

Posterior shoulder instability

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Abstract

Normally, shoulder movements are well balanced through an interplay between static structures (bone and soft tissues as capsule, ligaments and labrum) and muscular dynamic stabilizers (muscles and tendons). Dysfunction of one or more of these components due to an injury, degeneration or congenital abnormalities may lead to shoulder instability with concomitant pain and dysfunction. This article provides an overview of the soft tissue and bony anatomy of the shoulder joint and pathophysiology of shoulder instability. It also covers the important aspects of clinical examination and special test for diagnosis of shoulder instability. A brief overview of conservative and surgical management protocols for shoulder instability are also covered in view of recent literature and authors experience

Keywords: posterior shoulder instability, conservative treatment, Surgical management, arthroscopy

Introduction

The shoulder is the joint with the biggest range of movement of the human body and it is also the joint most frequently dislocated [1]. Considering the direction of dislocation, anterior-inferior shoulder instability is the most common type, posterior instability is less common. Rowe et al and Yee were the first who described posterior shoulder instability [2]. The incidence rate of posterior shoulder instability is estimated between 2%-10% of all shoulder dislocations [3,4].

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more of these components due to an injury, degeneration or congenital abnormalities may lead to shoulder instability with concomitant pain and dysfunction.

Posterior shoulder instability can be distinguished in traumatic/atramatic and a third type caused by repetitive microtrauma.

Due to this multiple kinds of instability it is important to focus on the characteristic of the patients, considering morphological (general laxity) and psychological (voluntary dislocations for psychiatric disorders) aspects of the patient. Generally, posterior instability typically affects athletes participating in contact sports or overhead sports as the result of repetitive microtrauma in the provocative position of flexion, adduction, and internal rotation, leading to recurrent subluxation events [5].

glenoid retroversion, posterior glenoid erosion can predispose patients to posterior instability [6].

Normally it is considered an excessive retroversion of the glenoid if its angle is more than -7° in the sagittal plane [7].

A traumatic glenohumeral posterior dislocation can cause a fracture of the posterior-inferior rim of the glenoid, called Reverse Bony Bankart lesion [8]. Similarly, patients who experience a posterior shoulder dislocation may also present with a Reverse Hill-Sachs lesion on the humeral head.

A recent paper considered also the morphology of the acromion as a possible cause of instability, showing that the acromion is more frequently situated higher and more horizontally in patients who experienced posterior instability [9].

Soft tissue abnormalities

The capsule and its posterior thickening, consisting in the posterior band of the inferior glenohumeral ligament (PIGHL), are the primary capsule-ligamentous restraints to posterior

Biomechanics

Bony Abnormalities

Any abnormalities in the bony morphology, such as glenoid hypoplasia, excessive humeral or

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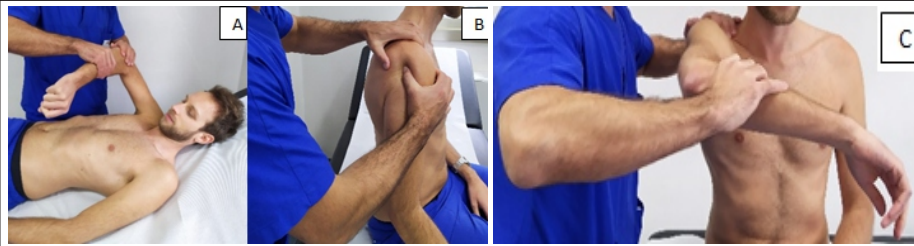


Figure 1: Clinical examination of shoulder instability. A) Posterior load and shift B) anterior and posterior drawer test C) Jerk test

translation. In case of a dislocations, PIGHL can be injured or avulsed from its attachment on the humerus (reverse humeral avulsion of the glenohumeral ligament RHAGL) [10].

The labrum is a dense fibrocartilage stabilizer and attaches along the periphery of the glenoid fossa increasing the depth of the glenoid socket. This structure can be damaged by subluxations or dislocations. A detachment of the posterior labrum is called a reverse Bankart lesion. In case of involvement of glenoid bone associated with the labral detachment is the injury is called Reverse Bony Bankart lesion. A tear between the posterior labrum and the glenoid cartilage without complete detachment of the labrum is defined Kim lesion. This injury is often the result of repetitive microtrauma and less commonly due to a frank posterior shoulder dislocation. Kim classified isolated posteroinferior

labral lesions into: Type I= incomplete stripping; posteroinferior labrum torned, but not displaced medially from

the glenoid rim; Type II= it is superficial tear between posterior aspect of the labrum and glenoid cartilage. Type III= represents chondrolabral lesion. Type IV = flap tear [11].

Dynamic stabilizers are represented by rotator cuff muscles. Of the four muscles, subscapularis provides the greatest resistance to posterior subluxation. Scapular rhythm and control are also important components in centering the humeral head position into the glenoid maintaining joint stability throughout all ranges of motion [10].

Diagnosis

Anamnesis has a central role in the diagnosis, understanding if the posterior instability is voluntary or not, to understand the timing (acute or chronic) and if the cause is traumatic or atraumatic. If a traumatic event is reported, it is important to investigate about the direction of applied force and the position of the arm during the event. Patients affected by posterior shoulder instability, usually do not refer a true

dislocation injury, but they often complain of mild pain, muscle weakness and fatigue, with sensation of clicking and instability in some movements. Typically, symptoms mainly occur in swimmers, throwers, contact athletes and the position that cause pain is the flexed, adducted, and internally rotated position of the shoulder.

Clinical examination

Side-to-side inspection is the first step of clinical examination assessing muscle atrophy, active and passive range of motion and scapular kinesis. These patients usually report a higher posterior laxity, translation and pain. Correction of the scapula position may improve the discomfort and apprehension suggesting a propensity for good rehabilitation potential.

Specific clinical tests are

- **Jerk test:** patient in sitting position, affected arm in 90° of flexion and internal rotation. A posterior force on the elbow is applied, while the scapula is stabilized with the other hand. Pain or apprehension can indicate a positive result

- **Kim test:** patient in sitting position, affected arm in 90° of abduction. The arm is passively elevated to additional 45° of forward flexion while applying a downward and posterior force to the upper arm with an axial load to the elbow. Pain and posterior subluxation indicate a positive result

- **Wrightington posterior instability test:** it is performed in sitting position, affected arm in 90° of flexion, full adduction and internal rotation. A force is applied downward on the hand, weakness and pain indicate a positive result.

- **Posterior load and shift:** it is performed with patient in a supine position. The examiner applies a medial and posterior force on the humerus, assessing the posterior translation.

Attention should be focused also on

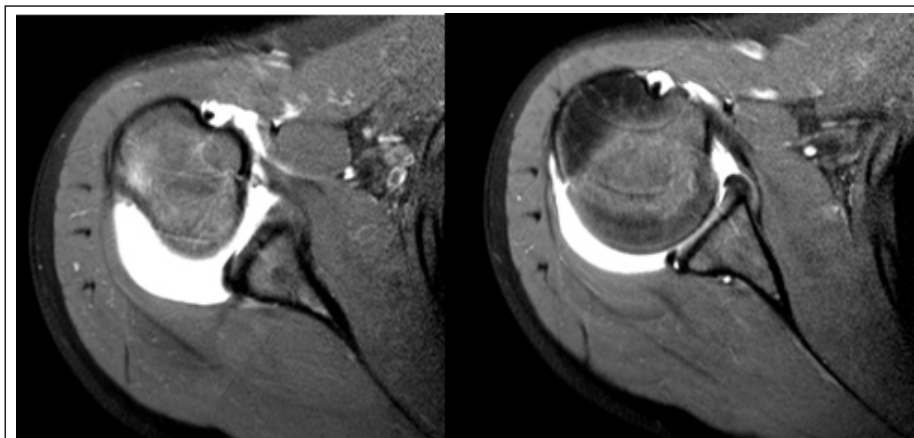


Figure 2: 18 years old female affected by shoulder instability. Posterior capsular laxity and degeneration of the posterior labrum are well studied by Arthro-MRI

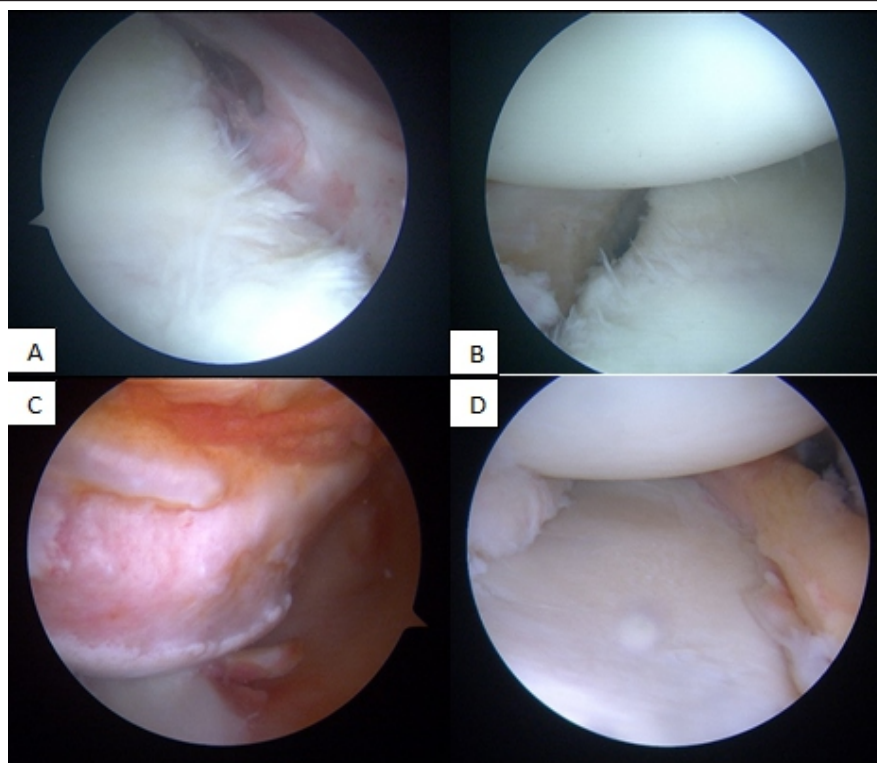


Figure 3: 23 years old injured by multiple shoulder dislocations. Intraoperative images: A) Anterior glenoid bony defect. B) Posterior capsule-labral lesion. C) Hill Sachs lesion. D) Final control: anterior + posterior capsular shift + labrum repair + posterior remplissage (not visible).

anterior instability (load and shift and apprehension/relocation test), inferior instability (sulcus test) and others joint to assess an eventual generalized ligamentous laxity (Beighton score >4) [12].

Radiology

Initial investigations consist in radiographs with AP and axillary views. Advanced imaging consists in magnetic resonance imaging (MRI) and computed tomography (CT). The first one allows a good view of soft tissues and the use of contrast enhancement is of great value in diagnosis a soft tissue injury as labral lesions. Bone-enhancing T1 sequences help to identify also small bony glenoid lesions. Instead, CT has a good resolution in identify bony pathomorphology as reverse Bankart lesions or reverse Hill Sachs that can occur in posterior dislocation [13].

Therapeutic Options

Conservative treatment:

Patients with an atraumatic history, initial management of shoulder instability often begins with non-operative measures consisting in physical therapy to strengthen the dynamic stabilizers of the shoulder and restore a correct scapulothoracic mechanics if altered. Usually conservative measures has 70–89 % success in patients with atraumatic instability and only 16 % success in patients with traumatic instability [14-16], but if it fails then operative management should be considered.

Surgical treatment:

Surgery is indicated for traumatic posterior instability with significative structural lesions or in presence of unsuccessful period of rehabilitation in case of lesser lesions.

A recent paper shows that about 46% of these patients treated conservatively were converted to surgery between 1 and

10 years after initial diagnosis [17].

In case of soft tissue injuries, without significant bone loss, the treatment of choice is arthroscopic repair act to restore the glenolabral concavity and retensioning the posterior capsule; in case of significant bone loss bone grafting is recommended. Surgical treatment should be avoided in patients with true voluntary instability.

Soft tissue involvement

After traumatic posterior shoulder dislocation, in 52%-66% of cases there is a posterior labrum defect [18] and a rupture of the teres minor and infraspinatus tendon is present in most of the cases (90% partial, 10% total rupture) [19].

In soft tissue tears, arthroscopic labral repair and posterior capsulorrhaphy (ie, capsular shift) are the treatments of choice. This procedure can be performed either beach-chair position either in lateral decubitus and requires, generally, the use of the standard posterior, anterior, posterolateral and anterosuperior portals to allow a good visualization and possibility to have a good anchor and sutures positioning. The labial repair consists in detaching the labrum from the glenoid, freshening, and repair of the labrum on the surface of the glenoid using suture anchor fixation. The number of anchors used depends on the dimensions of the tear and usually the repair begin at the most inferior part of the injury. An arthroscopic capsular shift is often performed in conjunction with a labral repair and consists of tightening any redundant posterior capsular tissue.

Osseous Involvement: glenoid bone deficiency & humeral head impaction fractures.

Surgical management is indicated in case of failed soft tissue procedure or significant bone deficiency and failure of conservative treatment causing recurrent instability.

In case of glenoid erosions, Reverse Bony

Table 1. Gleno-humeral defect, affecting instable shoulders

Bony abnormalities	Soft tissue abnormalities
Glenoid defect	Kim lesion
Reverse Hill-Sachs	Reverse Bankart lesion
Glenoid retroversion	Capsule laxity
Humeral retroversion	Rotator cuff lesions

Bankart or congenital abnormalities, a posterior bone block procedure can be suggested to recreate the normal contour of the glenoid surface. This procedure can be performed with iliac or acromial bone but nowadays also xenograft could potentially represent an option [20,21]. A recent paper described the possibility to treat a concurrent anterior and posterior instability in patients of suffer of a double bone defect. This technique proposed to apply an anterior and posterior bone blocks during the same arthroscopic surgical procedure [22].

In a systematic review, it was shown that bone grafting is a reliable option even if

there are concerns about graft lysis and residual glenohumeral osteoarthritis [23].

A posterior opening wedge osteotomy is performed in case of higher glenoid retroversion (more than 15°-20°) with intact soft tissue [24]. A wedge of bone graft (either autograft or allograft) is then inserted and fixed with screws to provide the predetermined amount of correction. Press fit grafting techniques have also been described.

Reverse Hill Sachs lesion can be treated with different techniques. McLaughlin described a procedure consisting in subscapularis tendon transfer into the humeral defect [25]. Other techniques

include lesser tuberosity transposition (Neer procedure), reverse remplissage with fixation of the subscapularis tendon into the Hill-Sachs defect with suture anchors [26]. Rotational osteotomy, anatomic reconstruction with bone grafting of the defect and arthroplasty represent options in cases of humeral bone loss 50 % of the humeral head.

Postoperative Rehabilitation

Different postoperative care protocols are described due to the individual preference of the surgeon. Our protocol consist in 25 days of shoulder sling in 15° of abduction and 0° of rotation to prevent internal rotation. In the following weeks, a rehabilitation program is begun at the removal of the orthosis. Usually we recommend to reach a complete passive motion and then focus the rehabilitation on active movements under a supervision of a physical therapist. When a complete active and passive range of movement is achieved strengthening exercises can be started. When the muscle strength is at least 80% of the contralateral side, a sport-specific rehabilitation program can be pursued, at about 5-6 months post-operatively [27-29].

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