

Review

Current clinical trends in first time traumatic anterior shoulder dislocation

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Anterior shoulder dislocation is a common traumatic event. Younger patients have increased risk for recurrent dislocations. Reduction of shoulder dislocation should be performed in a safe, convenient and patient tailored method. In young athletes with labral tear or with large engaging Hill-Sachs lesion, surgical stabilization should be considered to prevent additional dislocations. In other patients non-operative treatment with proper rehabilitation program might be considered. There is still a challenge to define the best timing and type of treatment which is most suitable for the individual patient. The method of treatment should be defined according to the patients' age, occupation and physical activity.

Keywords: Shoulder, dislocation, Bankart lesion, Hill-Sachs lesion, instability

INTRODUCTION

Glenohumeral joint is the most mobile and most commonly dislocated joint in the human body. Approximately 2% of the general population and 7% of the young athletes suffer from this type of injury (Davy and Steve, 2002). There are two peaks of high incidence of shoulder dislocation, at the second and at sixth decades of life. The most common mode of this injury is the anterior dislocation when the head of humerus dislocates anteriorly and medially in relation to its normal anatomical position, opposite to the scapular glenoid. Following the first dislocation, chronic anterior instability of the glenohumeral joint might occur.

The most common cause of shoulder instability is a traumatic injury, in 95% of all anterior shoulder dislocations (Henry and Genung, 1982; Dodson and Cordasco, 2008; Hovelius, 1987; Hovelius, 1978; Hovelius et al., 1996). In the rest 5% of cases the main

cause for the dislocation is due to non-traumatic ligamentous laxity. Occasionally trauma triggers shoulder dislocation in person with predisposing ligamentous laxity but without previous clinical evidence of glenohumeral dislocation.

The patient's age at the time of injury is inversely related to the incidence of dislocation recurrence rate. Recurrence rate in athletes younger than 20, may be as high as 90%, and is mostly dependent on the damage to the supporting structures, i.e. glenoid labrum and joint capsule. Other risk factors include early return to competitive contact sports and poor compliance to rehabilitation program (Howell and Brian, 1989). Patients older than 40 years of age are more prone to rotator cuff injury following shoulder dislocation, with lesser chance for involvement of the glenoid labrum. The incidence of rotator cuff injury may reach 60% in patients older than 60 years of age (Henry and Genung, 1982).

Currently chronic anterior shoulder instability in young adults is treated surgically via arthroscopic approach aiming to restore the damage in the glenoid labrum, i.e. by repairing the Bankart lesion. The arthroscopic

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Figure 1. Arthroscopic image presenting a Bankart lesion (arrow).

techniques evolved from previously wide spread use of open surgical repairs of the glenoid labrum. Permanent shoulder stability is expected following arthroscopic surgery, similarly to the classic open techniques, but with considerably lower surgical morbidity.

In this review we will discuss the current treatment trends for a first glenohumeral dislocation in an active adult person.

Pathophysiology of shoulder instability

Glenohumeral joint is stabilized by dynamic and static restraints. Superficial and deep musculature acts as a dynamic stabilizer. The capsuloligamentous structures, glenoid labrum, glenoid's articular surface, with the negative intra-articular pressure, and the three dimensional anatomy of the humeral head serve as static stabilizers. Shoulder instability occurs when one or more of these structures are compromised.

The labrum, attached to the rim of the glenoid, contribute near 50% to the total depth of the socket (Howell and Brian, 1989). In addition, joint congruity is maintained by a negative intra-articular pressure, which can be lost following a damage to the capsule (Habermeyer et al., 1992). The superior glenohumeral ligament is responsible for restraining inferior translation of the humeral head, when the arm is in adduction (O'Brien et al., 1990; Warner et al., 1992; Liu and Mark, 1996). The middle glenohumeral ligament restrains

anterior translation of the shoulder, when the arm is in external rotation at the mid-range of abduction. The anterior band of the inferior glenohumeral ligament restrains the anterior translation of the humeral head, when the arm is in abduction and external rotation. By this movement the arm is dislocated anteriorly when sufficient force is applied.

Tear of the anterior band of the inferior glenohumeral ligament, with subsequential detachment of the anterior labrum, i.e. "Bankart lesion", is the main cause of traumatic anterior instability (Figure 1). Anterior detachment of the labrum decreases the socket depth in the anteroposterior plane. In 97% of patients with traumatic anterior instability the underlying pathology is a Bankart lesion. Addressing this lesion is the fundamental principle of stabilization surgery.

A forceful impact of the posterolateral humeral head against the bony glenoid in anterior dislocations may result in a depression fracture, "Hill-Sachs" lesion, in 54%-75% of patients with anterior dislocation (Cunningham, 2005; Ceroni et al., 2000). Hill-Sachs lesion can be identified on a radiograph, especially on the axillary view, and it is pathognomonic for anterior post-traumatic instability of the shoulder (Dodson and Cordasco, 2008) (Figure 2). Most of the Hill Sachs lesions are small, not engaging and do not require surgery. When the defect involves more than 30% of the humeral articular surface, the engaging of the bony depression with anterior glenoid edge might occur, causing anterior dislocation of the humeral head

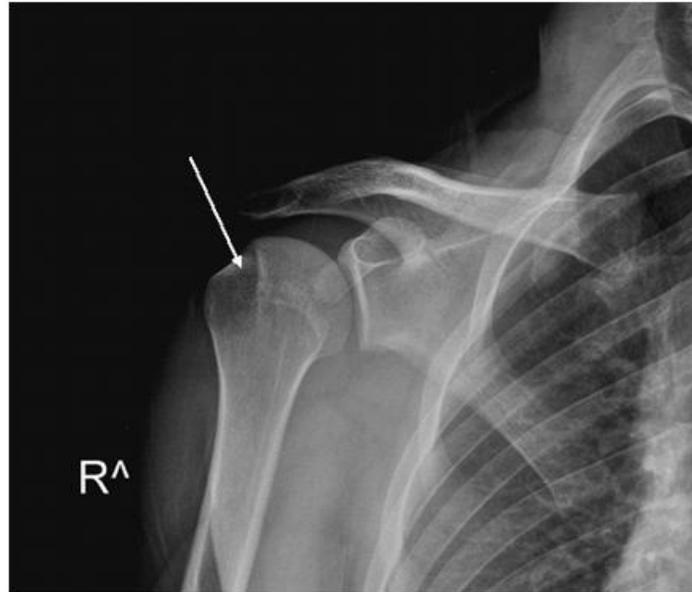


Figure 2. Anterior- posterior radiograph of right shoulder in 19 years old man after anterior glenohumeral dislocation. Arrow indicates 'Heel-Sachs' lesion.

(Rowe et al., 1984).

Anterior dislocation might be complicated by the fractures of the greater tuberosity (up to 25%), by fractures at other sites of proximal humerus (rare) or by neural injury, especially of the axillary nerve (up to 30% of patients with anterior dislocation) (Cunningham, 2005; Ceroni et al., 2000; Perron, 2003; Kralinger et al., 2002).

There are two groups of patients known to develop chronic shoulder instability, i.e. following trauma with glenohumeral dislocation and individuals with ligamentous laxity. Commonly the traumatic dislocation occurs in patient with previously chronic shoulder instability due to ligamentous laxity (Rowe et al., 1984).

The restoration of shoulder stability might be achieved either by physiotherapy, aiming for rehabilitating of the dynamic stabilizers, or by surgery, by restoring the static stabilizers (Cordasco et al., 1996).

Clinical evaluation

In the acute phase shoulder examination should include inspection of the upper limb in order to detect gross deformation, such as deformation at the anterior, medial and inferior aspects of the shoulder joint, which may indicate on anterior glenohumeral dislocation. The patient usually reports on an agonizing pain, holding the arm in adduction and internal rotation. Gentle palpation should include the acromioclavicular joint, sternoclavicular joint and the biceps tendon (Dodson and Cordasco, 2008). Commonly the humeral head is not palpated in the sub-acromial region (squaring sign) and fullness in the

anterior aspect of the shoulder, especially in the proximity to the coracoid process, might be notable. The neurovascular deficits must be evaluated due to the high chance of associated injuries of brachial plexus and its immediate neural distributions (Cunningham, 2005). After the reduction it is obligatory to evaluate the neurovascular status, and the passive range of motion.

On the follow up the pathology of the rotator cuff should be evaluated, especially among the older patients. Additionally clicks, grinding sensation or pain may indicate on chondral defects or labral tears.

During the follow up after patients following dislocation existence of ligamentous laxity might be identified by a positive "sulcus sign", i.e. by exerting a longitudinal traction on patient's distal humerus the humeral head is pulled downwards in relation to the acromion and skin depression at the lateral subacromial area is created. Grading of the sulcus sign might help for a gross diagnosis of shoulder instability, i.e. grade 1+, which is equivalent to 1cm inferior displacement, and grade 2+, which is equivalent to 2cm inferior displacement, are characteristic for individuals with "benign" laxity, such as in professional dancers or throwers, and grade 3+, which is equivalent to 3cm or greater displacement, is referred as pathological multidirectional glenohumeral instability (Dodson and Cordasco, 2008). An important clinical test for diagnosis of traumatic instability is the anterior apprehension test. This test is performed by placing the patient in the supine position with examined shoulder in maximal abduction and external rotation. If the patient becomes "apprehensive" by exhibiting a sense of discomfort or guarding, the exam is considered to be



Figure 3. Anterior-posterior radiograph of right shoulder in 70 years old woman demonstrating anteriorly dislocated humeral head.



Figure 4. Anterior-posterior radiograph of left shoulder(41 years old man) demonstrating comminuted fracture of head of the humerus in addition to its anterior dislocation.

positive. It should be noted that pain evoked in this position might be related to subacromial impingement syndrome or other pathology, therefore, in order to reduce the chance for misdiagnosis, the examiner should

perform a relocation test. This test is performed when the patient's shoulder is in full abduction and external rotation. The examiner exerts a posteriorly directed force to the shoulder. This test is considered to be positive for

anterior instability if the apprehension disappears. The load and shift test is used to determine the degree of shoulder translation (Dodson and Cordasco, 2008). This test is performed in the supine position. One of the physician's hands exerts an axial load on the patient's elbow, when the arm is abducted arm at 45 and 90 degrees. This position keeps the humeral head centered in the glenoid. Then the physician exerts posteriorly and anteriorly directed forces by the other hand to assess the amount of translation of the humerus on the glenoid. The worsening in the degree of translation with increased abduction indicates on damage to the capsulolabral structures. The grading of the examined shoulder is made with comparison to the other shoulder. Grade 1+ reflects higher translation in comparison with the other shoulder. Grade 2+ means that the humeral head translates over the glenoid rim and reduces spontaneously. Grade 3+ means that the humeral head translates over the glenoid rim without spontaneous reduction. Preferably this test is performed under general anesthesia due to the potential physical discomfort.

Imaging

In acute traumatic shoulder dislocation the basic radiographic series include anteroposterior and, if posterior dislocation is suspected, lateral trans-scapular views. It is not advisable to reduce the dislocated shoulder without this minimal radiographic evaluation due to the risk of aggravating existing or even causing additional fracture of the humeral head or neck (Figures 3 and 4).

In patients with chronic instability, additional views might be used in order to improve the diagnosis. The axillary, the Stryker notch and Bernageau views demonstrate the posterosuperior part of the head of the humerus and may reveal Hill-Sachs lesions. The West Point axillary view demonstrates the anterior glenoid rim and may identify bony Bankart lesions.

CT scan may be used when complex bony damage is suspected. MRI scan became the gold standard in assessing soft tissue injury in context with anterior instability. MR arthrogram is superior to other imaging methods in revealing ligament or capsular detachments, tears of rotator cuff, damage to articular cartilage and labral lesions (Chandnani et al., 1993; Chandnani et al., 1995; Gusmer et al., 1996).

Treatment

Closed reduction must be performed under relaxation and sedation in order to avoid additional bony or soft tissue injuries (Robinson et al., 2006). There are three most common types of shoulder reduction, i.e. reduction based on traction, on lever manipulation and on scapular

manipulation (Cunningham, 2005). After the procedure radiographic confirmation of the reduction is obligatory. Following the initial treatment in the acute setup a period of immobilization of the shoulder in the 'safe' position of internal rotation, neutral flexion-abduction with the elbow flexed in 90 degrees has been suggested (Liu and Mark, 1996). The recommended duration of the immobilization ranges between 3 to 6 weeks, followed by improving the active range of motion, peri-scapular muscle strengthening and restoration of proprioception in order to compensate for the instability. There is no solid evidence on the advantage of the specific regime of the initial time period of treatment or on the optimal method of immobilization (Robinson and Kelly, 2002; Smith, 2006). Some evidence support immobilization for more than 3 weeks with avoidance of physical activity. Other reports suggest that there is no necessity in immobilization at all (Maeda et al., 2002; Hovelius et al., 2008). Unlike the traditional method of immobilizing the arm in a simple sling in internal rotation, there are reports advocating for immobilizing the arm in external rotation (Robinson and Kelly, 2002; Smith, 2006). The anatomical background, according to a MRI study, is supported by an observation that Bankart lesion is more efficiently reduced onto the glenoid in the external rotation (Itoi et al., 2001). Cadaveric studies contradict the reasoning for this method of immobilization (Milgrom, 1998). Additionally clinical studies showed that this method of shoulder immobilization has no additive value (Limpisvasti et al., 2008).

Operative treatment for first time shoulder dislocations

In patients under the age of 30 years, especially young athletes, who dislocated their shoulder for the first time and were treated non-operatively, the recurrence rates might reach above 80% (Henry and Genung, 1982; (Hovelius, 1987; Hovelius, 1978; Hovelius et al., 1996; Hovelius et al., 1983). Arthroscopic stabilization usually successful in preventing recurrent dislocations of shoulder. The failure rate of arthroscopically treated shoulder instability might reach 14%-22%, but in comparison to the 80%- 92% failure rate in conservatively treated young active persons, the surgical treatment is clearly advantageous (Hovelius et al., 1983; Arciero et al., 1994). Additionally patients who are treated surgically by arthroscopic approach show better life quality results. Overall operative treatment in young patients with primary dislocation leads to reduced recurrences, improved functional outcome and reduced necessity for the later open surgical procedures, when bone deficiency in glenoid and in head of humerus might occur following recurrent dislocations. Naturally the concern that patients with no potential for re-dislocation will undergo an unnecessary surgery still exists (Brophy and Robert, 2009; Robinson et al., 2008; Jakobsen et al., 2007; Brophy

and Robert, 2009; Robinson et al., 2008; Jakobsen et al., 2007).

Postoperative rehabilitation

After surgical stabilization shoulder is usually immobilized in a sling for 3-4 weeks. During this period, pendulum motion and controlled active range of motion is permitted, avoiding abduction with external rotation position. After this period of time, a progress to exercises for strengthening of periscapular muscles, sport specific exercises and proprioception improvement should be initiated. Patients might be allowed to return to sports after 6 months (Dodson and Cordasco, 2008).

Postsurgical complications

The complications following arthroscopic shoulder stabilization are rare. The most important involve neurovascular injury (Green and Kevin, 1993; Lane et al., 1993; Bohnsack et al., 2002), adhesive capsulitis (Kandziora et al., 2000), and synovial fistula (Landsiedl, 1992). By arthroscopic approach the complications of open surgery such as prolong pain, loss of movement, infection, extensive neurovascular injury and late degenerative disease are usually avoided (Robinson and Dobson, 2004).

Summary

Anterior shoulder dislocation is a very common. The younger the patient at the time of his first dislocation, the higher the probability for recurrent dislocations. It is important to reduce the dislocated shoulder in a safe, convenient and patient tailored manner. In young athletes with labral tear or with large Hill-Sachs lesion, surgical stabilization should be considered to prevent further dislocations. In other individuals, non-operative treatment with proper rehabilitation program should be considered. There is still a challenge to define the best timing and type of treatment that are most suitable for the specific patient. In general the method of treatment should be planned according to the patients' age, occupation and the degree of physical activity (Robinson and Dobson, 2004).

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