



First-time traumatic anterior dislocation of the shoulder in young adults : The position of the arm during immobilisation revisited

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In contrast to the surgical treatment of chronic shoulder instability, there are only scarce publications about the management after a first episode of anterior shoulder dislocation and how to prevent the evolution towards chronic instability. We present here a review of the literature on this subject. Particular attention is paid to recent studies about the position of the arm during immobilisation. According to recent views, it may be preferable to immobilise the arm in external rather than internal rotation, but this has to be confirmed by further clinical studies. The issue of early arthroscopic stabilisation after a first dislocation event in young athletic patients is also discussed.

Keywords : shoulder ; dislocation ; immobilisation.

INTRODUCTION

The shoulder is the most mobile joint of the human body, offering the widest range of motion. In return for this mobility, the gleno-humeral joint is exposed to instability, as it has no inherent stability from the bony anatomy. Static stability of the gleno-humeral joint is provided by the articular soft tissues including the labrum, capsule and ligaments and by the negative intra-articular pressure. Instability can be defined as the inability to maintain the humeral head on the glenoid during a movement and this phenomenon causes apprehension and/or pain (8, 10). Anterior dislocation is the most common manifestation of instability and is

most often caused by trauma. Once the stabilising structures such as the labrum have been injured after a first episode, the risk of recurrence is higher in young patients, especially in teenagers (34).

Most literature dealing with recurrent anterior dislocation of the shoulder has addressed pathophysiological or anatomical considerations (33, 34, 39, 41), whereas many surgical techniques including arthroscopy (35, 43, 45) have been described. In contrast, there are only few studies on the position of shoulder immobilisation after the first episode. Until recently, the arm was undisputedly immobilised in internal rotation.

THE LESION

Detachment of the labrum from the antero-inferior rim of the glenoid, the so-called Bankart lesion (3), is the most common lesion associated with first-time anterior dislocation of the shoulder (35, 40).

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The detached labrum is the terminal insertion of the inferior gleno-humeral ligament which is the major structural restraint to the development of an anterior instability (41). A mid-substance tear of the inferior gleno-humeral ligament and capsule is less common in young patients (32). The Bankart lesion alone is not sufficient for a shoulder to dislocate. Experimentally, Bigliani *et al* (4) and Speer *et al* (39) found that significant plastic deformation of the inferior gleno-humeral ligament must occur before the labrum is avulsed from its bony attachment.

FACTORS OF RECURRENCE

Age at the first episode is the most significant single factor that affects the rate of redislocation. The pivotal study of Hovelius *et al* (18) confirms the influence of age at the first occurrence. The recurrence rate decreased with age : 34% in patients less than 22 years old, 28% in patients less than 29 years old and 9% in patients older than thirty years. These findings were confirmed by numerous authors (12, 15, 16, 24, 26, 27, 36-38, 42, 46). One of the main reasons advocated is that there is a constant avulsion of the labrum with poor self-healing capacity in the young patient, whereas in older patients, the incidence of capsular disruption with good healing prognosis increases (10, 25, 32, 33).

The influence of associated lesions such as a humeral head impression fracture or a greater tuberosity fracture on the rate of recurrence has also been studied. At the end of the dislocation, the humeral head will be impacted by the antero-inferior rim of the glenoid, causing a Hill-Sachs lesion, first described by Malgaigne, a French surgeon in the nineteenth century (29). Most anteriorly dislocated humeral heads will have this impaction fracture at their posterolateral side with a variable depth (6). It is generally believed that this fracture plays no role in recurrent instability unless it involves more than 30% of the articular surface (12, 15, 18, 34, 35). The presence of an associated fracture of the greater tuberosity is a good prognostic factor : patients with this fracture after a shoulder dislocation have less chance of redislocation (12, 15-17, 36, 42).

IMMOBILISATION REVISITED

Duration of immobilisation

Currently a first time shoulder dislocation is immobilised with a sling in a position of internal rotation for a period of about 2 to 4 weeks.

Most authors conclude that the duration of immobilisation does not influence the redislocation rate (14, 16-18, 27, 30, 36, 46). However Rowe and Sakellarides (34) found that absence of immobilisation had a detrimental effect on the recurrence rate compared to a 3-week period of immobilisation. Similarly, Kiviluoto *et al* (24) found a difference in the redislocation rate according to the duration of immobilisation in the patient group under 30 years of age : immobilisation for one week gives a statistically significant higher rate of redislocation than immobilisation during three weeks.

Maeda *et al* (28) found that in rugby players the time course between the first and the second dislocation was longer if the shoulder was initially immobilised for 4 weeks or more, compared to another similar group immobilised for less than 3 weeks.

Position of immobilisation

Before the pivotal studies of Itoi *et al* (19, 20), immobilisation in internal rotation was not questionable despite the absence of experimental data to support this position (18, 24, 35, 38). Considering that the recurrence rate remained high and that there was no consensus on the duration of immobilisation, these authors examined the optimal position of the shoulder in order to obtain approximation of the torn edges of the inferior gleno-humeral ligament. They found on a cadaver study that provided that the arm was adducted, both internal and external rotation were able to coapt the lesion. However, it was also observed that subscapularis tension in the front of the Bankart lesion favoured the application of the labrum against the glenoid. This observation was further verified in human volunteers and patients with an initial dislocation. Separation and displacement of the antero-inferior labrum were measured with magnetic resonance imaging. They concluded that external rotation of the arm repositioned a Bankart lesion better than internal rotation.

After this experimental work, Itoi *et al* (21) conducted a prospective clinical study in 40 patients to determine if immobilisation with the arm in external rotation could prevent or decrease the recurrence rate. Provisional results are supportive for the arm being held for three weeks in external rotation as with a mean follow-up of 15 months, they found 30% of redislocation in the internal rotation group compared to no recurrence for the patients immobilised in external rotation.

Another confirmation of this hypothesis came from Miller *et al* (31), who found in a cadaveric study that the contact force between the glenoid and the labrum increased with progressive external rotation of the arm.

Hart and Kelly (13) further support this concept as they arthroscopically observed a better approximation of the detached labrum to the glenoid in external rotation.

A possible drawback of maintaining the arm in external rotation is discomfort. This position needs a bulky supportive device (with belts and straps) that might discourage compliance to the treatment. Itoi *et al* (21) found that a position of 30° of external rotation was not well tolerated by the patients. In contrast, patients felt comfortable with an amount of 10° of external rotation and this position still gives a positive contact force between the Bankart lesion and the glenoid. In the clinical study of Itoi *et al* (21), there was no significant difference in compliance between immobilisation in internal or external rotation. Respectively five and four patients discontinued their immobilisation after one week on their own decision.

At this stage, we need more clinical and radiological studies with a longer follow-up and larger patients cohorts to confirm the conclusions of Itoi and his group, but it may be possible that in a near future, first-time shoulder dislocators will be immobilised in external rather than internal rotation.

EARLY STABILISATION IN YOUNG ATHLETIC PATIENTS

Because age is the most prominent factor in predicting redislocation, surgery is considered earlier in young patients. Arthroscopic stabilisation in

patients younger than 30 years remains controversial but has been advocated by Wheeler *et al* (45). In another prospective study, Arciero *et al* (1) found 80% of recurrence in a non-operated group compared to 14% in the arthroscopically treated group. Kralinger *et al* (26) came to similar conclusions. There is a consensus only for the younger (< 30 years) high-level athletes returning to competition. They are considered good candidates for immediate surgical treatment after a first episode of anterior shoulder dislocation (2, 5, 7, 9, 11, 22, 23, 44, 45).

However, these studies compared conventional immobilisation versus surgical stabilisation but no comparison has been made so far with immobilisation in external rotation.

CONCLUSION

It is evident that strict immobilisation for three weeks is mandatory in order to diminish the risk of recurrence after a first episode of anterior shoulder dislocation in young adults. The influence of the position of shoulder immobilisation on the recurrence rate needs to be studied on more patients and with longer follow-up. Should the preliminary results of Itoi and his group be confirmed, then immobilisation in internal rotation may be abandoned. In such event, early arthroscopic stabilisation in young high-level athletes should perhaps no longer be recommended.

REFERENCES

1. Arciero RA, Wheeler JH, Ryan JB, McBride JT. Arthroscopic Bankart repair versus nonoperative treatment for acute, initial anterior shoulder dislocations. *Am J Sports Med* 1994 ; 22 : 589-594.
2. Arciero RA, St Pierre P. Acute shoulder dislocation. Indications and techniques for operative management. *Clin Sports Med* 1995 ; 14 : 937-953.
3. Bankart A. The pathology and treatment of recurrent dislocation of the shoulder joint. *Br J Surg* 1938 ; 26 : 23-29.
4. Bigliani L, Pollock R, Soslowsky LJ *et al*. Tensile properties of the inferior glenohumeral ligament. *J Orthop Res* 1992 ; 10 : 187-197.
5. 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.
6. **Calandra J, Baker C, Uribe J.** The incidence of Hill-Sachs lesions in initial anterior shoulder dislocation. *Arthroscopy* 1989 ; 5 : 254-257.
 7. **Cleeman E, Flatow EL.** Shoulder dislocations in the young patient. *Orthop Clin North Am* 2000 ; 31 : 217-229.
 8. **Cole B, Warner J.** Anatomy, biomechanics and pathophysiology of glenohumeral instability. In : Iannotti J and Williams G. *Disorders of the Shoulder : Diagnosis and Management*. Lippincott Williams & Wilkins, Philadelphia 1999, pp 207-222.
 9. **Edmonds G, Kirkley A, Birmingham TB, Fowler PJ.** The effect of early arthroscopic stabilization compared to nonsurgical treatment on proprioception after primary traumatic anterior dislocation of the shoulder. *Knee Surg Sports Traumatol Arthrosc* 2003 ; 11 : 116-121.
 10. **Gerber C.** Instabilité antérieure chronique de l'épaule. In : Duparc J. (ed) *Conférences d'Enseignement de la Sofcot*, Expansion scientifique française, Paris, 1995, pp 111-122.
 11. **Good CR, MacGillivray JD.** Traumatic shoulder dislocation in the adolescent athlete : advances in surgical treatment. *Curr Opin Pediatr* 2005 ; 17 : 25-29.
 12. **Habermeyer P, Jung D, Ebert T.** Treatment strategy in first traumatic anterior dislocation of the shoulder. Plea for a multi-stage concept of preventive initial management. *Unfallchirurg* 1998 ; 101 : 328-341.
 13. **Hart W, Kelly C.** Arthroscopic observation of capsulolabral reduction after shoulder dislocation. *J Shoulder Elbow Surg* 2005 ; 14 : 134-137.
 14. **Henry J, Genung J.** Natural history of glenohumeral dislocation revisited. *Am J Sports Med* 1982 ; 10 : 135-137.
 15. **Hoelen MA, Burgers AM, Rozing PM.** Prognosis of primary anterior shoulder dislocation in young adults. *Arch Orthop Trauma Surg* 1990 ; 110 : 51-54.
 16. **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* 1983 ; 65-A : 343-349.
 17. **Hovelius L.** Anterior dislocation of the shoulder in teenagers and young adults. Five-year prognosis. *J Bone Joint Surg* 1987 ; 69-A : 393-399.
 18. **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* 1996 ; 78-A : 1677-1684.
 19. **Itoi E, Hatakeyama Y, Urayama M et al.** Position of immobilization after dislocation of the shoulder. A cadaveric study. *J Bone Joint Surg* 1999 ; 81-A : 385-390.
 20. **Itoi E, Sashi R, Minagawa H et al.** Position of immobilization after dislocation of the glenohumeral joint. A study with use of magnetic resonance imaging. *J Bone Joint Surg* 2001 ; 83-A : 661-667.
 21. **Itoi E, Hatakeyama Y, Kido T, Sato T.** A new method of immobilization after traumatic anterior dislocation of the shoulder : a preliminary study. *J Shoulder Elbow Surg* 2003 ; 12 : 413-415.
 22. **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 : 507-514.
 23. **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.
 24. **Kiviluoto O, Pasila M, Jaroma H, Sundholm A.** Immobilization after primary dislocation of the shoulder. *Acta Orthop Scand* 1980 ; 51 : 915-919.
 25. **Kuriyama S, Fujimaki E, Katagiri T, Uemura S.** Anterior dislocation of the shoulder joint sustained through skiing. *Am J Sports Med* 1984 ; 12 : 339-346.
 26. **Kralinger FS, Golser K, Wischatta R et al.** Predicting recurrence after primary anterior shoulder dislocation. *Am J Sports Med* 2002 ; 30 : 116-120.
 27. **Lill H, Verheyden P, Korner J et al.** Conservative treatment after first traumatic shoulder dislocation. *Chirurg* 1998 ; 69 : 1230-1237.
 28. **Maeda A, Yoneda M, Horibe S et al.** Longer immobilization extends the "symptom-free" period following primary shoulder dislocation in young rugby players. *J Orthop Sci* 2002 ; 7 : 43-47.
 29. **Malgaigne JF.** *Traité des Fractures et des Luxations*. G. Baillière, Paris, 1855.
 30. **McLaughlin HL, Mac Lellan DI.** Recurrent anterior dislocation of the shoulder. II. A comparative study. *J Trauma* 1967 ; 7 : 191-201.
 31. **Miller BS, Sonnabend DH, Hatrick C et al.** Should acute anterior dislocations of the shoulder be immobilized in external rotation ? A cadaveric study. *J Shoulder Elbow Surg* 2004 ; 13 : 589-592.
 32. **Reeves B.** Arthrography of the shoulder. *J Bone Joint Surg* 1966 ; 48-B : 424-435.
 33. **Reeves B.** Experiments on the tensile strength of the anterior capsular structures of the shoulder in man. *J Bone Joint Surg* 1968 ; 50-B : 858-865.
 34. **Rowe C, Sakkellarides H.** Factors related to recurrences of anterior dislocations of the shoulder. *Clin Orthop* 1961 ; 20 : 40-48.
 35. **Rowe C, Zarins B, Ciullo J.** Recurrent anterior dislocation of the shoulder after surgical repair. Apparent causes of failure and treatment. *J Bone Joint Surg* 1984 ; 66-A : 159-168.
 36. **Ryf C, Matter P.** The initial traumatic shoulder dislocation. Prospective study. *Z Unfallchir Versicherungsmed* 1993 ; Suppl I : 204-212.
 37. **Saragaglia D, Picard F, Le Bredonchel T et al.** Acute anterior instability of the shoulder : short- and mid-term

- outcome after conservative treatment. *Rev Chir Orthop* 2001 ; 87 : 215-220.
38. **Simonet WT, Cofield RH.** Prognosis in anterior shoulder dislocation. *Am J Sports Med* 1984 ; 12 : 19-24.
39. **Speer KP, Deng X, Borrero S et al.** Biomechanical evaluation of a simulated Bankart lesion. *J Bone Joint Surg* 1994 ; 76-A : 1819-1826.
40. **Taylor D, Arciero RA.** Pathologic changes associated with shoulder dislocations. *Am J Sports Med* 1997 ; 25 : 306-311.
41. **Turkel J, Panio M, Marshall J, Gargis F.** Stabilizing mechanisms preventing anterior dislocation of the glenohumeral joint. *J Bone Joint Surg* 1981 ; 63-A : 1208-1217.
42. **Vermeiren J, Handelberg F, Casteleyn PP, Opdecam P.** The rate of recurrence of traumatic anterior dislocation of the shoulder. A study of 154 cases and a review of the literature. *Int Orthop* 1993 ; 17 : 337-341.
43. **Walch G, Neyret P, Charret P et al.** L'opération de Trillat pour luxation définitive antérieure de l'épaule. Résultats à long terme de 250 cas avec un recul moyen de 11,3 ans. *Lyon Chir* 1989 ; 85 : 25-31.
44. **Wen DY.** Current concepts in the treatment of anterior shoulder dislocations. *Am J Emerg Med* 1999 ; 17 : 401-407.
45. **Wheeler JH, Ryan JB, Arciero RA, Molinari RN.** Arthroscopic versus nonoperative treatment of acute shoulder dislocations in young athletes. *Arthroscopy* 1989 ; 5 : 213-217.
46. **Yu J.** Anterior shoulder dislocations. *J Fam Pract* 1992 ; 35 : 575-576.