Shoulder impingement syndrome

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ABSTRACT Subacromial impingement syndrome is a common cause of shoulder pain. The purpose of this article is to review the clinical presentation, physical examination findings, and differential diagnosis of impingement syndrome. Using an evidence-based approach, we propose an algorithm for the management of subacromial impingement syndrome including indications for nonoperative management, advanced imaging, and operative management.

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Shoulder pain is a common presenting complaint for patients of all ages and activity levels. Subacromial impingement syndrome (SIS) encompasses a spectrum of subacromial space pathologies including partial thickness rotator cuff tears, rotator cuff tendinosis, calcific tendinitis, and subacromial bursitis. These conditions may all present similarly and are often distinguishable only by magnetic resonance imaging (MRI) or arthroscopy. In this article we present the clinician with key historical and physical examination findings, a differential diagnosis, and an algorithm to guide management and referral of patients with SIS.

Clinical presentation

Although impingement symptoms may arise following trauma, the pain more typically develops insidiously over a period of weeks to months. The pain is typically localized to the anterolateral acromion and frequently radiates to the lateral mid-humerus. Patients usually complain of pain at night, exacerbated by lying on the involved shoulder, or sleeping with the arm overhead. Normal daily activities such as combing one’s hair or reaching up into a cupboard become painful, and a general loss of strength may be noted. Onset of shoulder pain and weakness following a fall in an individual over 40 years of age should raise concern for a complete tear of the rotator cuff.

Examination findings

A thorough examination of the neck and shoulder is critical to properly diagnosing SIS. Strength testing of the upper extremities as well as neck and shoulder ranges of motion should be carefully assessed. In SIS, active and passive shoulder range of motion is typically normal. The muscles of the rotator cuff are best isolated with 3 separate maneuvers. To isolate the subscapularis, the patient places their hand behind the back and attempts to push away the examiner’s hand (Figure 1), a maneuver called the lift-off test. Next, with the arms at the sides and the elbows flexed, the examiner resists the patient in external rotation of the shoulder. Next, to isolate the supraspinatus, which may be painful with SIS, the patient abducts the arms to 90°, forward flexes to 30°, and internally rotates each humerus so that the thumbs are pointed to the floor. A downward force is then applied to the forearms as the patient resists (Figure 3).

Two provocative examination techniques are highly sensitive but not very specific for diagnosing SIS. Neer’s sign (Figure 4) elicits pain with maximum passive shoulder el-
evation and internal rotation while the scapula is stabilized.\textsuperscript{1} Hawkins sign (Figure 5) is pain with passive forward elevation to 90° and maximum internal rotation.\textsuperscript{2} These 2 tests have a negative predictive value of greater than 90\% when combined.\textsuperscript{3} Marked rotator cuff weakness with positive impingement signs may indicate a complete cuff rupture. The Neer impingement test involves injecting the subacromial space with 10 mL of local anesthetic and observing an amelioration of pain with these provocative tests.\textsuperscript{1}

### Differential diagnosis

Narrowing the etiology of shoulder pain can be difficult as a number of conditions often coexist in older individuals. The etiology of adhesive capsulitis is unknown, although thought to be inflammatory in nature. The disease is more commonly encountered among women in their 50s and 60s.

It is 5 times more likely to occur in patients with diabetes mellitus\textsuperscript{4} and has been associated with hypothyroidism. Adhesive capsulitis often presents with unremitting shoulder pain at rest, and early stages of adhesive capsulitis may present much like impingement syndrome. Later, patients will develop progressive loss of motion, with loss of internal rotation an early sign of the motion loss (Figure 6). Patients with adhesive capsulitis will be limited in both active and passive ranges of motion, particularly in contrast to SIS, where passive motion is unrestricted.

Cervical radiculopathy may present with unilateral shoulder pain. This can be particularly difficult to sort out in older patients who may have both rotator cuff pathology and cervical spine osteoarthritis. The patient with shoulder pain of a cervical origin may have pain and spasm in the trapezius muscles and a limited neck range of motion. They may also experience pain, numbness, or paresthesias radiating to the arm and hand. Symptoms may be provoked by hyperextension and lateral rotation of the neck (Spurling’s maneuver). A key historical detail may be that pain is alleviated when the forearm is rested above the head.

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**Figure 1** Examining the subscapularis using the lift-off test. This may be painful or weak with tears of the anterior supraspinatus or subscapularis.

**Figure 2** Examining the external rotators of the shoulder. This may be painful or weak with tears of the supraspinatus or infraspinatus.

**Figure 3** Examining the supraspinatus. Pain or weakness may be seen in disorders of the rotator cuff.

**Figure 4** Neer’s sign. A provocative test where pain is suggestive of impingement syndrome.

**Figure 5** Hawkins sign. (Figure 5) is pain with passive forward elevation to 90° and maximum internal rotation. These 2 tests have a negative predictive value of greater than 90\% when combined.

**Figure 6** Neer’s sign. A provocative test where pain is suggestive of impingement syndrome.
Degenerative changes within the acromioclavicular (AC) joint and osteolysis of the distal clavicle are often found in individuals with a history of heavy labor or weightlifting but may occur in anyone. The pain may be present over the AC joint itself or be referred to the upper shoulder and neck. Sleeping on the affected side and overhead movements exacerbate the symptoms. Physical examination typically confirms the diagnosis with marked tenderness over the AC joint and pain with compression of the joint through adduction of the elevated arm. Osteoarthritis of the glenohumeral joint presents with a painful diminished range of motion. Arthritic changes in either joint are apparent on radiographs.

Management

The natural course of SIS is poorly described, but evidence suggests that the condition is not self-limiting. The initial management of shoulder impingement has traditionally included physical therapy, nonsteroidal anti-inflammatory drugs (NSAIDs), and corticosteroid injection. A recent systematic review of 8 randomized controlled trials (RCTs) evaluated the efficacy of corticosteroid injection in the treatment of rotator cuff tendonitis (Koester MC, Dunn WR, Spindler KP, Kuhn JE. Does corticosteroid injection improve short term outcomes for rotator cuff tendonitis? A systematic review [unpublished]). Two of the trials also evaluated NSAIDs versus injection and placebo. Only 2 of the 8 trials showed clinically relevant improvements in pain and range of motion in the injection groups as compared with placebo. However, in both of these studies the outcomes of patients treated with injection and oral NSAIDs were equivocal.

Physical therapy is frequently implemented to lessen pain and improve function in SIS. A systematic review of manual and physical therapy treatment in SIS by Desmeules et al. revealed only 7 RCTs that met their criteria for review. They reported a lack of uniformity in defining, evaluating, and treating SIS. Each of the reviewed trials was scored on methodological design and each scored relatively poorly. The few trials that were moderately well designed offered limited evidence to support the efficacy of physical therapy in SIS.

In addition to physical therapy and medications, activity and workplace modifications must be discussed. Patients should attempt to discontinue overhead activities until symptoms diminish. It may be helpful to discuss “living within a window” in which they consciously attempt to keep their hands within an area in front of their body during activity. The “window” should be from chest to waist and 2 to 3 feet wide, allowing the patient to avoid reaching overhead, away from the body, or behind the back, all of which will exacerbate their symptoms.

Bearing in mind that the literature offers few truly well-conducted trials regarding the management of SIS, we present an algorithm of our recommended management of SIS based upon a synthesis of the best available literature (Figure 7). Note that an MRI is not recommended until at least a 6-week therapeutic trial has been implemented unless a complete rupture is suspected.

Indications for referral and surgical options

When conservative management fails to relieve the symptoms associated with SIS or a complete cuff rupture is seen on MRI, operative intervention may be warranted. Historically, open anterior acromioplasty with resection of the coracoacromial ligament and the subacromial bursa achieved excellent pain relief. Today, arthroscopic subacromial decompression with release of the coracoacromial ligament and resection of the subacromial bursa has been shown to achieve similar results without the violation of the deltoid insertion that is necessary in the open procedure. Shoulder arthroscopy also allows an evaluation of the glenohumeral joint and the integrity of the rotator cuff. Pathological conditions of the glenohumeral joint. This finding is an early sign of adhesive capsulitis.
joint, rotator cuff, and acromioclavicular joint may also be addressed at the time of surgery.

**Summary**

Subacromial impingement syndrome is common, yet it is important to differentiate this condition from a number of other conditions that affect the shoulder. Nonoperative treatment includes NSAIDs, physical therapy, and subacromial injections of corticosteroids, yet there is little evidence-based medicine research to support their use. Surgical subacromial decompression may help patients who fail nonoperative treatment.

**References**