Clinical Assessment of the Shoulder

When assessing shoulder pain, a structured physical examination, as directed by the patient's history, allows the clinician to look for important diagnostic clues. A look-feel-move approach helps the examiner gather the necessary information.

By Robert H. Hawkins MD, FRCSC

The approach to a physical examination of the shoulder is determined by a patient's history in the same way the history is guided by the presenting complaint. The onset of pain, its location, severity, modifying factors and its impact on daily activities, work and recreation are all important factors in characterizing and defining any ailment.

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Physical examination begins at the start of the interview. An initial impression is formed with regard to the patient's general appearance, level of fitness, habitus, posture and any evidence of unusual pain behavior.

Musculoskeletal examination of any body part involves assessment of an entire region. For example, numbness in the hand may originate from a disc protrusion in the neck, so for assessment purposes, the entire neck and upper extremity must be considered as a whole. This need not be time consuming. Each joint can be briefly checked in a systematic manner as the focus narrows to the source of the problem.

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Summary

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- Musculoskeletal examination of any body part involves assessment of an entire region. For shoulder ailments, always start at the level of the neck and upper back and continue all the way out to the hand.
- The best approach is a "look-feel-move" sequence, followed by special tests for a specific region. Inspection comes first.
- The neck should be examined for localized tenderness or malalignment in the spinous processes in the midline posteriorly. Soft tissues of the neck, both anterior and posterior, are also palpated.
- Examination of the foundation of the shoulder girdle is the next step. The patient's posture should have already been noted when observing him/her from behind. Periscapular soft tissues and muscles can be palpated for the tenderness, which often is associated with myofascial pain.
- It is important to observe the posture of the patient's scapula while at rest and in motion. Winging of the inferior pole indicates dysfunction of the serratus anterior muscle, but not necessarily a neurological injury.
- The most common causes of shoulder complaints are disorders of the rotator cuff. These may be grouped according to whether the cuff is intact or torn.

must be observed, it also must be exposed appropriately. Generally, male patients should be stripped to the waist. Female patients should be appropriately covered in a hospital gown, preferably tied underneath the arms, exposing the shoulders.

The best approach is a "look-feel-move" sequence, followed by special tests for a specific region. Inspection comes first. The author prefers to begin with the patient standing so he can observe the patient's posture. Note whether the shoulders and pelvis are level and the spine is straight. Since the shoulder girdles rest upon this truncal foundation, they can be easily affected by truncal abnormalities, such as spinal curvature with rib hump.

One cause of a "dropped posture" to one shoulder girdle is palsy of the accessory spinal nerve that supplies the trapezius muscle (Figure 1). Since the shoulder girdles rest upon this truncal foundation, they can easily be affected by truncal abnormalities, such as spinal curvature with rib hump. In the resting position, look for winging of the shoulder blade and spinatus muscle wasting (Figure 2), indicating a possible rotator cuff tear. The presence of a "popeye" muscle deformity in the biceps muscle contour indicates rupture of the long head of the biceps tendon (Figure 3). A step deformity in the contour of the cap of the shoulders indicates an acromio-clavicular (AC) separation (Figure 4). A step deformity here indicates an acromio-clavicular separation. Anteriorly, the pectoralis major muscle and anterior axillary fold are compared with the opposite side for possible tendon rupture (Figure 5). The contours of the clavicles are followed medially to the sterno-clavicular joints. Physicians should again note any asymmetry.

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Figure 1. “Dropped shoulder” due to palsy of the spinal accessory nerve.

Figure 2. Bony prominence of scapular spine from spinatus muscle wasting and cuff tear.

Figure 3. Bilateral long head of biceps rupture producing “popeye” muscle deformities.

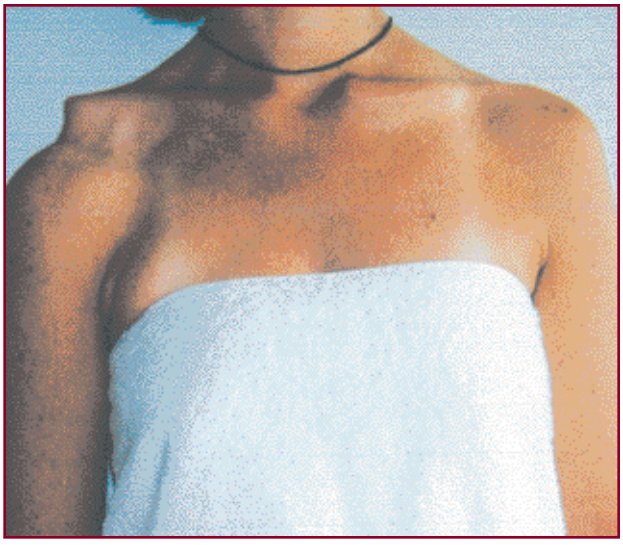

Figure 4. Marked step deformity due to AC separation.

pated. Range-of-motion also should be assessed. Spurling’s test may elicit pain associated with nerve root entrapment. To perform this test, the patient’s head is tilted forward and laterally, then the examiner applies vertical pressure in an attempt to enhance any foraminal encroachment on an exiting nerve root.[1] In such cases, the test may cause pain in the neck, which is particularly diagnostic if it radiates into the shoulder or down the arm.

Examination of the foundation of the shoulder

Figure 5. Bunching of the sternal head of pectoralis muscle due to tendon rupture.

Figure 6. Widespread tenderness not typical of a single organic diagnosis.

girdle is the next step. The patient's posture should have already been noted when observing him/her from behind. Periscapular soft tissues and muscles can be palpated for the tenderness, which often is associated with myofascial pain. These tissues are frequently found along the vertebral border of the scapula, especially the levator scapulae and the trapezius ridge. Widespread tenderness, crossing several anatomic regions, is unlikely to be due to a single organic cause, and is typical of chronic pain syndromes (Figure 6).

It is important to observe the posture of the patient's scapula while at rest and in motion. Winging of the inferior pole indicates dysfunction of the serratus anterior muscle, but not necessarily a neurological injury. Many painful shoulder conditions will cause dynamic winging. For example, winging is commonly seen in the early phases of rehabilitation after shoulder instability surgery. Having the patient do push-ups against the wall or the floor will also enhance serratus winging (Figure 7). The other, less common type of winging is due to dysfunction of the trapezius, mostly related to injury to the spinal accessory nerve. The shoulder girdle will sag downward and forward (Figure 1) and the entire vertebral border of the scapula will be projected outward. Patients will demonstrate weakness of shoulder shrug and be unable to push up from a sitting position with both arms.

Physicians usually assess range of motion using the recommendations of the American Shoulder and Elbow Surgeons Research Committee.[2] One of the most important motions is the ability to raise the arm upwards to the highest point possible. This may be achieved starting in the coronal plane (abduction) or the sagittal plane (flexion), but to reach maximum height, the shoulder must eventually rotate externally and shift to the plane of the scapula. Abduction and flexion, therefore, are no longer commonly measured. Instead, the maximum achievable angle between the humerus and thorax is recorded as shoulder elevation (Figure 8). This represents a combination of glenohumeral and scapulo-thoracic motion. With the arm at the side, external rota-

Figure 7. Winging of the shoulder blade due to weakness of the serratus anterior muscle.

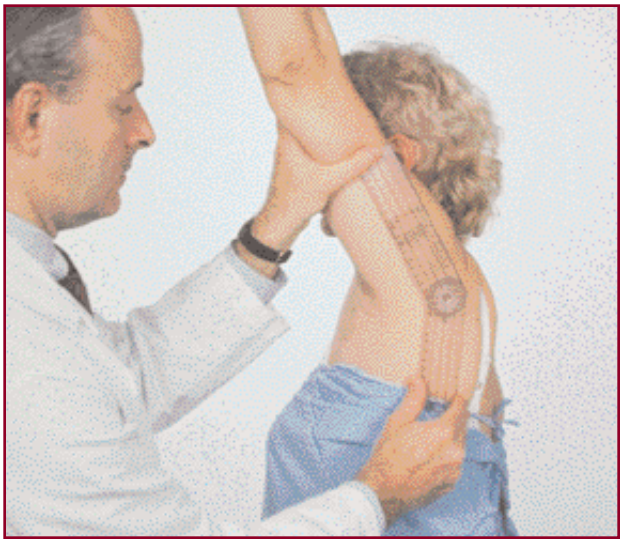

Figure 8. Total elevation measured by the thoraco-humeral angle.

tion is the angle between the forearm and the sagittal axis as the forearm moves outward. Internal rotation is the highest spinal level achievable in the midline posteriorly as the patient reaches up behind with the "hitch-hiking thumb" (Figure 9). External and internal rotation also are measured in 90º abduction at the shoulder with the elbow flexed 90º. The starting point is with the forearm in a horizontal position.

The author always measures rotator muscle strength as part of shoulder examination. This can be quantified according to the Medical Research Council (MRC) system of grading 0 to 51. Physicians must allow for limitations in their patients, due to pain or stiffness. Supraspinatus strength is assessed with the shoulder in 90º elevation (*i.e.*, in the scapular plane) and with the arm fully internally rotated, thumb pointing to the floor — the "empty can" position (Figure 10). The strength of elevation against resistance in this position should be noted. Infraspinatus strength is measured with the arm in 90º abduction, elbow at 90º flexion and the forearm horizontal. The strength of external rotation against resistance is recorded. External rotation strength with the elbow at the side measures both supra and infraspinatus (Figure 11). The subscapularis is assessed by the "lift-off test," which is performed with the shoulder fully internally rotated,

Figure 9. Measuring internal rotation, arm at side.

Figure 10. Testing supraspinatus strength in the "empty can" position.

Figure 11. Testing external rotation strength elbow at side.

Figure 12. The "lift-off" test.

placing the back of the hand against the small of the back (Figure 12).[3] This examiner must first ensure this arm positioning can be reached passively, and without undue discomfort, with the hand held off the back (the test is invalid if it causes undue discomfort in the patient). The subject is then asked to hold the arm in that position and not allow the hand drop to the small of the back.

It is very useful to note differences between active and passive motion. Large differences suggest significant tendon or nerve injury and are referred to as lag signs.[4] For example, a large rotator cuff tear will often present with a drop-arm sign (Figure 13). External rotation weakness will likely be profound as well. A positive lift-off sign signifies major disruption of the subscapularis tendon, perhaps from a shoulder dislocation or recent instability surgery.

The most common causes of shoulder complaints are disorders of the rotator cuff. These may be grouped according to whether the cuff is intact or torn. In the former, the intact cuff is subjected to repetitive mechanical friction against the coraco-acromial arch. Frequently, these patients will have a tight posterior capsule, which perpetuates the problem by pushing the humeral head and overlying cuff tendon against

Figure 13. The drop-arm sign.

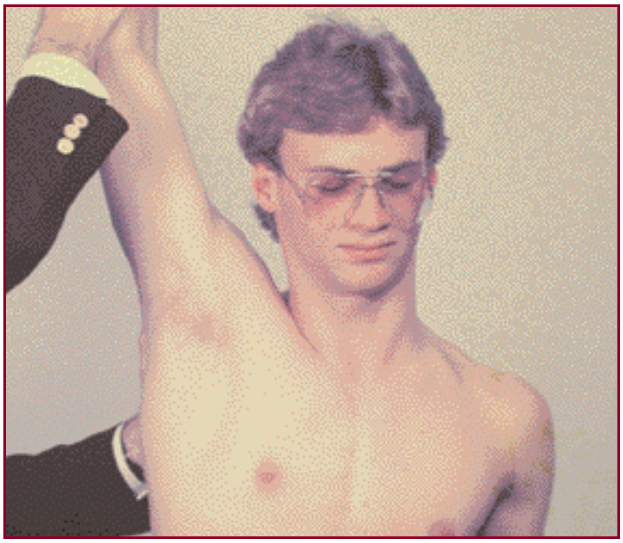

Figure 14. The Neer test: forced forward elevation

the coraco-acromial arch whenever the arm is elevated.[5] Loss of internal rotation is usually evident, especially if compared to the opposite normal shoulder. Posterior capsular stretches are particularly useful here. In this form of mechanical tendinopathy, called impingement syndrome, one or more of the impingement tests usually will be painful. The first is forced forward elevation, or the Neer sign, in which the arm is elevated to the full overhead position and then pushed a bit further (Figure 14).[6] The forced internal rotation test or Hawkins sign is performed by raising the arm horizontally, and then internally rotating the shoulder using the flexed forearm as a lever (Figure 15).[1] Both tests are done passively. In contrast, the third test (the painful arc sign or Jobe test) is an active abduction motion against light resistance (Figure 16).

A useful method of confirming the diagnosis is to inject 10 ccs of 1% lidocaine into the subacromial space using a sterile technique (Figure 17). Ablation of pain for the duration of the anesthetic effect often is very helpful.

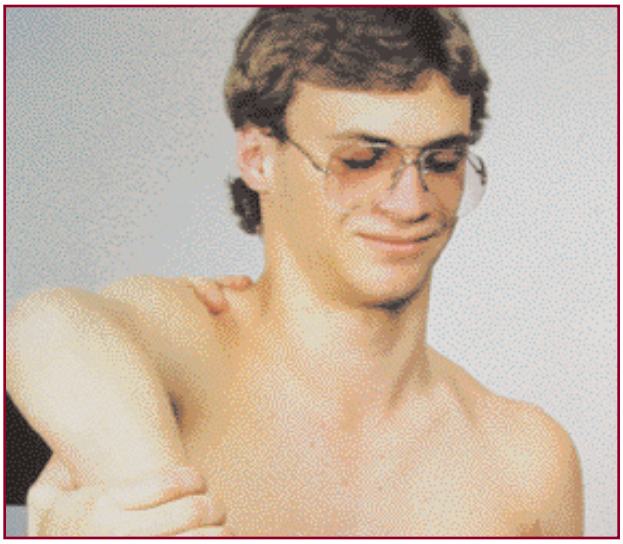

Figure 15. The Hawkins sign: Forced internal rotation at shoulder height.

The signs and symptoms of rotator cuff tear depend on the size of the tear and the patient's activity level. A small tear in a sedentary person may escape notice. In patients with medium and larger defects, a prolonged history of shoulder

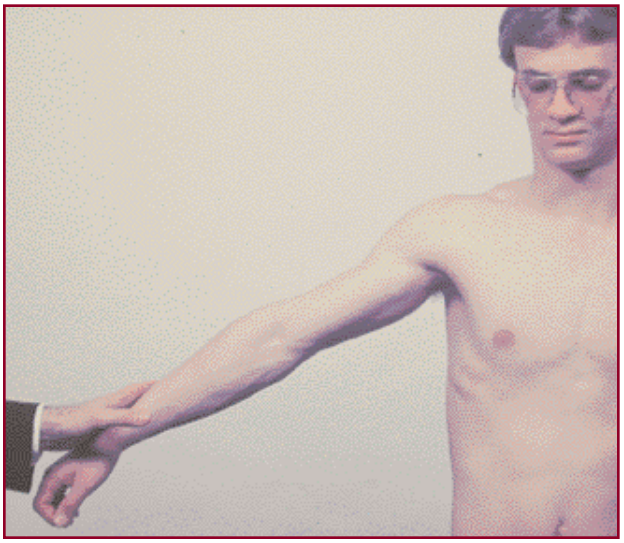

Figure 16. The Jobe sign or painful arc.

Figure 17. Subacromial injection test.

Figure 18. Marked weakness and pain in a significant rotator cuff tear.

Figure 19. The sulcus sign: inferior subluxation in a shoulder with multi-directional instability.

pain is typical, often with no recognized traumatic event. Such individuals often have night pain and notice crepitus. Rotator strength should be measured and compared with the opposite side. Marked weakness and pain in middle-aged individuals will frequently mean a significant cuff tear (Figure 18).

Instability is the second most common category of shoulder complaints, after rotator cuff disorders. Of these, 90% or more are anterior and anteroinferior, either unidirectional in nature or associated with inferior laxity. Translation testing assesses the amount of passive shifting of

Figure 20. The apprehension test.

Figure 21. The relocation test.

ball in socket in any given direction.

With the patient in the sitting position and his/her arm hanging comfortably at his/her side, the proximal humerus can be gripped and shifted anteriorly, posteriorly and inferiorly. The latter will produce a sulcus sign in the lax shoulder, which is characterized by an hourglass shape of soft tissues beneath the acromion as the humeral head descends (Figure 19). Generally, this is not painful and is often more obvious on the uninvolved shoulder, since the condition is frequently bilateral. Translation testing is then repeated with the subject in the supine position. The load-and-shift maneuver can be done with the patient in this position. The upper arm is gripped with both hands and the glenohumeral joint is loaded by pressing the ball into the socket. By loading the joint in this fashion, the humeral head centers in the glenoid socket, providing a starting point for assessment of any subsequent shifting. With the load still applied, the humeral head is then "shifted" in an anterior, inferior and posterior direction. The test is first done with the shoulder in about 30º of elevation and then repeated at 90º. Translation is recorded as grade 3 if the ball can be felt to shift all the way over the glenoid edge, grade 2 if it shifts up to, but not over, the edge, grade 1 if it only moves a little and grade 0 if no movement is detected. The examiner should carefully note any symptom reproduction. Unfortunately, the load and shift test has poor inter- and intra-observer reliability.[7]

Apprehension and relocation testing also can be performed with the patient in the supine position. Here, the examiner attempts to recreate the dread of an imminent subluxation or dislocation already familiar to the patient, and then relieve it by pushing the ball back into the socket. Pain alone in this position does not constitute a positive apprehension sign.[8] Many shoulder conditions (*e.g.*, rotator cuff disease or osteoarthritis) might be uncomfortable with such positioning. Conversely, the sense that the shoulder is about to "come out of the joint again" is a unique sensation. Unfortunately, the amount of apprehension elicited will vary, depending on the circumstances, especially the length of time elapsed

Figure 22. The biceps resistance test.

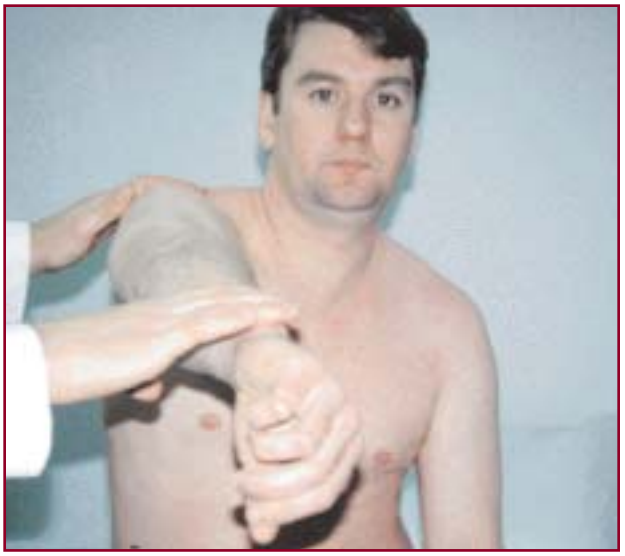

Figure 23. The O'Brien test for a SLAP lesion.

since the last incident. Apprehension and relocating testing often can fail to provoke apprehension, even in known dislocators (*i.e.*, people who are proven to have dislocated in the past). Its greatest value is when the direction of instability is unclear and even sophisticated imaging provides no answer. In such cases, the sense of apprehension for an anterior dislocation may be the only evidence the shoulder is going out at the front. This is obviously of great help to the surgeon, since it confirms the surgical approach should be on the front, rather than the back, of the shoulder.

For both tests, the subject is moved to the edge of the examining table so there is no posterior support and the shoulder is positioned in 90º abduction, with the elbow also at 90º. The arm is then carefully brought back into further external rotation while the examiner asks the patient if a dislocation feels imminent (Figure 20). If the apprehension test is positive, a posteriorly directed force is applied to the anterior shoulder. If apprehension is relieved, it is termed a positive relocation test (Figure 21). Sudden release of this pressure may cause startled surprise — termed the "surprise" sign — as apprehension returns. In performing these tests, physicians must avoid inducing an actual dislocation in vulnerable shoulders. Also, the test may have to be aborted if there is too much active resistance and guarding.

Shoulders with posterior instability also may demonstrate apprehension. The vulnerable position here is the FAIR position of ***F***lexion to horizontal, ***A***dduction and ***I***nternal ***R***otation. More typically, however, these shoulders will simply subluxate out the back without any premonitory apprehension. In many cases, subjects will be able to demonstrate the event on command and are termed voluntary subluxators. Contrary to earlier thinking, it is rare that these individuals suffer from psychological disorders and willfully perform this type of pain to gain attention.

Biceps tendonitis is generally part of impingement syndrome affecting the whole rotator cuff, but may occur by itself. It is not as common as impingement syndrome. Localizing tenderness over the biceps groove in the anterior shoulder cap is typical. The Speed or biceps resistance test may also be positive (Figure 22). Here the arm is flexed to 90º and externally rotated with the forearm in maximal supination. The subject resists a downward force. Again, an injection test of lidocaine directly into the biceps groove can be very useful in confirming the diagnosis.

Lesions of the biceps anchor at its origin inside the shoulder joint have received much attention in recent years. These are called superior labrum anterior and posterior (SLAP) lesions. Various forms of detachment have been described and such detachment typically causes shoulder pain in throwing athletes. Several physical tests have been described for this, but none has any proven reliability.[9] Probably the best known is the O'Brien test. The shoulder is raised to the horizontal position and then fully internally rotated and adducted, with the thumb pointing downward (Figure 23). The subject is then asked to resist a downward directed force. Pain with this maneuver is said to indicate a SLAP lesion. As a control, the test is repeated with the thumb pointing upwards and should be painless.

Summary

A structured physical examination, as directed by the patient's history, will allow the clinician to look for important clues as to the diagnosis of shoulder injury. As with other musculo-skeletal examinations, a look-feel-move approach will help the examiner gather the necessary information. Armed with this information the next phase of investigation — imaging studies — may be approached with confidence. CME

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