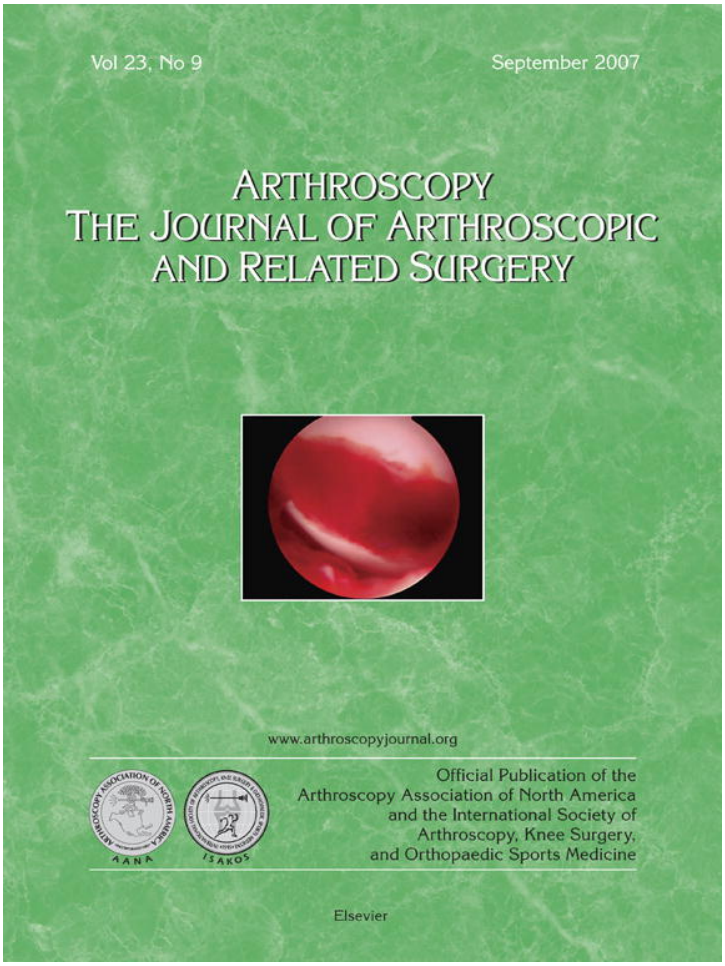
Provided for non-commercial research and education use.
Not for reproduction, distribution or commercial use.



This article was published in an Elsevier journal. The attached copy is furnished to the author for non-commercial research and education use, including for instruction at the author's institution, sharing with colleagues and providing to institution administration.

Other uses, including reproduction and distribution, or selling or licensing copies, or posting to personal, institutional or third party websites are prohibited.

In most cases authors are permitted to post their version of the article (e.g. in Word or Tex form) to their personal website or institutional repository. Authors requiring further information regarding Elsevier's archiving and manuscript policies are encouraged to visit:

http://www.elsevier.com/copyright

Author's personal copy

A Comparison of the Spectrum of Intra-articular Lesions in Acute and Chronic Anterior Shoulder Instability

Christos K. Yiannakopoulos, M.D., Elias Mataragas, M.D., and Emmanuel Antonogiannakis, M.D.

Purpose: The purpose of the study was to compare the incidence of secondary intra-articular shoulder lesions in patients with acute and chronic anterior shoulder instability. The occurrence of glenoid shape alterations (inverted pear glenoid) in recurrent instability was especially examined. **Methods:** Data for all arthroscopically ascertained intra-articular shoulder lesions in a series of 127 patients with acute and chronic traumatic anterior instability were recorded. **Results:** Hemarthrosis was evident in all patients with acute dislocation and in 7 patients with chronic laxity who underwent surgery shortly after a dislocation episode. In both groups the presence of a chondral or osteochondral Hill-Sachs lesion was noted in 112 patients (88.1%), a Bankart lesion was noted in 106 patients (83.46%), an anterior labroligamentous periosteal sleeve avulsion (ALPSA) lesion was noted in 13 patients (10.23%), a SLAP lesion was noted in 26 patients (20.47%), a humeral avulsion of the glenohumeral ligament (HAGL) lesion was noted in 2 acutely dislocated shoulders (1.57%), and capsular laxity was noted in 33 patients (25.98%). All ALPSA lesions were noted in patients with chronic instability ($P = .044$), and both HAGL lesions were found in patients with acute dislocations ($P = .002$). In patients with acute dislocations the incidence of Bankart lesions was 78.2% (18/23), whereas in chronic cases the incidence of Bankart or ALPSA lesions was 97.11% (101/104) ($P = .002$). In the group with acute dislocations there was a Hill-Sachs lesion in 15 cases (65.21%) and chronic recurrent instability accounted for 97 cases (93.26%) ($P = .001$). The capsule was considered lax in 2 patients with acute instability and 31 patients with chronic instability (8.69% *v* 29.8%, $P = .037$). The overall frequency of SLAP lesions was not statistically significant between acute and chronic cases ($P = .868$), unlike their distribution. In acute cases there were 3 type I and 2 type II SLAP lesions, whereas in chronic cases there were 4 type I, 13 type II, 3 type III, and 1 type IV SLAP lesions. Loose bodies were found and removed in 17 chronic and 4 acute cases (16.34% *v* 13.04%, $P = .903$). A partial-thickness articular rotator cuff tear was found in 14 patients: 12 with chronic dislocations and 2 with acute dislocations (11.53% *v* 8.69%, $P = .694$). The cuff tears were partial articular surface tears, involving less than 25% of the cuff thickness, and were treated with debridement, and cuff repair was not necessary in any case. The inverted pear configuration of the glenoid was found in 16 cases with chronic instability (15.38%), whereas no patient with an acutely dislocated shoulder had an inverted pear–shaped glenoid ($P = .044$). **Conclusions:** Associated, secondary intra-articular lesions are more frequent in patients with chronic compared with acute shoulder instability, probably as a result of the repeated dislocation or subluxation episodes. **Level of Evidence:** Level IV, prognostic case series. **Key Words:** Arthroscopy—Bankart lesion—Hill-Sachs lesion—Instability—Shoulder.

The shoulder joint (comprising the glenohumeral and scapulothoracic joints) displays the greatest range of motion of all joints in the human body, and preservation of its stability is essential to its function.[1] The glenohumeral joint is an inherently unstable ball-and-socket joint, and it is susceptible to a variety of injuries, especially dislocation. The overall incidence of shoulder dislocation in adults aged between 18 and 70 years is 1.7%, and it is 3 times more common in male patients.[2] The prevalence rate of shoulder dislo-

From the Second Orthopaedic Department, Army General Hospital, Athens, Greece.

The authors report no conflict of interest.

Address correspondence and reprint requests to Christos K. Yiannakopoulos, M.D., Byzantiou 2, 171 21 Nea Smyrni, Athens, Greece. E-mail: cky@ath.forthnet.gr

© 2007 by the Arthroscopy Association of North America

0749-8063/07/2309-4672$32.00/0
doi:10.1016/j.arthro.2007.05.009

Author's personal copy

cations in patients aged less than 21 years is 19.7 in 10,000 for men and 5.01 in 10,000 for women, although in men aged between 22 and 33 years, the incidence is 42.4 in 10,000.[3]

The term *shoulder instability* refers to a variety of mechanisms and clinical presentations including symptomatic and asymptomatic laxity, subluxation, and dislocation. Acute and chronic anterior shoulder instability is accompanied by secondary injuries of the humeral head, articular cartilage, anterior and posterior capsule, glenohumeral ligaments, and glenoid and biceps tendon. Significant injuries occur during the initial shoulder dislocation event, and additional soft-tissue, cartilage, and bony injury may occur with every subsequent dislocation episode. The severity of associated injuries may increase with time as a result of repeated dislocation or subluxation episodes. The severity of labrum lesions in post-traumatic shoulder instability increases with time.[4] Associated injuries may influence long-term outcome. The goal of all reconstructive procedures in the unstable shoulder is to reduce the amount of pathologic translation and avoid secondary morbidity to intra- and extra-articular structures.

The association of secondary injuries with the duration of time since the original injury is well established in anterior cruciate ligament (ACL)–deficient knees in adults and adolescents. The delay in ACL reconstruction increases the incidence of associated meniscal and osteochondral injuries.[5,6] The meniscal injuries in chronic ACL insufficiency are more complex and less amenable to surgical repair.[7]

The purpose of this study was to report the prevalence of associated lesions in a series of young male patients with traumatic acute and chronic anterior shoulder instability.

METHODS

In our department 127 male patients with traumatic acute and chronic anterior shoulder instability underwent diagnostic and operative arthroscopy of the shoulder joint. All findings were recorded prospectively by use of a special evaluation form. Arthroscopy was performed within 10 days of the first dislocation episode in 23 patients (18.11%), whereas the instability was chronic and recurrent in the rest. Most patients were military cadets, with a mean age at the time of surgery of 23.8 years (range, 17 to 29 years). The time interval since the last dislocation episode ranged between 2 and 10 days in acute dislocation cases and between 8 months and 2 years in patients with chronic instability. The number of subjectively reported dislocations or subluxations in our patients ranged from 1 to approximately 50 (mean, 9.3). Patients with recurrent instability reported between 6 and 50 instability episodes (mean, 8.3). In all patients a discrete shoulder injury episode was reported, whereas none had a history of shoulder instability or other shoulder symptoms before dislocation. The occurrence of dislocation was verified radiographically in 109 patients. Reduction was performed by a physician in 118 patients and by the patient or other individuals in 9. The first dislocation occurred after a fall in 47 cases, during athletic activities in 71, and after a motor vehicle accident in 9. The preoperative diagnostic evaluation included a detailed history, clinical examination, and imaging studies. The clinical evaluation included performance of the anterior and posterior drawer tests, the sulcus test, and the apprehension and relocation tests. Radiologic evaluation included anteroposterior and axillary views, as well as the West Point view occasionally, and magnetic resonance imaging was also performed in 57 patients.

Shoulder stability was examined with the patient under anesthesia. Translation of the humeral head to the edge of the glenoid was rated 1+, translation anterior to the glenoid with spontaneous reduction was rated 2+, and a non–spontaneously reduced dislocation was rated 3+. All procedures were performed with the patient in the lateral decubitus position via 1 posterior viewing portal and 2 anterior working portals. The shoulder joint was evaluated systematically after the use of a 15-point examination scheme, with examination of 10 points from the posterior portal and 5 points from the anterior portals while the arthroscope was being alternated between the portals. The morphology of the glenoid was evaluated from the anterior-superior portal. Increased capsular volume at arthroscopy was based on the presence of a "drive-through" sign and redundancy of the capsule and glenohumeral ligaments with and without saline solution distention of the joint. Other criteria were the presence of external rotation greater than 100° and at least 50% anterior humeral head translation during arthroscopy.

After completion of the operation and infiltration with local anesthetic, the skin wounds were sutured and the upper limb was immobilized in a Velpeau bandage.

The comparison of the frequencies between the 2 groups was performed with the χ^2 test. Continuous variables (age, number of dislocations) were com-

Author's personal copy

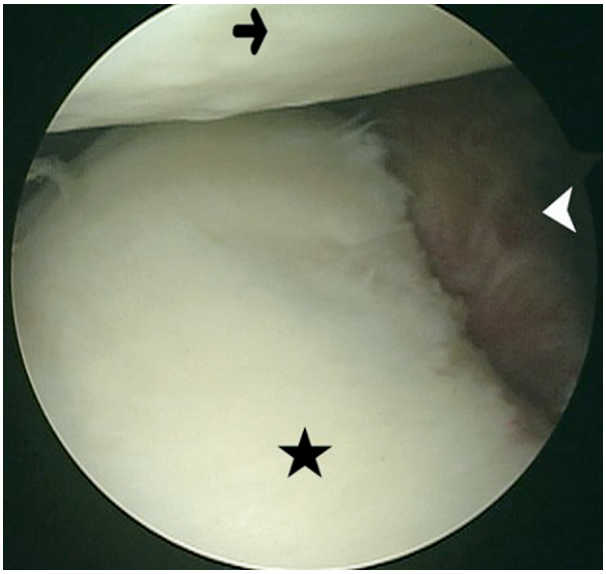


FIGURE 1. ALPSA lesion: Left shoulder in a patient with recurrent anterior instability viewed from anterior-superior portal. The anterior capsulolabral complex (arrowhead) is avulsed from its original position on the edge of the glenoid (star) and attached on the glenoid neck. The humeral head (arrow) is anteriorly subluxated.

pared by use of the unpaired *t* test. A difference was considered significant at $P < .05$.

RESULTS

Hemarthrosis was evident in all patients with acute dislocation and in 7 patients with chronic laxity who underwent operation soon after a recent dislocation episode. Of the patients, 12 had mild instability (1+), 94 had anterior instability with spontaneous reduction (2+), and 21 had anterior instability with nonreducing dislocation (3+). In both groups the presence of a chondral or osteochondral Hill-Sachs lesion was noted in 112 patients (88.1%), a Bankart lesion was noted in 106 patients (83.46%), an anterior labroligamentous periosteal sleeve avulsion (ALPSA) lesion (Fig 1) was noted in 13 patients (10.23%), a SLAP lesion was noted in 26 patients (20.47%), a humeral avulsion of the glenohumeral ligament (HAGL) lesion was noted in 2 acutely dislocated shoulders (1.57%), and capsular laxity was noted in 33 patients (25.98%). The results are presented in Table 1. All ALPSA lesions were noted in patients with chronic instability ($P = .044$), whereas both HAGL lesions occurred in patients with acute dislocations ($P = .002$). In patients with an acute dislocation the incidence of Bankart lesions was 78.2% (18/23), whereas in chronic cases the incidence of Bankart or ALPSA lesions was 97.11% (101/104); the difference was statistically significant ($P = .002$). A Hill-Sachs lesion was found in 15 cases in the group with acute dislocations (65.21%) and in 97 cases in the chronic recurrent instability group (93.26%) ($P = .001$). The capsule was considered lax in 2 patients with acute instability and 31 patients with chronic instability (8.69% *v* 29.8%, $P = .037$). In 119 patients the labrum was reattached via suture anchors, and open reconstruction was performed in the rest. Both patients with a HAGL lesion underwent open shoulder reconstruction, although this lesion could have been repaired arthroscopically. The frequencies of SLAP lesions were not significantly different between acute and chronic cases ($P = .868$), unlike their distribution. In both groups there were 7 type I, 15 type II, 3 type III, and 1 type IV SLAP

TABLE 1. *Arthroscopic Findings in Acute and Chronic Shoulder Instability*

Parameter	Acute Instability	Chronic Instability	*P* Value	Total
No. of patients	23	104		127
Mean age at operation (yr)	21.9 (17-26)	26.8 (17-32)	.16	24.8 (17-32)
No. of instability episodes	1	8.3 (6-50)	<.001	(6.4) 1-50
Hemarthrosis	23	7	<.001	30 (23.62%)
Bankart/ALPSA lesion	18 (78.2%)	101 (97.11%)	.002	119 (93.7%)
Bony Bankart	3 (13.04%)	11 (10.57%)	.733	14 (11.02%)
ALPSA lesion	0	13 (12.5%)	.074	13 (10.23%)
Hill-Sachs lesion	15 (65.21%)	97 (93.26%)	.001	112 (88.1%)
Inverted pear glenoid	0	16 (15.38%)	.044	39 (30.7%)
HAGL lesion	2 (1.5%)	0	.002	2 (1.18%)
Capsular laxity	2 (8.69%)	31 (29.8%)	.037	33 (25.98%)
SLAP lesion	5 (21.73%)	21 (20.19%)	.868	26 (20.47%)
Cuff tear	2 (8.69%)	12 (11.53%)	.694	14 (11.02%)
Loose bodies	4 (13.04%)	17 (16.34%)	.903	21 (16.5%)

Author's personal copy

lesions. In acute cases there were 3 type I and 2 type II SLAP lesions, whereas in chronic cases there were 4 type I, 13 type II, 3 type III, and 1 type IV SLAP lesions. Type II lesions were repaired arthroscopically with bone anchors, type III bucket-handle lesions were excised, and biceps tenodesis was performed for type IV lesions. Loose bodies were found and removed in 17 chronic and 4 acute cases (16.34% *v* 13.04%, $P = .903$). The loose bodies were chondral or osteochondral and originated from the femoral head or the glenoid as a result of the impact of the dislocation. A partial-thickness articular surface rotator cuff tear was found in 14 patients: 12 with chronic dislocations and 2 with acute dislocations (11.53% *v* 8.69%, $P = .694$). The cuff tears were only partial articular surface tears, involving less than 25% of the cuff thickness, and were treated with debridement, and cuff repair was not necessary in any case. The inverted pear configuration of the glenoid (Fig 2) was found in 16 cases with chronic instability (15.38%), whereas no patient with acute shoulder dislocation had an inverted pear–shaped glenoid ($P = .044$). In 6 patients with significant bone loss a coracoid transfer procedure was performed. Minor bony Bankart lesions (<5 mm) were noted in 2 patients with acute dislocations and 11 patients with chronic instability but were not addressed.

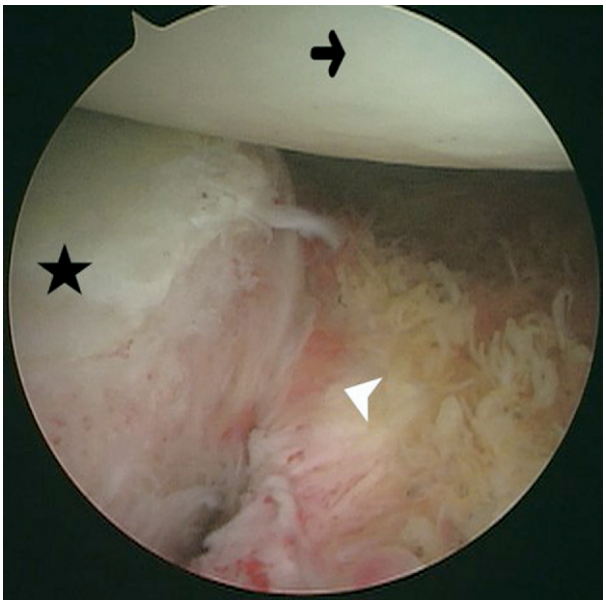


Figure 2. Left shoulder in same patient as in Fig 1 viewed from anterior-superior portal. The morphology of the glenoid (star) is altered, resembling an inverted pear. An ALPSA lesion (arrowhead) and the humeral head (arrow) are evident.

DISCUSSION

The prevalence of glenohumeral joint lesions was described in a series of patients with acute and recurrent anterior shoulder instability. Patients with recurrent shoulder instability had significantly more associated lesions relative to patients with acute dislocations. In both acutely and chronically unstable shoulders, multiple lesions coexist, and these have to be addressed at surgery.

The spectrum of the pathoanatomic lesions encountered in shoulder instability is broad.[8-16] The arthroscopic findings in patients with acute instability are quantitatively and qualitatively different from the findings in patients with chronic instability. The significance of the arthroscopic findings in predicting instability recurrence is still challenged. In a series of patients with acute shoulder dislocation, te Slaa et al.[16] did not observe any correlation between recurrence rate and arthroscopic findings. Age was the only predictive factor. In our series hematoma was found in all acute cases, whereas the incidence of most associated injuries, including Bankart, Hill-Sachs, SLAP, and inverted pear lesions, was higher in the chronic instability group. A striking difference between acute and chronic cases was the presence of an inverted pear–shaped glenoid only in cases with recurrent instability (15.38% *v* 0%). All ALPSA lesions were found in chronic cases, whereas both HAGL lesions were found in acute cases, but this finding probably underestimates the prevalence of this lesion in patients with recurrent instability. The more severe subtypes of SLAP lesions, types III and IV, were encountered in chronic cases, possibly as a result of repeated dislocation episodes. There was no difference in the presence of loose bodies, chondral and osteochondral (16.34% *v* 13.04%), and in the occurrence of rotator cuff partial tears (11.53% *v* 8.69%) between the 2 groups.

The difference between acute and chronic instability is a result of intervention of the healing response of the traumatized tissues and the occurrence of repetitive dislocation or subluxation episodes, which led to additional injuries. For example, a capsular tear in acute instability may present as capsular laxity in chronic cases,[17] whereas ALPSA lesions are more likely to occur in chronic cases because the detached labrum has more time to heal medially on the glenoid neck.

Although a Bankart lesion was considered the "essential" lesion of anterior shoulder instability, it is not always present. This lesion was found in 93.7% of the

Author's personal copy

patients with anterior shoulder dislocation and was more common in chronic than acute instability (97.11% *v* 78.2%). The typical Bankart lesion may be encountered in symptomatic atraumatic shoulder instability associated with pathologic laxity of the capsule with or without a labral lesion.[18] In experimental studies with selective ligament cutting, re-creation of the Bankart lesion is not enough to cause shoulder dislocation.[19] A midsubstance complete capsular tear may also cause anterior instability. The incidence of this lesion is low (4%) and is accompanied by a small or nonexistent Hill-Sachs lesion.[20]

The reported incidence of Bankart and Hill-Sachs lesions varies. Sugaya et al.[21] examined 100 patients with recurrent anterior glenohumeral instability and found a Bankart lesion in 97% of their patients and an osseous Bankart lesion in 50%. In a series of 25 patients with acute shoulder dislocation, Hart and Kelly[22] found that Bankart and Hill-Sachs lesions were evident in 23 cases, whereas loose bodies were found in 8 cases. In the report of Norlin[15] on acute shoulder dislocations, the incidence of Bankart and Hill-Sachs lesions was 100%. In a similar study on acute dislocations, Taylor and Arciero[14] found a 97% incidence of Bankart lesions with no macroscopic evidence of ligament injury. In the same study no cuff tears were reported. Baker et al.[11] examined 45 patients arthroscopically within 10 days after the initial shoulder dislocation. Most patients (n = 28) had capsular tears, labral detachment, and unstable shoulders with large hemarthrosis. In a mixed population of 212 patients with at least 1 shoulder dislocation, 87% had labral tears, 79% had insufficiency of the anterior capsule, and 68% had Hill-Sachs lesions.[23] A significant difference between this study and ours is the increased incidence of complete rotator cuff tears. In our study only partial undersurface cuff tears were found compared with 14% of complete tears in the other study. A strong correlation between instability episodes and rotator cuff tears is evident in patients aged 40 to 60 years. The correlation is stronger when the number of dislocations is more than 7.[24]

In atraumatic instability the arthroscopic findings may also be predictable. In a study of 43 patients with atraumatic instability resistant to physiotherapy, 44.2% had capsule elongation, 30.2% had typical Bankart lesions, and 25.6% had complex lesions of the labrum and capsule whereas Hill-Sachs lesions were identified in 60.5%.[18]

Knowledge of the variety of associated lesions in shoulder instability aids surgical treatment. The most common errors in anterior shoulder instability operations leading to instability recurrence are failure to recognize the presence of a defective anterior glenoid rim and failure to reduce capsular redundancy.[25] The detached anterior labrum may adhere to the glenoid neck and macroscopically give the impression of a stable connection, which is actually functionally incompetent, forming an ALPSA lesion. This lesion was encountered in our series only in chronic cases. Failure to recognize, mobilize, and restore the labrum to its original location is a common cause of failure of arthroscopic techniques.[26]

The incidence of Hill-Sachs lesion is generally higher than previously thought.[27] This lesion occurs on the articular surface posterior to the humeral greater tuberosity and must be distinguished from the denuded articular cartilage, the non-articulating bare area of the humeral head. The Hill-Sachs lesion may be limited to the articular cartilage or may extend to the subchondral bone.[15] The incidence of Hill-Sachs lesions in acute cases was less than that in chronic cases (65.21% *v* 93.26%). In a study examining the results of arthroscopic treatment of acute and recurrent traumatic anterior shoulder instability in rugby players, it was shown that the incidence of small and large bone defects as well as capsular laxity was increased in chronic instability cases compared with acute instability cases.[28]

The normal glenoid is pear-shaped, whereas in patients with recurrent dislocation there is significant bone and cartilage loss from the anteroinferior glenoid rim as a result of the repeated impact of the humeral head.[29] The presence of an inverted pear–shaped glenoid predisposes patients to instability recurrence in those involved in contact sports.[29] In our series only patients with recurrent instability had an inverted pear–shaped glenoid. This finding was not uncommon and was noticed in 15.38% of our patient group. In the arthroscopic study by Lo et al.[29] the glenoid bone loss averaged 36%; however, when they examined cadaveric shoulders, it was estimated that 27% to 30% of the glenoid had to be removed to alter its shape to an inverted pear. In a biomechanical study Itoi et al.[30] reported that a loss of 21% of the glenoid may cause shoulder instability. In patients with this glenoid morphology, a bone block procedure such as the Latarjet procedure seems to be more appropriate to re-establish the glenoid articular arc.[30]

CONCLUSIONS

Arthroscopy helps to locate and quantify the associated lesions in patients with anterior shoulder insta-

Author's personal copy

bility. The incidence of shoulder lesions increases with time because the initial dislocation and secondary lesions are more common in patients with chronic instability. In symptomatic, unstable shoulders, early stabilization may be recommended to prevent secondary injuries.

REFERENCES

1. Labriola JE, Lee TQ, Debski RE, McMahon PJ. Stability and instability of the glenohumeral joint: The role of shoulder muscles. *J Shoulder Elbow Surg* 2005;14:32S-38S (suppl S).
2. Hovelius L. Incidence of shoulder dislocation in Sweden. *Clin Orthop Relat Res* 1982:127-131.
3. Milgrom C, Mann G, Finestone A. A prevalence study of recurrent shoulder dislocations in young adults. *J Shoulder Elbow Surg* 1998;7:621-624.
4. Habermeyer P, Gleyze P, Rickert M. Evolution of lesions of the labrum-ligament complex in posttraumatic anterior shoulder instability: A prospective study. *J Shoulder Elbow Surg* 1999;8:66-74.
5. Millett PJ, Willis AA, Warren RF. Associated injuries in pediatric and adolescent anterior cruciate ligament tears: Does a delay in treatment increase the risk of meniscal tear? *Arthroscopy* 2002;18:955-999.
6. Maffulli N, Binfield PM, King JB. Articular cartilage lesions in the symptomatic anterior cruciate ligament-deficient knee. *Arthroscopy* 2003;19:685-690.
7. Keene GC, Bickerstaff D, Rae PJ, Paterson RS. The natural history of meniscal tears in anterior cruciate ligament insufficiency. *Am J Sports Med* 1993;21:672-679.
8. Arciero R, Wheeler J, Ryan J, McBride J. Arthroscopic Bankart repair versus nonoperative treatment for acute, initial anterior shoulder dislocations. *Am J Sports Med* 1994;22:589-594.
9. Deitch J, Mehlman CT, Foad SL, Obbehat A, Mallory M. Traumatic anterior shoulder dislocation in adolescents. *Am J Sports Med* 2003;31:758-763.
10. O'Neil D. Arthroscopic Bankart repair of anterior detachments of the glenoid labrum. *J Bone Joint Surg Am* 1999;81:1357-1365.
11. Baker CL, Uribe JW, Whitman C. Arthroscopic evaluation of acute initial anterior shoulder dislocations. *Am J Sports Med* 1990;18:25-28.
12. Hintermann B, Gachter A. Arthroscopic findings after shoulder dislocation. *Am J Sports Med* 1995;23:545-551.
13. Mok DW, Fogg AJ, Hokan R, Bayley JI. The diagnostic value of arthroscopy in glenohumeral instability. *J Bone Joint Surg Br* 1990;72:698-700.
14. Taylor D, Arciero R. Pathologic changes associated with shoulder dislocations. Arthroscopic and physical examination findings in first-time traumatic anterior dislocations. *Am J Sports Med* 1997;25:306-311.
15. Norlin R. Intraarticular pathology in acute, first-time anterior shoulder dislocation: An arthroscopic study. *Arthroscopy* 1993;9:546-549.
16. te Slaa RL, Brand R, Marti RK. A prospective arthroscopic study of acute first-time anterior shoulder dislocation in the young: A five-year follow-up study. *J Shoulder Elbow Surg* 2003;12:529-534.
17. Mologne T, McBride M, Lapoint J. Assessment of failed arthroscopic anterior labral repairs. Findings at open surgery. *Am J Sports Med* 1997;25:813-817.
18. Werner AW, Lichtenberg S, Schmitz H, Nikolic A, Habermeyer P. Arthroscopic findings in atraumatic shoulder instability. *Arthroscopy* 2004;20:268-272.
19. Pouliart N, Marmor S, Gagey O. Simulated capsulolabral lesion in cadavers: Dislocation does not result from a Bankart lesion only. *Arthroscopy* 2006;22:748-754.
20. Mizuno N, Yoneda M, Hayashida K, Nakagawa S, Mae T, Izawa K. Recurrent anterior shoulder dislocation caused by a midsubstance complete capsular tear. *J Bone Joint Surg Am* 2005;87:2717-2723.
21. Sugaya H, Moriishi J, Dohi M, Kon Y, Tsuchiya A. Glenoid rim morphology in recurrent anterior glenohumeral instability. *J Bone Joint Surg Am* 2003;85:878-884.
22. Hart WJ, Kelly CP. Arthroscopic observation of capsulolabral reduction after shoulder dislocation. *J Shoulder Elbow Surg* 2005;14:134-137.
23. Hintermann B, Gachter A. Arthroscopic findings after shoulder dislocation. *Am J Sports Med* 1995;23:545-551.
24. Porcellini G, Paladini P, Campi F, Paganelli M. Shoulder instability and related rotator cuff tears: Arthroscopic findings and treatment in patients aged 40 to 60 years. *Arthroscopy* 2006;22:270-276.
25. Tauber M, Resch H, Forstner R, Raffl M, Schauer J. Reasons for failure after surgical repair of anterior shoulder instability. *J Shoulder Elbow Surg* 2004;13:279-285.
26. Mologne T, McBride M, Lapoint J. Assessment of failed arthroscopic anterior labral repairs. Findings at open surgery. *Am J Sports Med* 1997;25:813-817.
27. Calandra JJ, Baker CL, Uribe J. The incidence of Hill-Sachs lesions in initial anterior shoulder dislocations. *Arthroscopy* 1989;5:254-257.
28. Larrain MV, Montenegro HJ, Mauas DM, Collazo CC, Pavon 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.
29. Lo IK, Parten PM, Burkhart SS. The inverted pear glenoid: An indicator of significant glenoid bone loss. *Arthroscopy* 2004; 20:169-174.
30. Itoi E, Lee SB, Berglund LJ, Berge LL, An KN. 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.