Scapular dysfunction has been widely implicated as a contributing factor to shoulder pathology. Thus, evaluations of scapular motion and strength have been described as key components of a comprehensive shoulder examination. Some methods for evaluating scapular function, however, might not yield sufficient information from which to make an informed clinical decision regarding appropriate interventions. Traditional evaluation of the scapula has often been limited to nothing more than having patients raise and lower their arms for several repetitions. Unfortunately, observation during unweighted arm elevation is often insufficient to detect scapular dysfunction because it fails to load and challenge the scapulothoracic musculature. Three-dimensional measurement of scapular kinematics has provided a great deal of information regarding normal and abnormal scapular function, but these methods are not readily available or practical in the clinical setting. Determining appropriate clinical tests to evaluate scapular dysfunction can be a challenge. Therefore, the objective of this article is to present methods for evaluating scapular dysfunction that will help clinicians develop an appropriate course of intervention.

**Key Points**

- Scapular evaluation should include repetitive loading of the scapula muscles.
- Soft-tissue mobility assessment of the shoulder is an important aspect of scapular evaluation.
- Scapular special tests include the scapular-assistance test and the scapular-retraction test.
- Key Words: shoulder, dyskinesis, classification

**Clinical Evaluation**

**Visualization**

Evaluation of the scapula requires full visualization of the posterior thorax and both scapulae. This can be achieved by having male athletes remove their shirts and by appropriately draping female athletes in gowns tied at the neck and waist or having them wear swimsuit tops or sport bras that do not cover (thereby possibly stabilizing) the scapula (Figure 1). Comprehensive evaluation of the scapula includes observation of scapular motion to detect scapular dyskinesis (aberrant scapular motion or winging).

**Figure 1** Weighted bilateral shoulder-flexion testing to evaluate scapular motion.
Classification Protocols

Several investigators\(^1\text{-}^7\) have reported on the development of scapular-assessment protocols that incorporate specific tests designed to load and challenge the periscapular musculature in order to detect and classify movement dysfunction. Johnson et al.\(^2\) developed a protocol that was later refined and used to evaluate 27 patients with active shoulder pathology \(N = 32\).\(^1\) Their data indicated that three simple clinical tests should be performed to detect abnormal scapular motion: (a) observation of bilateral scapular motion during multiple repetitions (5–10) of unweighted humeral elevation in the scapular plane to establish a baseline of scapular movement, (b) observation of bilateral scapular motion during multiple repetitions (5–10) of weighted (0.5–5 kg \([1–10 \text{ lb}]\)) shoulder flexion, and (c) observation of scapular motion during performance of resisted isometric external rotation with the arm at the side in neutral rotation \(\text{(scapular flip sign)}\).\(^8\) It is important to note that an adequate amount of weight should be chosen to load the scapular musculature but not exacerbate shoulder pain.

Several scapular-classification protocols have evolved from the work of Johnson et al.,\(^2\) and each consists of similar test components that include unweighted and weighted flexion and abduction and the scapular flip sign.\(^1,2,4\text{-}7\) Collectively these tests appear to demonstrate acceptable intrarater\(^1\) and interrater\(^1,6,7\) reliability and percentage agreement.\(^1,6,7\) A positive test for abnormal scapular motion with weighted flexion has been shown to be a valid indicator of abnormal scapular motion compared with three-dimensional kinematic measures.\(^4\)

Of all of the tests reported, weighted shoulder flexion has consistently been identified as the single clinical test most highly associated with abnormal scapular motion (Figure 1).\(^1,4,6\) Johnson et al.\(^1\) reported that weighted flexion and the scapular flip sign identified 100\% of visible scapular-motion abnormalities.\(^1\) Gard et al.\(^6\) reported that weighted flexion identified the most scapular-motion abnormalities \((48/50)\), followed by unweighted flexion \((43/50)\), with lower values for weighted \((54/50)\) and unweighted abduction \((29/50)\) and resisted external rotation at neutral elevation \(\text{(scapular flip sign; 23/50)}\). It is important to note that the diagnostic value \(\text{(accuracy, sensitivity, specificity, and positive and negative predictive value)}\) of these tests in isolation, or as part of a classification protocol, remains to be demonstrated.

Manual Muscle Testing

In addition to scapular-motion assessment, a thorough assessment of muscle strength should be performed using graded manual muscle tests\(^9\) for the scapula-stabilizing muscles including the serratus anterior, rhomboids, and middle, upper, and lower trapezius. These muscles are the primary scapular stabilizers, and changes in their strength have been implicated in altered scapular kinematics and subacromial impingement.\(^10,11\) Michener et al.\(^12\) have demonstrated that a single clinician can reliably assess these muscles using a handheld dynamometer in patients with pain and functional loss.

Scapular Special Tests

The addition of scapular special tests including the scapular-assistance test and scapular-retraction test might prove useful in trying to determine whether scapular-motion abnormalities are contributing to a patient’s symptoms. The scapular-assistance test is performed by manually stabilizing the scapula on the thorax and assisting the inferomedial border in rotating in a stable and coordinated fashion while the patient raises his or her arm (Figure 2).\(^13,14\) A positive test is when the patient reports a reduction of symptoms.

![Figure 2 Scapular-assistance test.](image-url)
while you are manually stabilizing and assisting the scapula through a full range of motion.

The scapular-retraction test is another special test that can be performed to assess the contribution of the scapulothoracic articulation to impairments such as pain and muscle weakness. The test is performed by manual and patient-assisted retraction and stabilization of the scapula on the thorax (Figure 3). I prefer to then have the patient move through a full range of motion to assess any change in symptoms with manual scapular stabilization. The scapular-retraction test has been described as a test to assess the contribution of scapular stability to muscle-force output. The athlete begins the test by performing a traditional empty-can test with no scapular retraction or stabilization. The scapula is then retracted and manually stabilized, and the test is repeated. If the patient demonstrates greater strength during retesting with the scapula in the retracted and stabilized position, the test is considered positive.

The scapular-assistance and scapular-retraction tests are both designed to stabilize and position the scapula on the thorax. Diminished pain or increased muscle strength during these tests suggests that abnormal scapular control is contributing to the patient’s symptoms, and rehabilitative interventions should be implemented to restore scapular stability and motor control. The diagnostic value of these tests, however, remains to be demonstrated.

**Soft-Tissue Mobility Assessment**

Other useful adjuncts to clinical evaluation of the scapula include various tests of soft-tissue mobility about the shoulder. Soft-tissue restrictions such as decreased posterior shoulder mobility or increased pectoralis-minor tightness can lead to alterations in scapular kinematics, including reduced posterior tilting, upward rotation, or external rotation during arm elevation. Posterior-capsule or rotator-cuff tightness can be evaluated by measuring passive isolated glenohumeral-joint internal rotation or cross-body horizontal adduction. Pectoralis-minor tightness can be evaluated by measuring, with the patient supine, from the treatment table to the posterior acromion. Wang et al. recently determined that, with the patient supine on a treatment table, a linear distance between the posterior acromion and the surface of the table of less than 2.5 cm is indicative of a short pectoralis minor.

**Postural Assessment**

Forward head posture, forward shoulder posture, and thoracic kyphosis should be assessed as part of any scapular evaluation. Collectively, this triad of impairments has been widely implicated in shoulder dysfunction. Patients with spinal posture changes indicative of forward head and shoulder posture and thoracic kyphosis, such as increased cervical extension and thoracic flexion, demonstrate altered scapular kinematics consistent with subacromial impingement. These postural malalignments are suspected to inhibit scapular posterior tilt and external rotation during arm elevation, thereby compromising the subacromial space. A quick and efficient postural screen for forward head posture, forward shoulder posture, and thoracic kyphosis can be accomplished using the side-view plumb-line screen (Figure 4).

**Intervention Implications**

Patients with identifiable scapular impairments should receive specific interventions to restore neuromuscular control, strength, and soft-tissue mobility and to address postural malalignments. Treatment interventions for scapular dysfunction should be based on specific clinical-examination findings. For instance, two patients with subacromial-impingement syndrome might have differing scapular contributions to their pain and dysfunction that require different treatment strategies. One patient might demonstrate scapular...
dyskinesia and scapular-muscle weakness that are leading to altered scapular kinematics (decreased posterior tilt, external rotation, and upward rotation). This patient would probably benefit most from a thorough scapular-stabilization and neuromuscular-control rehabilitation program. The other patient might exhibit coordinated and stable scapular motion but exhibit significant pectoralis-minor and posterior-capsule or -cuff tightness in addition to forward shoulder posture and thoracic kyphosis that are contributing to altered scapular kinematics (decreased posterior tilt, external rotation, and upward rotation). This patient would most likely benefit from specific manual therapies aimed at restoring soft-tissue mobility and thoracic extension coupled with strengthening exercises to promote thoracic extension and scapular retraction. Patients with negative scapular-examination findings should still receive core scapular-stabilization exercises, but these might be adjunctive to other interventions that have been given higher priority based on the physical examination.

Alterations in scapular kinematics in the presence of shoulder pathology have been well demonstrated.\textsuperscript{10,24} Visible scapular-motion abnormalities might be more common, however, in cases of long-standing or more severe shoulder pathology\textsuperscript{1} or in patients with nerve injury.\textsuperscript{25} Furthermore, the evidence suggests that visible scapular-motion abnormalities are more prevalent in patients with the specific diagnoses of shoulder instability and shoulder-impingement syndrome.\textsuperscript{1,26}

Proximal stability and neuromuscular control of the scapula are critical to distal mobility and function of the arm. A thorough and systematic evaluation of the scapula to determine scapular-motion quantity and quality, scapular-positioning contribution to pain and strength, scapular-muscle strength, soft-tissue mobility, and spinal posture should be central to every examination of the shoulder. This evaluation will help identify specific impairments that might be contributing to functional loss and disability and will serve to establish clear priorities for treatment intervention. Nonetheless, the prognostic value of scapular dysfunction in relation to normal, pain-free shoulder function remains unclear. More research is needed to evaluate the diagnostic and prognostic value of scapular tests in specific patient populations with well-defined shoulder pathology.

\textbf{Clinical-Evaluation Summary}

1. The examiner must expose the posterior thorax and scapulae by having male patients remove their shirts or by draping female patients with a gown.

2. Visible observation of scapular-movement dysfunction usually requires that you repetitively challenge the scapula under loaded conditions.

3. Clinical evaluation of the scapula should consist of the following examination techniques:
   a. Observation of bilateral scapular motion during multiple repetitions (5–10) of unweighted shoulder flexion to determine a baseline.
   b. Observation of bilateral scapular motion during multiple repetitions (5–10) of weighted (0.5–5 kg [1–10 lb]) shoulder flexion.
   c. Observation of scapular motion during performance of resisted isometric external rotation.
with the arm at the side in neutral rotation (scapular flip sign).

d. Manual muscle testing of the scapular-stabilizing muscles (serratus anterior, rhomboids, and middle, upper, and lower trapezius).

e. Performance of the manual scapular-assistance test and scapular-retraction test to determine the contribution of scapular dysfunction to shoulder symptoms.

f. Evaluation of specific soft-tissue mobility patterns such as posterior-capsule or rotator-cuff hypomobility and pectoralis-minor tightness.

g. Screening for forward head posture, forward shoulder posture, and thoracic kyphosis using a side-view plumb line.

4. A thorough clinical evaluation of the scapula that demonstrates specific impairments (e.g., dyskinesia and hypomobility) should be used to determine specific treatment interventions (e.g., strengthening and mobilization).

5. Further research into the diagnostic and prognostic value of clinical tests to evaluate scapular dysfunction is needed.

References


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