Rehabilitating Rotator Cuff Impingement Syndrome

By Jay S. Greenstein, DC, CCSP, CGFI-L1, CKTP

Recently I attended the United States Olympic Committee (USOC) Sports Medicine Shoulder Symposium, which brought together DCs, PTs, MDs, ATCs and massage therapists. During the event, orthopedic surgeon Jeff Walden, MD, performed a live intraoperative video for a Bankart repair; John Konin, PhD, PT, ATC, reviewed active rehabilitative techniques for the shoulder; Anthony Bouffard, MD, a radiologist, taught the latest imaging techniques of the shoulder; and Bill Moreau, DC, DACBSP, director of the USOC Sports Medicine Clinics, presented on management of shoulder conditions through manual techniques. It was great to be in a multi-disciplinary environment where letters were left at the door. The only thing that mattered was learning the latest evidence on managing shoulder conditions from one another. I'd like to pass on to you a few gems that were shared with me.

Diagnosing RCIS

While it's impossible to discuss every shoulder pathology seen in our practices, rotator cuff impingement syndrome (RCIS) is a common condition we all see. In 1972, Neer introduced the RCIS concept into the scientific knowledge base. By definition, RCIS occurs when the rotator cuff tendon (most commonly the supraspinatus tendon) is impinged between the humeral head and the anteroinferior portion of the acromion process, especially with the arm elevated in the frontal or sagittal plane with internal rotation.[1] Neer described three stages of impingement, which covered the spectrum of the patients younger than 25 years of age and having acute inflammation and edema (Stage 1) to the 25- to 40-year-old patient with the chronic inflammatory response with significant tendinosis (Stage 2) to the 40-year-old and above patient who has mechanical disruption of the rotator cuff tendon and possibly osteoarthritic changes in the acromion.

A recent study evaluating coactivation ratios found that participants with impingement exhibited decreased rotator cuff coactivation (subscapularis-infraspinatus and supraspinatus-infraspinatus) and increased middle deltoid activation at the initiation of elevation (0 to 30 degrees of humeral elevation). The participants with impingement also had higher subscapularis-infraspinatus and supraspinatus-infraspinatus coactivation above the level of the shoulder where pain is typically present (90 to 120 degrees of humeral elevation).[2] Correcting these abnormal ratios, as well as improving scapulothoracic mechanisms, may be beneficial for this patient population. Many of our patients are Stage 2, so we will focus on evaluation and rehabilitative techniques for this unique population.

A thorough history is critical to evaluation and management of the shoulder. It should be inclusive but not limited to identifying the following:

1. age
2. occupation
3. athletic and recreational activities
4. symptom onset, chronicity, location (pain can often be in the deltoid insertion), setting during onset, quality, pain score, alleviating and aggravating factors, functional limitations (the SPADI is a great outcome assessment tool), associated manifestations and other history that may require evaluation of other areas and/or organ systems.

The physical exam must also be thorough and inclusive but not limited to inspection, neurovascular examination, active range of motion measurement and assessment of imbalances, palpation, manual muscle testing, special tests, tests for instability and other tests of related anatomic and biomechanical regions.

Note: If you suspect a SLAP (superior labral anterior posterior) tear of the glenoid, or a Bankart (anterior/inferior tear typically due to repeated dislocations thus identifying anterior instability on the exam), advanced imaging may be indicated. For a SLAP tear, an MRI is usually adequate, but the gold standard for Bankart lesions is the MR arthrogram.

Treating RCIS

Once the problem has been identified as a rotator cuff (supraspinatus) impingement syndrome, the real work begins.

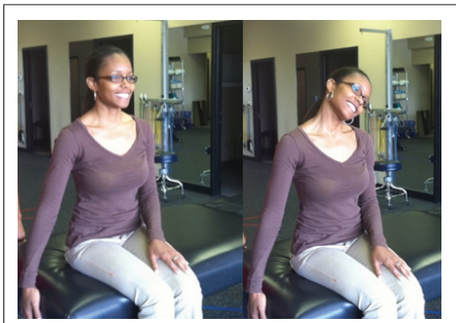

Fig. 1. In many patients with RCIS, the superior and anterior trapezius is tight and hypertonic. This can elevate and protract the scapula and factors into RCIS. In order to improve scapulothoracic mechanics, a seated upper trapezius stretch can be quite helpful.

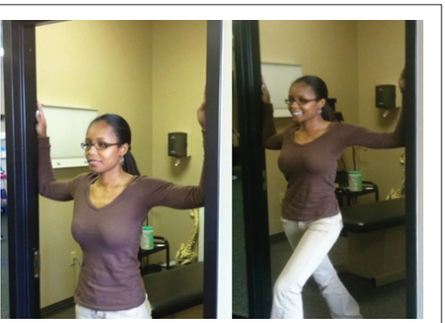

Fig. 2. Stretching the anterior musculature is also important. A three-part pectoralis major stretch should be done as part of a scapulothoracic optimization strategy. Start with the arms at 90 degrees abduction. Then lower the arms to 45 degrees abduction and then up to 135 degrees abduction to stretch middle, lower and upper portions of the pectoralis major.

Fig. 3. Inferior glide of the humerus on the glenoid is a key consideration in the RCIS. When inferior glide is limited, consider doing specific exercises to strengthen the latissmus dorsi and the teres major—think humeral internal rotation extension and adduction equals humeral head depression.

Fig. 4. Scapulothoracic movement is also a key consideration for this condition. In your evaluation, if you find that there is poor scapular stability, consider working anteriorly to strengthen the serratus anterior.

Fig. 5. To stabilize the scapula posteriorly, work to strengthen and activate the lower traps without activating the upper trap.

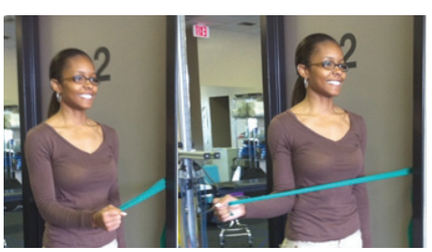

Fig. 6. Elastic external rotation.

Fig. 7. Prone external rotation.

You've answered the "what," but most important is the "why." Primary (anatomical) impingement can result from:

- increased subacromial loading
- acromial morphology (three types of acromial shape have been described in the literature)
- acromioclavicular osteophytes
- coracoacromial ligament hypertrophy
- coracoids impingement
- subacromial bursa thickening and fibrosis
- prominent humeral greater tuberosity and/or trauma.

Secondary (functional) impingement can occur because of:

- rotator cuff overload/soft-tissue imbalance
- eccentric muscle overload
- glenohumeral laxity/instability
- long head of the biceps tendon laxity/weakness
- glenoid labral lesions
- muscle imbalance
- scapular dyskinesia
- posterior capsular tightness and/or
- lower trapezius weakness.

Based on your findings, your treatment and rehabilitative techniques will be structured to meet the functional, anatomical and biomechanical issues of the specific patient, but the following exercise pearls are meant to provide some guidance (Figs. 1-5).

While high muscle activation levels are often desirable, what's more important is the relative activation of other muscles during the movement. For example, in a 2007 paper published by Reinhnold et al.,[2] the authors suggested that a good rotator cuff exercise should produce the greatest supraspinatus activity while minimizing the deltoid activation. Theoretically, reducing deltoid activation decreases the upward shear of the humerus during arm elevation, which may be desirable when prescribing exercise to strengthen the supraspinatus in impingement patients.

In a study published in *Medicine and Science in Sports and Exercise*, subjects performed five isometric exercises in random order while measuring the EMG activity of the deltoid, supraspinatus and infraspinatus. The exercises were full can, empty can, prone elevation, elastic external rotation and prone external rotation. The researchers noted that all exercises produced similarly high levels of supraspinatus activity, while the full- and empty-can exercises also had higher levels of deltoid activity. The researchers concluded that shoulder external rotation at 0° of abduction with an elastic band and prone external rotation were preferable exercises for the supraspinatus. While the full- and empty-can exercises are traditionally favored to isolate the supraspinatus, the authors noted that elastic external rotation (Fig. 6) and prone external rotation (Fig. 7) did not activate the deltoid at high levels compared to the full- and empty-can exercises. In addition, the exercises exhibited high levels of infraspinatus activation.[3]

Evaluation, treatment and rehabilitation of rotator cuff impingement syndrome take many forms. A thorough history and physical exam, multi-modal treatment and rehabilitation, and modifications of ADLs all play a role in a long-lasting, optimal outcome. ■

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For video clips of the above exercises, please visit www.youtube.com/ssraca.

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