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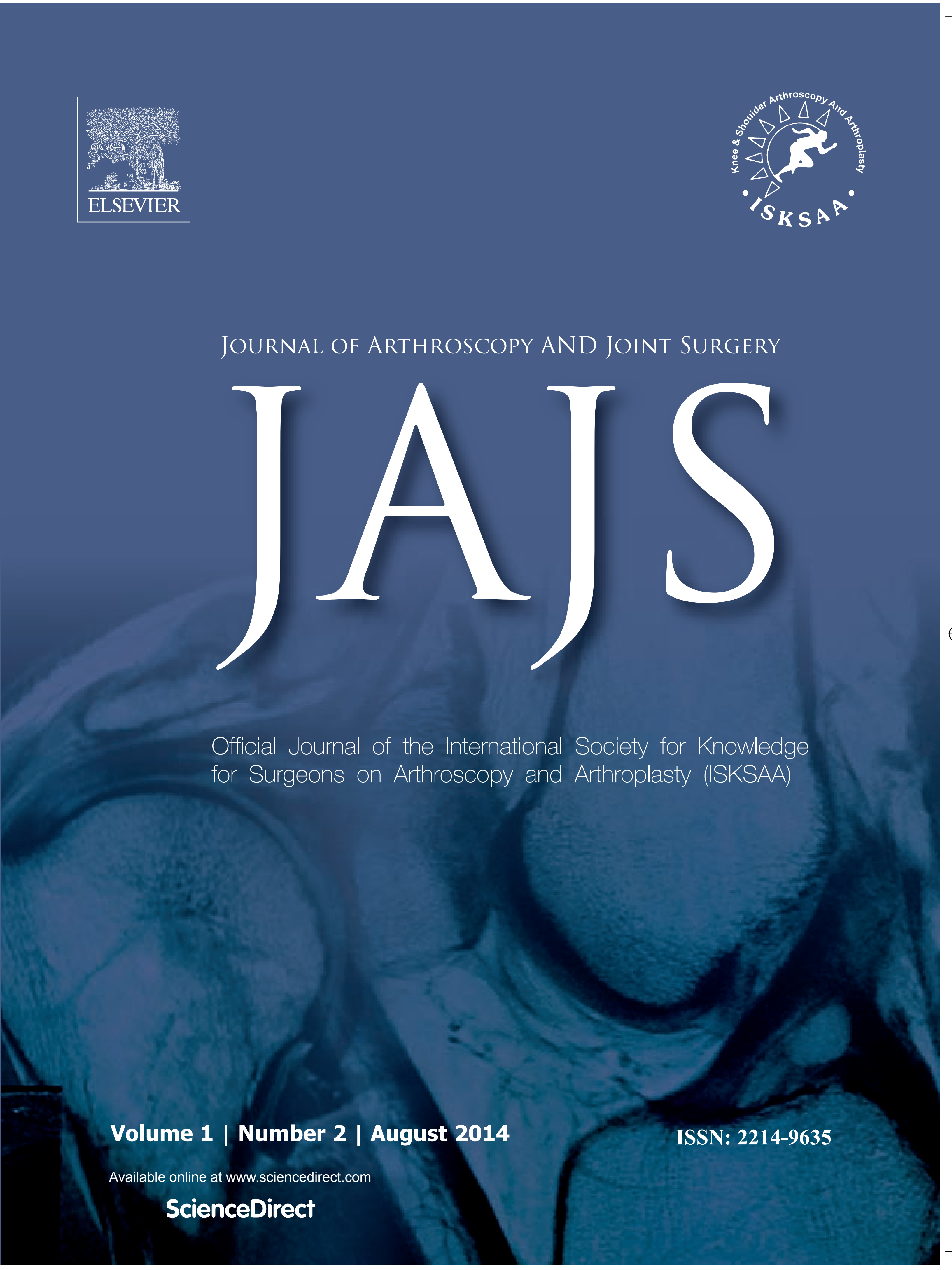

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Journal of Arthroscopy and Joint Surgery (JAJS) is the official and peer-reviewed publication of *International Society for Knowledge for Surgeons on Arthroscopy and Arthroplasty* (ISKSAA). The Journal is committed to bring forth scientific manuscripts in the form of original research articles, current concept reviews, meta-analyses, case reports and letters to the editor. The focus of the Journal is to present wide-ranging, multi-disciplinary perspectives on the problems of the joints that are amenable with Arthroscopy and Arthroplasty. Though Arthroscopy and Arthroplasty entail surgical procedures, the Journal shall not restrict itself to these purely surgical procedures and will also encompass pharmacological, rehabilitative and physical measures that can prevent or postpone the execution of a surgical procedure. The Journal will also publish scientific research related to tissues other than joints that would ultimately have an effect on the joint function. The journal is published bi-annually (July and December) by Reed Elsevier India Pvt.Ltd. Contributors are invited to submit their manuscripts in English through the Online Manuscript Management System at **http://ees.elsevier.com/jajs**

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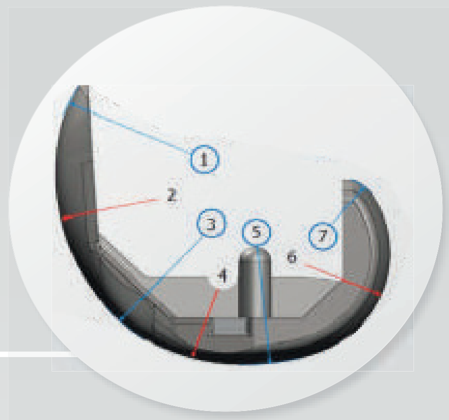

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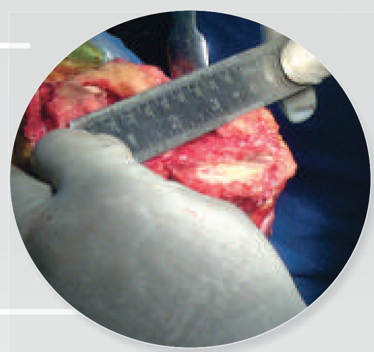

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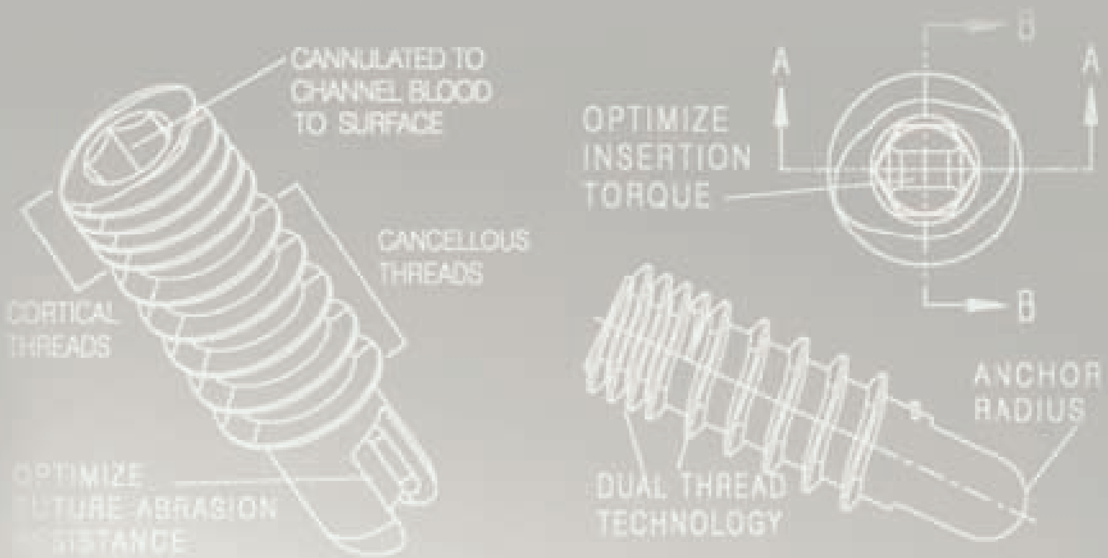

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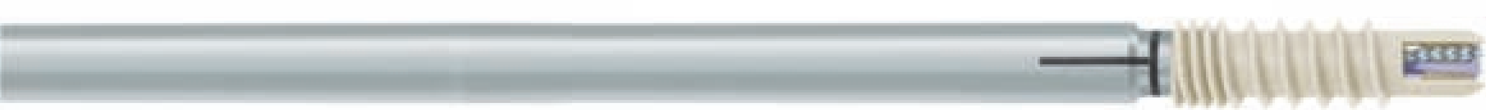

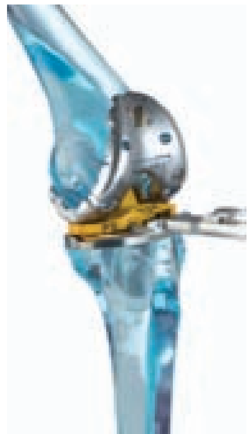

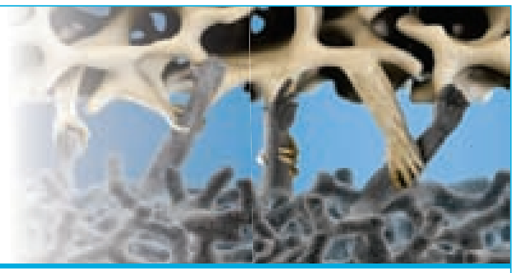

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3. The 2012 John Charnley Award Clinical Multicenter Studies of the Wear Performance of Highly Crosslinked Remelted Polyethylene in THA (2)

4. Macheras GA, et al., Radiological evaluation of the metal-bone interface of porous tantalum monoblock acetabular component. J Bone Joint Surg (Br). March 2006;88(3):304-309

5. Gruen T, et al., Radiographic evaluation of a non-modular acetabular cup: a 2- to 5-year multi-center study. Scientific Exhibit: 71st Annual Meeting of the American Academy of Orthopaedic Surgeons; 2004; San Francisco, CA

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Review Article

Clinical assessment of posterior shoulder joint instability

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ABSTRACT

Posterior shoulder instability is less common than anterior and is not as readily recognised. There are numerous clinical tests for posterior instability. They all have benefits and disadvantages, depending on the type of instability and strength of the patient. In this article we describe the most common clinical tests for posterior instability and review the literature supporting each test. In this manner, we hope that this will provide the clinician with a better understanding of each test and it's value.

1. Introduction

The shoulder is capable of the widest range of movement of all joints: for these to be normal and asymptomatic they depend on the interaction of both static and dynamic stabilisers of the shoulder. Static stabilisers include the bony anatomy, the glenoid labrum, the negative intra-articular pressure, the joint capsule, and the glenohumeral ligaments. The dynamic stabilisers are the muscles of the rotator cuff, and those surrounding the joint.[1] Unlike the hip and knee joints, the shoulder glenoid fossa is shallow. Glenohumeral stability from the glenohumeral ligaments of the capsule is effective primarily when the range of motion is at the extremes.[2] To have extensive movement at the glenohumeral joint the ligaments are required to be relatively lax. This requires combined involvement of dynamic and static stabilisers through range of motion.

The shoulder also benefits from the concavity compression mechanism, where the convex head of the humerus is compressed into the concave glenoid fossa to stabilise it against translating forces. The depth of the concavity and the magnitude of the compressive force influence joint stability with the depth of the bony glenoid being significantly less anteroposteriorly (2.5 mm) than superoinferiorly (9 mm), hence the stability against anterior and posterior forces was less than inferiorly and superiorly directed forces.[3] The labrum is a fibrocartilaginous ring around the glenoid increasing the depth of the glenoid upto 50%, contributing to the concavity compression mechanism.[4] The labrum also works alongside the synovial fluid to form a suction effect by adhesion-cohesion forces, providing stability to the articulation.[5] The negative intra-articular pressure also contributes to this effect and centres the humeral head into the glenoid. The attachment points for the glenohumeral ligaments and the long head of biceps arise from the labrum.

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The glenohumeral ligament structure consist of three parts; the superior glenohumeral ligament (SGHL), which resists translation inferiorly with the arm adducted and in neutral rotation; the middle glenohumeral ligament (MGHL), an anterior stabiliser in adduction and the inferior glenohumeral ligament complex. This comprises the anterior band of the inferior glenohumeral ligament (IGHL), which is the primary static stabiliser in a neutral position; and the posterior band of the IGHL (PIGHL), the primary static posterior stabiliser when the arm is flexed and internally rotated. The coracohumeral ligament (CHL) resists posterior and inferior translation when the shoulder is suspended and inferiorly when the arm is adducted.[1] Tension in the ligaments and capsule provide additional proprioceptive feedback to the rotator cuff muscles helping to prevent abnormal joint translation.[6]

The rotator cuff muscles have independent actions that in combination contribute to stability during mid and end range motions of the glenohumeral joint, working in both a concentric and eccentric manner. The rotator cuff muscles also provide compressive force across the joint, helping to centralise the humeral head in the glenoid fossa.

Injury to either the static or dynamic stabilisers of the shoulder may compromise function resulting in instability. In general terms this can be anterior, posterior, multi-directional, traumatic or atraumatic. We like to use the Stanmore classification system, which is based on three polar groups – traumatic structural, atraumatic structural and habitual non-structural (muscle patterning).[7] Basing these three poles as the points of a triangle it is possible to establish a continuum where a patient may fit into one of the three groups, or as is often the case, overlapping and moving between more than one group.

2. Pathogenesis

Posterior instability is less common than anterior instability, and accounts for between 2 and 12% of cases of instability.[8,9] It was typically described as occurring in patients who have experienced posterior dislocation due to seizures, electrocution. In an anatomically normal shoulder it is now considered in three broad etiological categories: acute trauma, repetitive microtrauma and purely atruamatic.[10–12] The most frequent cause being repetitive microtrauma to the posteroinferior shoulder complex often seen in young, active people performing activities such as bench pressing, rugby, rowing and swimming.[13] These activities result in repetitively loading the glenohumeral joint in a flexed internally rotated position, stretching and injuring the PIGHL and posterior labrum. Anatomical abnormalities in glenoid version, hypoplasia and humeral retroversion can also contribute.[8,14,15] We have also found traumatic posterior instability in a high number of contact athletes [REF].

3. Clinical assessment of the posteriorly unstable shoulder

The basis of diagnosing posterior instability is a careful history and physical examination of both the symptomatic and asymptomatic shoulders. Factors to bear in mind during assessment include:

- How the problem affects their activities of daily living
- How the problem affects their work or sporting lives
- What pathology is present or likely to be present
- An appropriate management plan

Often the diagnosis is not clear and several shoulder complaints can arise from different shoulder relate disorders. The primary complaint is often an aching pain with weakness located around the posterior joint line, biceps tendon or superior aspect of the cuff. The physical examination aims to reproduce the symptoms experienced by the patient. Often in cases of posterior instability symptoms are exacerbated with the arm placed in 90° flexion, adduction and internal rotation.[16]

The patient should be assessed for generalised laxity using the Beighton Score. A score of 6/9 or greater indicates hypermobility but not necessarily benign joint hypermobility syndrome.[17] Throughout the clinical assessment it is necessary to bear in mind the difference between laxity and instability. Lax patients can have the same degree of glenohumeral translation as an unstable patient but report no symptoms or discomfort.[18] In fact ligamentous laxity is often seen in athletes where it may provide an advantage in their sport, but this can be associated with an increased incidence of joint instability, for example in rugby union players, laxity in the shoulder joints may confer increased risk for dislocation.[19]

4. Clinical tests for posterior laxity

4.1. *Posterior drawer test*

In 1984 Christian Gerber and Reinhold Ganz discussed the lack of attention in the literature of clinical diagnosis of shoulder instability; instead most accounts were focussed on the surgical procedures themselves.[20] They attributed some of the failures of the surgeries to not adequately detecting anterior and posterior instabilities and so described the anterior and posterior drawer tests. The posterior drawer test requires the patient to be supine with the examiner level with the shoulder, the proximal forearm is held by the examiner who then flexes to the elbow to approximately 120° and moves the shoulder to be abducted from 80° to 120° and flexed forward of 20°–30°. Holding the scapula with the other hand, with the thumb placed lateral to the coracoid process. The humerus is then slightly medially rotated and flexed further to 60° or 80°, the thumb placed lateral to the coracoid subluxes the head of the humerus posteriorly which can be felt by the fingers behind the shoulder. The patient often responds with apprehension when this is performed. There is a lack of published research showing sensitivity and specificity figures for this test (Fig. 1).

4.2. *The load and shift test*

The load and shift test examines glenohumeral translation and should be performed with the patient sitting in an upright neutral position and also supine.[20] With the examiner behind the shoulder a hand over the scapula helps to stabilise it and then the humerus is held and “loaded” into the glenoid fossa

Fig. 1 – Posterior drawer test.

by applying an axial load, compressing the joint. The humeral head can then be moved anteriorly and posteriorly. The test is repeated in the supine position with the arm positioned in slight abduction and forward flexion.[21] The amount of translation felt varies and as such is graded[22]:

- +0 No translation from being centred in the glenoid fossa
- +1 Translation but not to the rim
- +2 Translation to the humeral head onto the glenoid rim
- +3 Translation over the glenolabral rim
- +4 Translation with complete dislocation and manual reduction required

Other variations of the load and shift test exist with the patient seated with the arm relaxed by their side, and the patient supine with 20° and 90° abduction. These give sensitivity and specificity figures for posterior load and shift as 14% and 100% respectively (Fig. 2).[23]

5. Clinical tests for posterior instability

5.1. *The jerk test*

The jerk test can be performed sitting or supine, the examiner takes the arm and flexes the elbow to 90° and abducts it horizontally.[24] Holding the arm at the elbow and stabilising the scapula with the other hand, the humerus internally rotated and then adducted across the patient's body. A sudden clunk or jerk as the humeral head slides off the back of the glenoid is a positive result.

Kim et al[25] concluded that in a shoulder with symptomatic posteroinferior instability the presence of pain when the jerk test was performed was indicative of a posteroinferior labral lesion. Pain with the jerk test was 89.7% sensitive and 85% specific, with a positive predictive value of 72% and a negative predictive value of 94% (Fig. 3).

Fig. 2 – Load and shift test, with anterior and posteriorly directed loading.

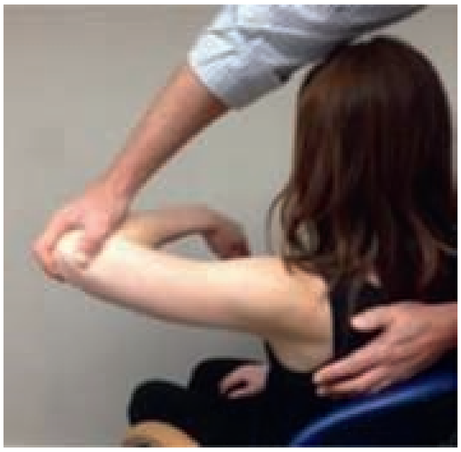

Fig. 3 – The jerk test is shown in a seated patient. The examiner stabilises the scapular, and provides flexion and internal rotation with a posteriorly directed force at approximately the 7 o'clock direction. A positive test reproduces the patient's symptoms when the shoulder is provoked in this manner and is consistent with the diagnosis of posterior instability.

5.2. *The Kim test*

The Kim test is performed with the patient seated and the arm in 90° of abduction (Fig. 4).[26] To perform this test, the clinician grasps the patient's elbow with one hand, while with his or her other hand, the clinician grasps the lateral aspect of the proximal arm, applying an axial loading force. While elevating the patient's arm to 45°, the clinician applies a downward and posterior force to the upper arm. Pain signifies a positive test regardless of an accompanying clunk. They reported a sensitivity of 80%, specificity of 94%, positive predictive value (PPV) was 0.73 and negative predictive value was 0.95. Combined with a jerk test they concluded the sensitivity of detecting a posteroinferior labral lesion was 97%.

5.3. *Posterior stress test and posterior apprehension test*

Again this is performed in a seated position.[27] The scapula is fixed medially whilst applying a posterior force to the arm held in a 90 forward flexed position, adducted and internally rotated position. It is considered positive if it reproduces the patients symptoms along with subluxation or dislocation. For the posterior apprehension test the patient is once again supine, the examiner holds the elbow and stabilises the shoulder with the other hand. The arm is positioned with the shoulder flexed to 90° and internally rotated; the examiner then applies pressure along the axis of the humerus in a posterior direction. A positive test occurs when the patient responds with apprehension and guarding, to prevent the shoulder from subluxating (Fig. 5a).

Jia et al published the results of their study that involved 1913 patients undergoing shoulder surgery at their centre from 1995 to 2008. Posterior instability was one of the diagnoses they examined and collected data on. Their results showed a sensitivity and specificity of the posterior apprehension test were 19.2% and 99.2% respectively with a likelihood ratio of 25.[28] Therefore in a person who gives a clear history of posterior subluxation or dislocation this would be valuable in confirming the suspected diagnoses, however, in a person giving a vague history of an unstable shoulder this test could not be used to rule out posterior instability (Fig. 5b).

5.4. *Wrightington Posterior Instability Test (WPIT)/ Modified O'Brien's Test*

In many cases of posterior instability, patients present with posterior pain and clicking instead of true dislocations. We have found this predominantly in muscular contact athletes. These patients have excess posterior laxity and translation, posterior glenohumeral joint pain in hyperabduction and external rotation. This is a form of subclinical instability. These patients will exhibit marked weakness and pain in resisted flexion in full adduction and internal rotation at 90° – a similar position to the O'Brein's test. This is probably due to

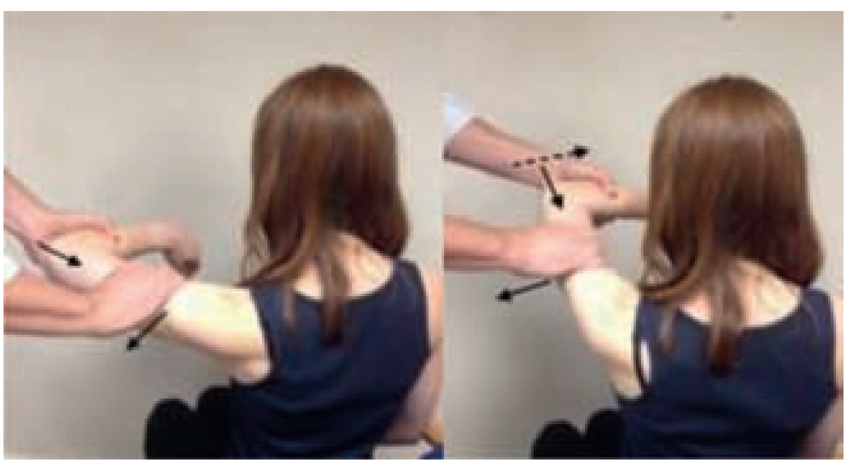

Fig. 4 – The Kim test.

Fig. 5 – a: Posterior stress test. b: Posterior apprehension test.

posterior translation of the humeral head in the position of flexion and internal rotation, with resultant posterior cuff weakness. We are currently validating this test (Fig. 6).

6. Imaging

As an adjunct to history and examination the role of magnetic resonance imaging (MRI) has become a mainstay. MRI is a static study so instability alone cannot be diagnosed, but the presence of labral pathology in conjunction with clinical findings are utilised. Most commonly used is direct MRI arthrogram with gadolinium injected intra-articularly into the glenohumeral joint. Multiple studies have reported sensitivities and specificities of over 90% in detecting labral lesions.[29,30] The use of indirect MRI (I-MRI) has been advocated in the past.[31] The technique involves an intravenously administered contrast agent, which enhances the joint space producing an arthrographic effect. Its perceived weakness is not distending the joint space to show subtle labral detachment. Recent work on I-MRI for labral tears showed a sensitivity and specificity of 95% and 91%.[32]

7. Summary

The diagnosis of posterior instability comprises a good clinical history and detailed examination of laxity and instability. The shoulder may be lax but not symptomatic of any instability, so for appropriate management the pathological must be differentiated from the physiological. The presence of multiple tests to diagnose a condition is usually indicative of no one test being conclusively diagnostic. The validated tests for posterior instability, in particular the load and shift test and the posterior apprehension test, have high specificity but low sensitivity. This suggests the most useful time for these tests

Fig. 6 – Modified O'Briens/WPIT (Wrightington Posterior Instability Test).

is when posterior instability is already the main differential diagnosis based upon the history. In the future, clinical trials around assessment of posterior instability should focus on identifying tests with high sensitivity, which could be used as screening tests during examination of the shoulder, where a classical history of posterior instability is not present. We expect the WPIT test may fulfil this option.

Conflicts of interest

All authors have none to declare.

REFERENCES

1. Lugo R, Kung P, Ma CB. Shoulder biomechanics. *Eur J Radiol*. 2008;68(1):16–24.
2. Lippitt S, Matsen F. Mechanisms of glenohumeral joint stability. *Clin Orthop Relat Res*. 1993;291:20–28.
3. Howell SM, Galinat BJ. The glenoid-labral socket. A constrained articular surface. *Clin Orthop Relat Res*. 1989;243:122–125.
4. Bahk M, et al. Laxity testing of the shoulder: a review. *Am J Sports Med*. 2007;35(1):131–144.
5. Hill AM, et al. Collagenous microstructure of the glenoid labrum and biceps anchor. *J Anat*. 2008;212(6):853–862.
6. Lephart SM, et al. Proprioception of the shoulder joint in healthy, unstable, and surgically repaired shoulders. *J Shoulder Elbow Surg*. 1994;3(6):371–380.
7. Jaggi A, Lambert S. Rehabilitation for shoulder instability. *Br J Sports Med*. 2010;44(5):333–340.
8. Antoniou J, Harryman Ii DT. Posterior instability. *Oper Techn Sport Med*. 2000;8(3):225–233.
9. Mc LH. Posterior dislocation of the shoulder. *J Bone Joint Surg Am*. 1952;24-A-3:584–590.
10. Fronek J, Warren RF, Bowen M. Posterior subluxation of the glenohumeral joint. *J Bone Joint Surg Am*. 1989;71(2):205–216.
11. Robinson CM, Aderinto J. Recurrent posterior shoulder instability. *J Bone Joint Surg Am*. 2005;87(4):883–892.
12. Schwartz E, et al. Posterior shoulder instability. *Orthop Clin North Am*. 1987;18(3):409–419.
13. Provencher MT, et al. Posterior instability of the shoulder: diagnosis and management. *Am J Sports Med*. 2011;39(4):874–886.
14. Wirth MA, Lyons FR, Rockwood Jr CA. Hypoplasia of the glenoid. A review of sixteen patients. *J Bone Joint Surg Am*. 1993;75(8):1175–1184.
15. Weishaupt D, et al. Posterior glenoid rim deficiency in recurrent (atraumatic) posterior shoulder instability. *Skeletal Radiol*. 2000;29(4):204–210.
16. Tibone JE, Bradley JP. The treatment of posterior subluxation in athletes. *Clin Orthop Relat Res*. 1993;291:124–137.
17. Beighton P, Horan F. Orthopaedic aspects of the Ehlers-Danlos syndrome. *J Bone Joint Surg Br*. 1969;51(3):444–453.
18. McFarland EG, Campbell G, McDowell J. Posterior shoulder laxity in asymptomatic athletes. *Am J Sports Med*. 1996;24(4):468–471.
19. Cheng SC, et al. Shoulder instability in professional rugby players-the significance of shoulder laxity. *Clin J Sport Med*. 2012;22(5):397–402.
20. Gerber C, Ganz R. Clinical assessment of instability of the shoulder. With special reference to anterior and posterior drawer tests. *J Bone Joint Surg Br*. 1984;66(4):551–556.
21. Silliman JF, Hawkins RJ. Classification and physical diagnosis of instability of the shoulder. *Clin Orthop Relat Res*. 1993;291:7–19.
22. Antoniou J, Harryman 2nd DT. Posterior instability. *Orthop Clin North Am*. 2001;32(3):463–473,. ix.
23. Tzannes A, Murrell GA. Clinical examination of the unstable shoulder. *Sports Med*. 2002;32(7):447–457.
24. Blasier RB, et al. Posterior glenohumeral subluxation: active and passive stabilization in a biomechanical model. *J Bone Joint Surg Am*. 1997;79(3):433–440.
25. Kim SH, et al. Painful jerk test: a predictor of success in nonoperative treatment of posteroinferior instability of the shoulder. *Am J Sports Med*. 2004;32(8):1849–1855.
26. Kim SH, et al. The Kim test: a novel test for posteroinferior labral lesion of the shoulder–a comparison to the jerk test. *Am J Sports Med*. 2005;33(8):1188–1192.
27. Pollock RG, Bigliani LU. Recurrent posterior shoulder instability. Diagnosis and treatment. *Clin Orthop Relat Res*. 1993;291:85–96.
28. Jia X, et al. Examination of the shoulder: the past, the present, and the future. *J Bone Joint Surg Am*. 2009;91(suppl 6):10–18.
29. Flannigan B, et al. MR arthrography of the shoulder: comparison with conventional MR imaging. *AJR Am J Roentgenol*. 1990;155(4):829–832.
30. Palmer WE, Caslowitz PL. Anterior shoulder instability: diagnostic criteria determined from prospective analysis of 121 MR arthrograms. *Radiology*. 1995;197(3):819–825.
31. Winalski CS, et al. Enhancement of joint fluid with intravenously administered gadopentetate dimeglumine: technique, rationale, and implications. *Radiology*. 1993;187(1):179–185.
32. Fallahi F, et al. Indirect magnetic resonance arthrography of the shoulder; a reliable diagnostic tool for investigation of suspected labral pathology. *Skeletal Radiol*. 2013;42(9):1225–1233.

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