

# Shoulder Pain in Musicians

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## Abstract

Professional musicians with shoulder pain and other performance-related musculoskeletal disorders have received little attention in the orthopedic literature. Musicians, who repetitively use their hands overhead such as small string instrument players and conductors, are susceptible to rotator cuff injury. Rotator cuff injuries range from an acute tendonitis to chronic tendinosis and rotator cuff tears. The rotator cuff functions as a shoulder stabilizer and assists in arm elevation and rotation. Rotator cuff injuries cause pain and may result in weakness and difficulty performing daily as well as musical activities. Treatment of rotator cuff injuries focuses on nonoperative modalities, but surgical intervention may be indicated for persistent pain. Physicians should be aware that rotator cuff injuries occur in musicians to ensure timely and appropriate treatment.

## Keywords

music medicine, shoulder pain, rotator cuff, impingement

Rotator cuff tendonitis and other overuse shoulder injuries are well described and documented in athletes who participate in overhead activities (Braun, Kokmeyer, & Millett, 2009; Burkhart, Morgan, & Kibler, 2003; Hawkins & Kenneth, 1980; Heyworth, 2009). However, there is a paucity of data on shoulder pain in musicians who, like athletes, participate in repetitive overhead activity. Zaza and Farewell (1997) coined the phrase “playing-related musculoskeletal disorders” (PRMDs) to highlight the occurrence of musculoskeletal disorders in musicians. The incidence of PRMDs in musicians ranges from 37% to 87% depending on the age of the musician and the types of instruments played (Zaza, 1998). In one study, 64% of musicians’ shoulder problems occurred with playing small string instruments, while 36% arose in trombone, bassoon, and cello players (Zaza & Farewell, 1997).

Regardless of the instrument played, the common pathology and most common cause of rotator cuff injury is chronic, repetitive overhead use of the arm that results in tendon inflammation and pain (Kuhn, 2009). Nonoperative treatment has been successful in the athletic population but little data exist for musicians with shoulder pain (Braun et al., 2009; Bytomski, 2006). More studies are needed to look at the appropriate treatment modalities for musicians to ensure a quick return to practice and performance. It is important for physicians to be aware that this problem occurs in musicians so that an accurate diagnosis can be made and treatment can begin promptly.

## Background

The glenohumeral joint, commonly known as the shoulder joint, is a ball and socket type joint where the top part of the arm bone, the humerus, articulates with the glenoid fossa of the scapula. The humeral head is much larger than the glenoid

fossa and is often likened to a golf ball (head of the humerus) sitting on a golf tee (glenoid fossa).

The glenohumeral joint is the most mobile joint in the body. Since it does not have a substantial amount of bony coverage, it relies heavily on the surrounding soft tissues to maintain stability. The soft tissues can act as passive (capsulolabral complex) and active (musculotendinous unit) stabilizers of the shoulder. A very important active stabilizer is the rotator cuff.

The rotator cuff consists of the subscapularis, supraspinatus, infraspinatus, and teres minor muscle tendons (see Figure 1). The rotator cuff tendons pass between the humeral head and a part of the scapula called the acromion before inserting onto the humerus. The rotator cuff compresses the humeral head against the glenoid, allowing concentric rotation of the humeral head, and also functions in rotation and elevation of the arm.

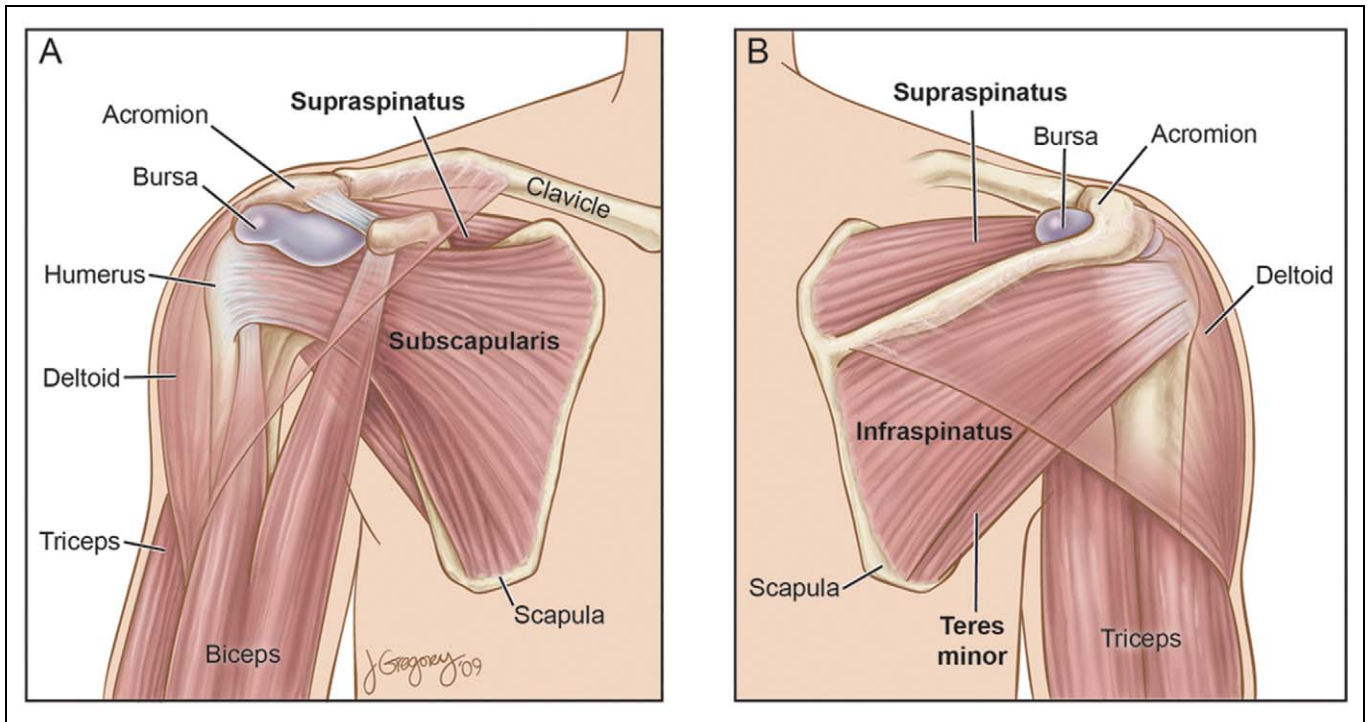
Rotator cuff tendinopathy is a term that describes a spectrum of tendon injuries including tendonitis and tendinosis. Rotator cuff tendonitis is acute inflammation of the rotator cuff tendons that causes pain. It usually occurs after an acute traumatic event. Rotator cuff tendinosis is degeneration of the rotator cuff tendon that occurs from chronic, repetitive overuse. Rotator cuff tendinopathy is one of the most common causes of shoulder pain in adults and usually occurs in patients between 30 and 50 years old. People who participate in activities that

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**Figure 1.** Rotator cuff anatomy

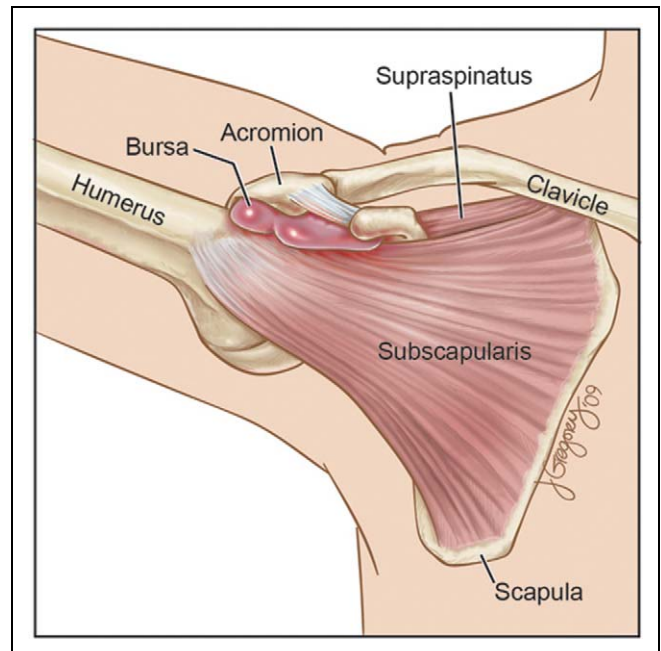
Note: (A) Anterior view and (B) posterior view of the shoulder illustrating the rotator cuff tendons traveling between the humeral head and acromion. The bursa lies on top of the rotator cuff and protects it from the acromion.

involve repetitive motion above shoulder level, like musicians, are prone to this injury.

Unlike acute injuries, chronic overuse injuries take place over a period of months to years. When a tendon is stressed beyond its limit, microscopic tearing occurs, which elicits an inflammatory response to induce tendon healing. However, when the tendon is not given time to heal before it is subjected to the same activity, the inflammation becomes chronic and proper healing does not occur.

Chronic inflammation not only causes pain but can also lead to progressive damage to the rotator cuff tendon. Over time, the tendon can become less elastic and more susceptible to larger, full thickness tears. Two theories have been described to account for the development of rotator cuff injuries. The classic theory, by Neer (1972), describes the mechanical rubbing of the rotator cuff against the undersurface of the acromion during arm elevation above shoulder level, which leads to injury and inflammation of the rotator cuff (see Figure 2). In contrast, the second theory, popularized by Uthoff and Sano (1997), postulates that there is primary degeneration or “wear and tear” changes of the rotator cuff tendon itself.

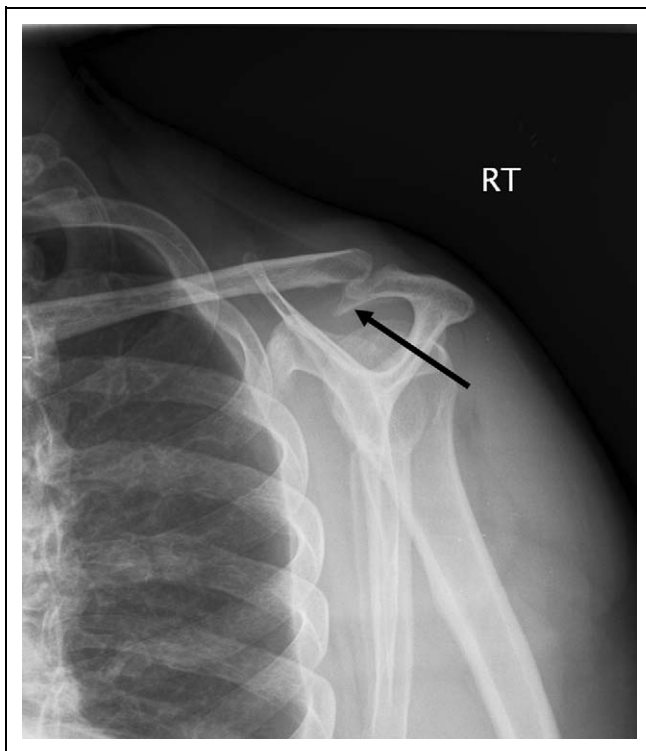
Despite the mechanism of injury, the primary symptom of rotator cuff tendonitis is pain. The pain can be either dull, achy, throbbing, or diffusely localized in the upper area of the arm under the deltoid muscle or pinpoint piercing pain under the acromion during overhead activity. The pain is often worse when raising the arm overhead or while sleeping in bed at night. Weakness in forward arm elevation or rotation may occur as well.



**Figure 2.** Shoulder impingement

Note: As the arm is elevated above shoulder level, the rotator cuff tendon can rub under the acromion.

The patient’s description of the history and symptoms of their shoulder pain as well as the physical examination are extremely important in establishing the correct diagnosis. In most instances, the onset of pain is insidious and not associated



**Figure 3.** Shoulder x-ray: Acromial bone spur

with a specific incident or traumatic event. The pain is associated with repetitive or sustained activity above shoulder level. In musicians, this is most commonly seen with small string instruments such as violins and violas, but it has also been described in musicians who play the trombone, bassoon, and cello. Conductors are also susceptible to this injury (Zaza, 1998; Zaza & Farewell, 1997).

Physical examination may reveal subacromial tenderness to palpation and a positive Hawkins Sign or Neer sign. A positive Neer sign is a reproduction of pain when the shoulder is raised overhead. The Neer Injection Test can confirm the diagnosis of shoulder impingement; 10 ml of 1% lidocaine is injected into the subacromial space. A test is positive if that patient exhibits relief of symptoms. Although patients typically have full passive range of motion and strength, they may exhibit weakness in certain arm positions, particularly external rotation and forward elevation.

The physician will likely order shoulder radiographs to rule out other causes of shoulder pain. In rotator cuff tendonitis, radiographs are typically normal but may show a bone spur on the underside of the acromion seen best on the lateral view of the shoulder (see Figure 3). This corresponds to a type 3 acromion, which was described in Bigliani, Morrison, and April's (1986) classic anatomic study correlating acromial morphology with the presence of rotator cuff tear. An MRI may also be performed to rule out the presence of a rotator cuff tear or other soft tissue problems that can cause shoulder pain (see Figure 4).

Rotator cuff tendon injuries occur along a spectrum. Neer (1983) classified rotator cuff tendon pathology into three stages

that may assist the physician in recommending proper treatment. The first stage consists of edema and hemorrhage of the rotator cuff. This is usually seen after initial injury to the rotator cuff and typically resolves with time and rest. However, this acute inflammatory phase can progress to stage two, in which fibrosis and tendinosis occur. Tendinosis results in tendon thickening and weakens the strength of the tendon. In stage three, there is partial or full thickness tearing of the rotator cuff tendon.

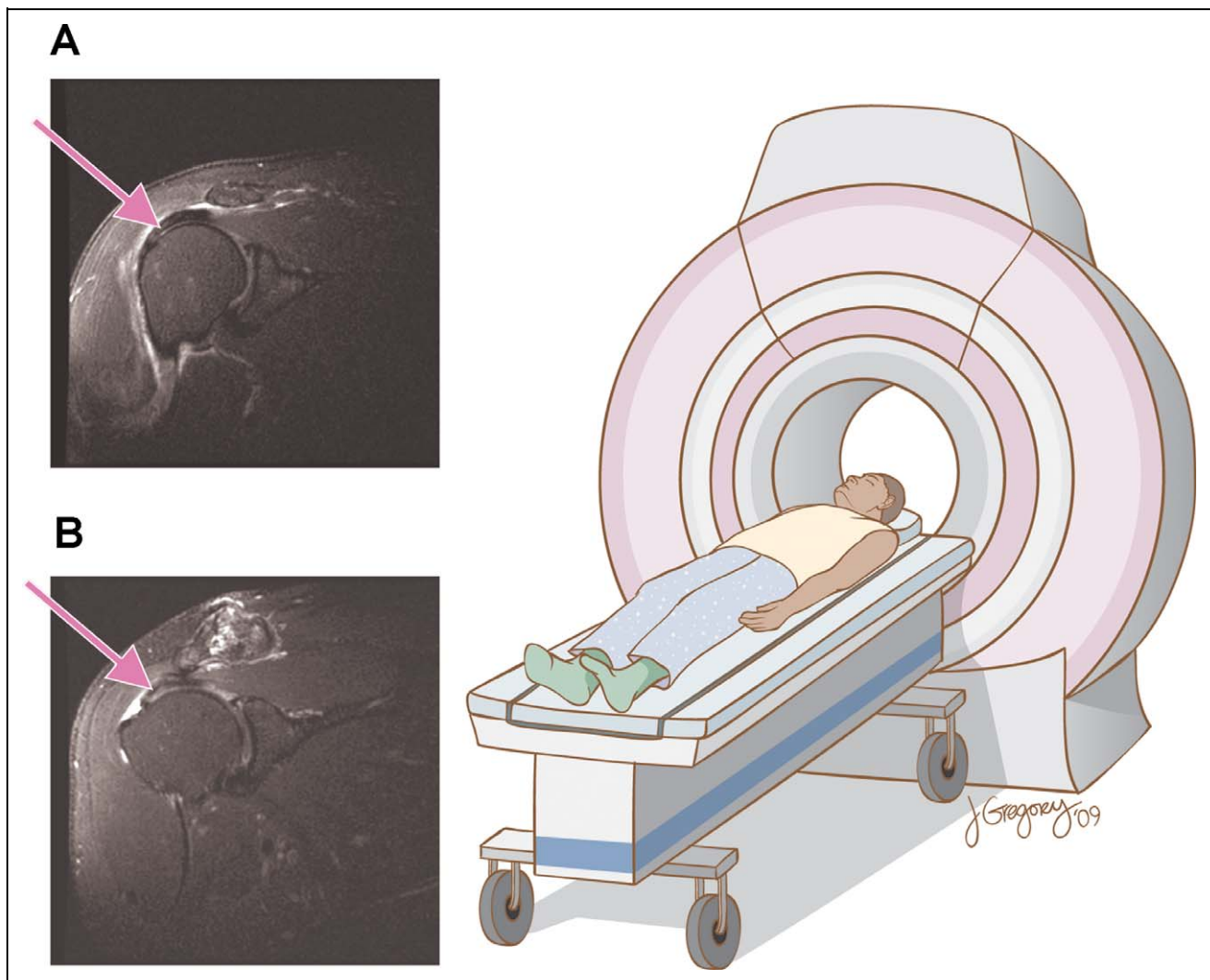
Treatment of rotator cuff tendon injuries is a function of the stage of tendon injury. Initial nonoperative treatment includes ice, anti-inflammatory medications, and activity modifications (i.e., staying active but avoiding those activities that exacerbate pain). Physical therapy exercises that not only strengthen the rotator cuff and other shoulder muscles but also increase shoulder flexibility are also prescribed to help alleviate pain and improve function (Millett, Wilcox, O'Holleran, & Warner, 2006). Cortisone injections into the subacromial space can also provide pain relief.

If symptoms persist for 3 to 4 months despite complete and thorough nonoperative treatment, then surgery may be considered. The indications for surgery are pain unresponsive to nonoperative treatment and shoulder dysfunction. Surgery is usually performed arthroscopically with 2- to 3-cm incisions that allow instruments and a camera to be inserted into the shoulder joint. A subacromial decompression is performed in which the thickened, inflamed, and painful bursal tissue is removed and the space where the rotator cuff tendon lies is opened up by shaving the acromial bone spur and releasing the coracoacromial ligament. If there is a full thickness tear of the rotator cuff or a partial thickness tear that is greater than 50% of the tendon thickness, it is repaired to its bone insertion with anchors and stitches (see Figure 5).

The postoperative rehabilitation consists of rest and protected activities below shoulder level in the first 2 weeks with gradual overhead motion exercises and full motion by 4 weeks. Then, 2 to 3 months of strengthening are required before full recovery is complete. If the rotator cuff requires repair, strengthening is delayed until 3 months and full recovery is achieved by 6 months. Results of an arthroscopic subacromial decompression have produced good long-term patient satisfaction with 80% of patients being satisfied up to 10 years after surgery (Stephens, Warren, & Payne, 1998). Maintenance of flexibility and strength is essential to avoid recurrent injury and subsequent pain in musicians who continue to perform, just as athletes who engage in overhead sports must maintain conditioning.

The following case report illustrates these important clinical points. The patient has reviewed the manuscript and offered written informal consent for publication.

A 45-year-old right-hand dominant violinist and conductor presented to one of the authors in 2005 with a chief complaint of right shoulder pain for 6 months. The pain was worse with activities of daily living that required sustained use of his right arm above shoulder level. The pain was worse at night, which interrupted his sleep and compromised his ability to rehearse and perform.



**Figure 4.** Shoulder MRI

Note: (A) Rotator cuff tendon intact. (B) Full thickness tear of the rotator cuff tendon.

On physical examination, his cervical spine was normal. His right shoulder had decreased forward elevation and internal rotation but normal strength. He had tenderness to palpation and crepitus in the subacromial region, a positive arc of pain, and a positive impingement sign. No acromioclavicular joint tenderness was present. Radiographs of his right shoulder were normal.

On the basis of his history and physical exam, he was diagnosed with shoulder bursitis and was treated with a short course of anti-inflammatory medication, a home physical therapy program, and a cortisone injection. Six weeks later, he reported that his pain had improved but had not completely resolved. He was still experiencing difficulty with sleep and had persistent pain while conducting an orchestra.

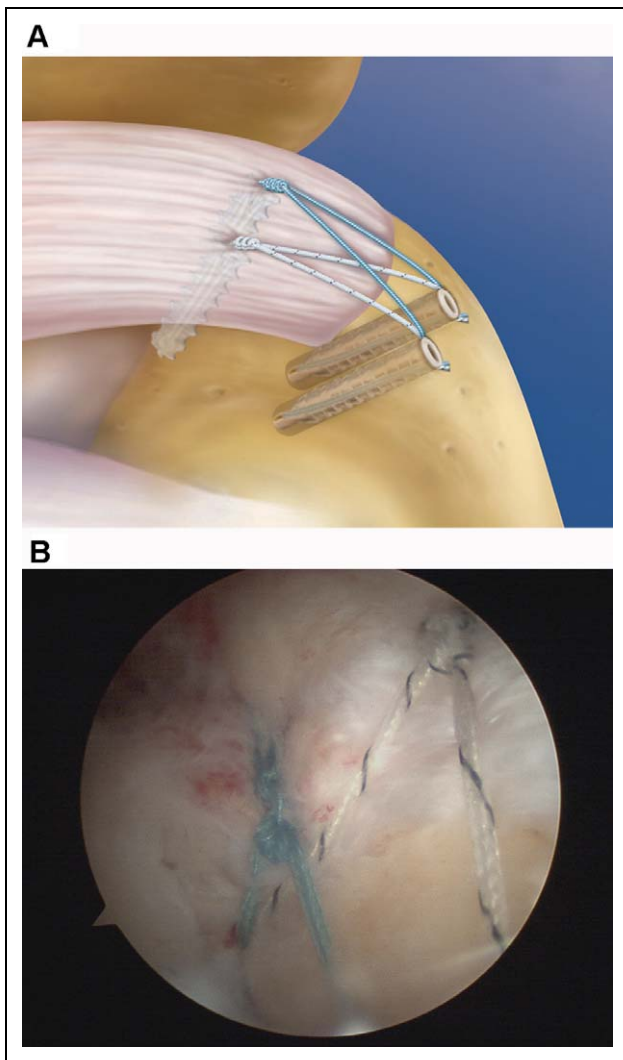
An MRI was performed to rule out a full thickness rotator cuff tear. The MRI revealed a partially torn rotator cuff tendon. Because he was symptomatic for more than 6 months and unresponsive to a complete nonoperative treatment

program, he underwent arthroscopic surgery for a subacromial decompression.

At 4 months after surgery, the patient had full shoulder range of motion with good strength and less pain with activities of daily living but had persistent soreness with sustained overhead use especially during a 10-week season with 3- to 4-hour daily rehearsals. He began a supervised physical therapy program and had significant improvement. In subsequent years, he required a consistent rotator cuff strengthening program and an occasional cortisone injection to maintain his demanding rehearsal and performance schedule.

### Summary

Shoulder pain in athletes, resulting from repetitive overhead use, has been extensively reported in the orthopedic literature but is underreported in musicians. Repetitive overhead use of the arm can lead to a spectrum of rotator cuff tendon injuries



**Figure 5.** Rotator cuff repair

Note: An anchor is placed into the humerus. Sutures in the anchor are placed through the rotator cuff tendon and tied down to the anchor. (A) Illustration. (B) Intra-operative photos showing the sutures holding down the rotator cuff. Figure 5A reprinted with permission from Arthrex.

that range from an acute tendonitis to a rotator cuff tear. Like athletes, some musicians, especially small string players and conductors, who spend long periods of time with their arms at or above shoulder level may injure their rotator cuff.

Rotator cuff injuries cause shoulder pain, especially with overhead activity and sleeping. It can be easily diagnosed based on the patient's history, physical examination, and imaging studies. Initial treatment is nonoperative and involves anti-inflammatory medication, cortisone injection, activity modification, and physical therapy. However, if nonoperative treatment fails to relieve pain and allow return to full activity, then surgery may be considered. Increased physician awareness of shoulder overuse syndromes in musicians such as rotator cuff tendonitis is paramount to accurate diagnoses and timely and appropriate treatment.

### Declaration of Conflicting Interests

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