Clinical Examination of Biceps, SLAP and Pulley Lesions

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Modern understanding of proximal biceps complex and improved arthroscopic techniques for treating biceps pathologies has renewed interest in the proximal biceps complex as source of shoulder pain. However, establishing an exact clinical diagnosis can be difficult. Many different clinical tests have been described in the past ten years with subtle variations between them. I have managed to find 29 clinical tests for the proximal biceps alone! This is confusing for clinicians, who feel inadequate when a test is presented that they have not heard of.

In this talk I will concentrate on the clinical tests that I personally find useful in my clinical practice, with some evidence to support them. For each common pathology I like to have two key points in the history and two clinical tests to confirm or refute the diagnosis.

A. **Long Head of Biceps (LHB) Pain**

Pain from the long head of biceps may be due to:

1. Attritional tendonitis from degenerative or post-traumatic osteophytes in the biceps groove
2. LHB Instability (secondary to a pulley lesion, cuff tear or rupture of the transverse ligament)
3. Primary synovitis
4. Partial traumatic tear
5. Intrinsic LHB tendinopathy
6. Post-traumatic scarring (e.g. with proximal humeral fractures or iatrogenic)

Clues from the history (in descending order of significance):

1. Pain distribution specifically over the LHB and radiating to the biceps muscle
2. Exacerbated by lifting in the frontal pain with the elbow extended and shoulder externally rotated
3. (clunking with rotation in abduction – biceps instability – uncommon)

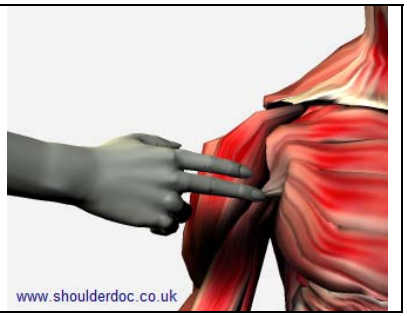
Clinical examination:

- Speed's test:

Description:	The patient's elbow is extended, forearm supinated and the humerus elevated to 60°. The examiner resists humeral forward flexion.	
Positive:	Pain located to bicipital groove. This is commonly interpreted as suggestive of inflammation or lesions related to the long head of biceps or biceps/labral complex.	
Sensitivity:	90%	
Specificity:	14%	
Comments:	It is a very useful 'screening' test for proximal biceps problems, but not specific for any particular pathology.	

References:	Bennet WF. Arthroscopy. 1998 Nov-Dec;14(8):789-96. (Note: there are many other studies evaluating Speed's test, but they have larger numbers of SLAP tears and therefore the accuracy for pure LHB pathology is diluted)	

- Palpation of LHB over the biceps groove

Description:	Directly palpate over the biceps groove region, identifying point of maximal tenderness.	
Positive:	Specific tenderness over biceps groove	
Sensitivity:	Not been investigated	
Specificity:	Not been investigated	

Diagnostic confirmation:

- Ultrasound scan – for extra-articular LHB pathology only. One can dynamically test for LHB Subluxation, instability and dislocation on rotation of the arm. Fluid in the sheath can be seen, along with biceps hypertrophy and tendinosis (on modern high resolution machines). Irregularity of the biceps groove causing attritional tendonitis can be seen, as well as associated rotator cuff tears. Note that fluid in the biceps sheath is also an indirect sign of a rotator cuff tear and may not be tendonitis, so correlation with the clinical findings is essential.
- MRI Scan – Less sensitive than ultrasound for biceps pathology, unless using a high Tesla machine and experienced interpreter.
- Arthroscopy – Not best suited to assess the extra-articular LHB, but the 'gold standard' for intra-articular LHB pathologies.

B. SLAP Lesions

SLAP tears are traumatic injuries, most common in athletes, caused by overload trauma of the superior labrum. This may be due to torsional, traction (peel-back) during overhead cocking or a superiorly directed Subluxation force of the humeral head with an eccentrically contracted biceps.

Clues from the history:

1. Traumatic episode, as above
2. Pain reproduced by overhead sports, lifting, throwing, etc.
3. Painful clunking, clicking and popping of the joint

Clinical examination:

There are numerous clinical tests for SLAP tears. I have found 17 so far. No-one can be expected to know or perform them all. There is a basic common theme to the tests, which is to attempt to reproduce the force of injury mechanism.

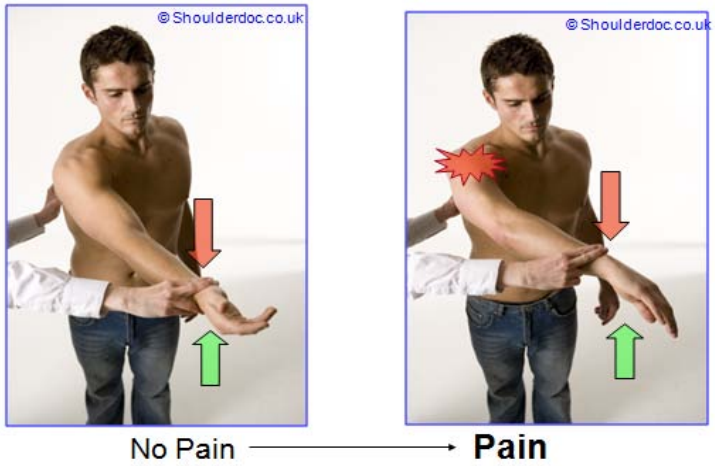
1. Tests which try reproduce a torsional traction force to the superior labrum (active tests): O'Brien's Test, Anterior Slide Test (Kibler), Posterior Slide Test, Luddington's Test, AERS Test, SLAPprehension Test, Feagin Test, Biceps Load Test 1 , Biceps Load Test 2, The Resisted Supination External Rotation and Supine Flexion Resistance Test.

2. Tests which try reproduce a compressive force to the superior labrum (passive tests): Compression Rotation Test (Crank Test), Mayo Shear / O'Driscoll's SLAP Test, Passive Compression Test, Curtain's Test, Kibler's grind test and Pain Provocation Test.

Guanche and Jones (2003) combined 2 or more labral tests on patients undergoing arthroscopy and found specificity increased with a combination of tests. Therefore it is best to choose two tests, one with a high sensitivity and one with a high specificity.

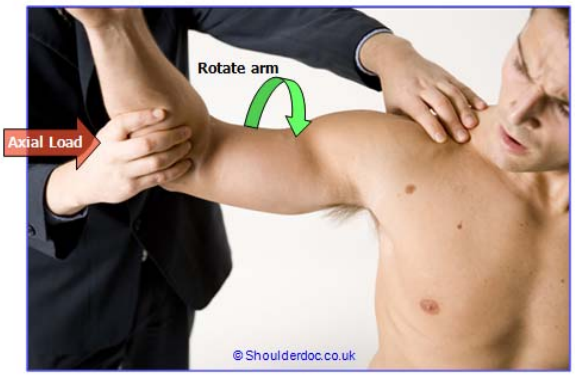
I prefer the O'Brien's test (high specificity) and Compression Rotation Test (crank) (high sensitivity), but also use the Biceps Load Test 2 in equivocal cases.

- O'Brien's test:

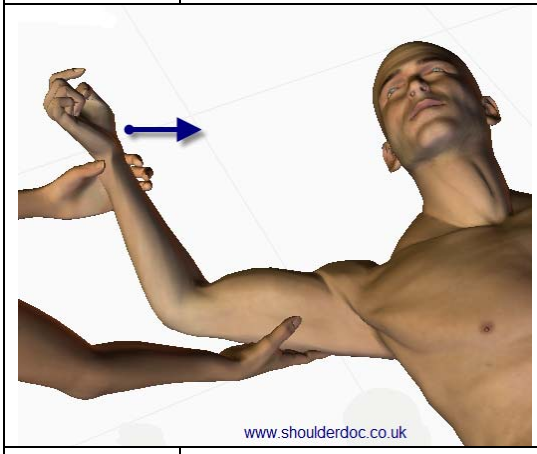
Description:	"The standing patient forward flexed the arm to 90 degrees with the elbow in full extension and then adducted the arm 10 degrees to 15 degrees medial to the sagittal plane of the body and internally rotated it so that the thumb pointed downward. The examiner, standing behind the patient, applied a uniform downward force to the arm. With the arm in the same position, the palm was then fully supinated and the maneuver was repeated." (O'Brien, 1998)
Positive:	"The test was considered positive if pain was elicited during the first maneuver, and was reduced or eliminated with the second. Pain localized to the acromioclavicular joint or "on top" was diagnostic of acromioclavicular joint abnormality, whereas pain or painful clicking described as "inside" the shoulder was considered indicative of labral abnormality." (O'Brien, 1998)
	
Sensitivity:	90% (from O'Brien, 1998 and Pandya et al., 2004)
Specificity:	98% (O'Brien, 1998)
Comments:	Other studies reporting lower sensitivities have a large proportion of patients with additional pathology, leading to false results (eg. Parentis et al. 2006)
References:	O'Brien SJ, Pagnani MJ, Fealy S, et al: The active compression test: A new and effective test for diagnosing labral tears and acromioclavicular joint abnormality. Am J Sports Med 26: 610–613, 1998 Pandya NK, Colton A, Webner D, Sennett B, Huffman, R. Physical Examination and Magnetic Resonance Imaging in the Diagnosis of Superior Labrum Anterior-Posterior Lesions of the Shoulder: A Sensitivity Analysis. Arthroscopy. 24(3):311-7. 2008. Parentis MA, Mohr KJ, ElAttrache NS: Disorders of the superior labrum: Review and treatment guidelines. Clin Orthop 400: 77–87, 2002

- Compression Rotation (crank) Test

Description:	The patient's affected shoulder is abducted to 90 degrees and slowly internally and externally rotated, whilst applying an axial compressive load through the glenohumeral joint. This is analogous to the McMurray's test of the knee for meniscal tears.

Positive:	If the patient reports pain and/ or catching deep in the shoulder joint.
	
Sensitivity:	80%
Specificity:	20%
Comments:	This is a passive compression test, and helps me to discern the location of the labral pathology by the direction of the load and rotation of shoulder.
References:	Snyder SJ, Karzel RP, Del Pizzo W, et al: SLAP lesions of the shoulder. Arthroscopy 6: 274–279, 1990 Stetson WB, Templin K: The crank test, the O'Brien test, and routine magnetic resonance imaging scans in the diagnosis of labral tears. Am J Sports Med 30: 806–809, 2002 Holovacs TF, Osbahr D, Singh H, et al: The sensitivity and specificity of the physical examination to detect glenoid labrum tears. Presented at the specialty day meeting of the American Shoulder and Elbow Society, Orlando, Florida, March 2000

- Biceps Load Test II

Description:	The patient is tested in supine. The arm is abducted to 120°, externally rotated maximally, elbow in 90° flexion and forearm supinated. If this test position reproduces pain then perform active elbow flexion against resistance.
Positive:	The active elbow flexion component of the test should increase pain (or elicit pain) reproduced in the first part of the test. The test is negative if pain is not elicited on active elbow flexion, or if it is unchanged or decreased. The basis of the test is that the abduction/external rotation component changes the relative direction of the biceps tendon in a position obliquely angled to the postero-superior labrum. The resultant contraction of the biceps increases the pain generated by increasing tension on the superior labrum that is already peeled off the glenoid margin in abduction/external rotation.
	
Sensitivity:	90%
Specificity:	97%
References:	Kim SH, Ha KI, Ahn JH, Kim SH, Choi HJ. Biceps load test II: A clinical test for SLAP lesions of the shoulder. Arthroscopy 2001;17:160-164

Diagnostic confirmation:

- MRI Arthrogram – Less sensitive and specific than clinical examination for SLAP tears (approx. 75% in most studies). This is probably due to the fact that a SLAP tear is a dynamic injury and is best assessed dynamically. The accuracy on MR Arthrogram is improved with ABER views. Interpretation accuracy is also improved with an experienced musculoskeletalradiologist or the shoulder surgeon themselves .
- Arthroscopy –The 'gold standard' fordiagnosis of SLAP tears, as they can be dynamically probed and assessed for instability.

C. Pulley lesions

The superior glenohumeral ligament forms a U-shaped anterior suspension sling for the long head of the LHB tendon. The role of the biceps pulley is as a stabilizing sling for the LHB tendon against anterior shearing stress in the rotator interval.

Clinical and radiological diagnosis is extremely difficult, as pulley lesions are often associated with other lesions. These lesions are mainly supraspinatus and subscapularis tears and LHB lesions.

Clinical Examination:

Habermeyer (JSES 2004) in a review of 89 consecutive patients with a mean age of 47.7 years (range, 16-77 years) and an arthroscopically verified pulley lesion found:

- Positive impingement sign in 47 patients
- Positive O'Brien test in 59
- Positive palm-up test in 59.
- One of the above tests was positive in 67 patients (75.3%)
- Two tests were positive in 51 (57.3%)
- None of the patients had any signs of instability or laxity, and all had a full range of motion.

Diagnostic confirmation:

- Arthroscopy –The 'gold standard' for diagnosis of pulley lesions and their associated pathologies.