000;16:677-694.
24. Provencher MT, Mologne TS, Michio H, Zhao K, Tasto JP, An KN. Arthroscopic versus open rotator interval closure: Biomechanical evaluation of stability and motion. *Arthroscopy* 2007; 23:583-592.
25. Plausinis D, Bravman JT, Heywood C, Kummer FJ, Kwon YW, Jazrawi LM. Arthroscopic rotator interval closure: Effect of sutures on glenohumeral motion and anterior-posterior translation. *Am J Sports Med* 2006;34:1656-1661.
26. Mologne TS, Zhao K, Hongo M, Romeo AA, An KN, Provencher MT. The addition of rotator interval closure after arthroscopic repair of either anterior or posterior shoulder instability: Effect on glenohumeral translation and range of motion. *Am J Sports Med* 2008;36:1123-1131.
27. Kim SH, Ha KI, Jung MW, Lim MS, Kim YM, Park JH. Accelerated rehabilitation after arthroscopic Bankart repair for selected cases: A prospective randomized clinical study. *Arthroscopy* 2003;19:722-731.
28. Lo IK, Parten PM, Burkhart SS. The inverted pear glenoid: An indicator of significant glenoid bone loss. *Arthroscopy* 2004; 20:169-174.
29. Taverna E, Golanò P, Pascale V, Battistella F. An arthroscopic bone graft procedure for treating anterior-inferior glenohumeral instability. *Knee Surg Sports Traumatol Arthrosc* 2008; 16:872-875.
30. Burkhart SS, Morgan CD, Kibler WB. The disabled throwing shoulder: Spectrum of pathology. Part I: Pathoanatomy and biomechanics. *Arthroscopy* 2003;19:404-420.
31. Burkhart SS, Morgan CD, Kibler WB. The disabled throwing shoulder: Spectrum of pathology. Part II: Evaluation and treatment of SLAP lesions in throwers. *Arthroscopy* 2003;19:531-539.
32. Burkhart SS, Morgan CD, Kibler WB. The disabled throwing shoulder: Spectrum of pathology. Part III: The SICK scapula, scapular dyskinesis, the kinetic chain, and rehabilitation. *Arthroscopy* 2003;19:641-661.
33. Porcellini G. Shoulder instability and related rotator cuff tears: Arthroscopic findings and treatment in patients aged 40 to 60 years. *Arthroscopy* 2006;22:270-276.
34. Berbig R, Weishaupt D, Prim J, Shahin O. Primary anterior shoulder dislocation and rotator cuff tears. *J Shoulder Elbow Surg* 1999;8:220-225.
35. Gumina S. Anterior dislocation of the shoulder in elderly patients. *J Bone Joint Surg Br* 1997;79:540-543.
36. Toolanen G. Early complications after anterior dislocation of the shoulder in patients over 40 years. An ultrasonographic and electromyographic study. *Acta Orthop Scand* 1993;64:549-552.
37. Simonich SD. Terrible triad of the shoulder. *J Shoulder Elbow Surg* 2003;12:566-568.
38. Kirkley A. Scoring systems for functional assessment of the shoulder. *Tech Shoulder Elbow Surg* 2002;4:220-233.
39. Leggin BG, Iannotti JP. Shoulder outcome measure. In: Iannotti JP, Williams GR, eds. *Disorders of the shoulder: Diagnosis and management*. Philadelphia: Lippincott Williams & Wilkins, 1999;1023-1040.
40. Nagi S. Some conceptual issues in disability and rehabilitation. In: Sussman M, ed. *Sociology and rehabilitation*. Washington, DC: American Sociology Association, 1965;100-113.
41. Kirkley A, Griffin S, McLintock H, Ng L. Development and evaluation of a disease-specific quality of life measurement tool for shoulder instability (WOSI). *Am J Sports Med* 1998;26:764-772.