

Delineation of diagnostic criteria and a rehabilitation program for rotator cuff injuries

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ABSTRACT

In the examination and rehabilitation of patients with shoulder injuries it is necessary to isolate the individual rotator cuff muscles as much as possible. We subscribe to the belief that, independent of the deltoid, the rotator cuff muscles can become fatigued, injured, or atrophied individually. Accordingly, we feel that these muscles must be considered separately during examination and rehabilitation.

This paper describes methods and positions to isolate the cuff and, thus, enable the examiner to be more precise in diagnosis and treatment. In addition, individual exercises for each component are described.

EXAM

The strength of the infraspinatus/teres minor and the subscapularis muscles can be tested with subjects in the sitting or supine posture, with the elbow flexed 90° and resisting external rotation (infraspinatus/teres minor) or internal rotation (subscapularis). Athletes who engage in repetitive overhead motion may display weakness and atrophy of the infraspinatus muscle mass due to suprascapular nerve entrapment. The atrophy is usually visible grossly and the decreased strength can be detected quite easily when compared to the opposite side.

The supraspinatus is the muscle most frequently compromised in patients with rotator cuff pathology. We have recently determined that activity in this muscle can be isolated to some degree with the arm in a position of 90° abduction, 30° horizontal flexion, and full internal rotation (Fig. 1).¹ Electromyographic records obtained with patients in this position indicate that the supraspinatus is the dominant rotator cuff muscle firing during this maneuver (Fig. 2).

Another important examination posture is seen in Figure 3. Here the examiner applies stress or resistance in the position of maximal shoulder excursion during pitching. Pain suggests rotator cuff injury.

CATEGORIES

In our practice we have devised a system of categorization for rotator cuff lesions in the adult athletic population which separates these lesions into four distinct groups (Table 1). Once the stage of pathology is known, decisions can be made regarding the appropriate treatment. In Stage I lesions the rotator cuff becomes inflamed and usually is allowed to become contracted with concurrent muscle atrophy. Stage II lesions involve fiber disruption without an actual tear in the muscle substance. In the past they also have been allowed to heal in a contracted position. It is therefore emphasized that, in order that healing may take place without contracture, stretching exercises are done on a daily basis in Stages I and II. The third category consists of tears limited to 1-cm circumferential defect, while the fourth group comprises all tears larger than 1 cm, as well as those involving complete rupture and has a poor prognosis if the player is a pitcher.

Therefore, depending on the specific diagnosis, the treatment may be either conservative (Stages I and II) or surgical (Stages III and IV). In any case, the rehabilitation program for all these patients should involve both stretching and strengthening exercises designed specifically to incorporate each of the rotator cuff muscles. The stretching program begins immediately and the strengthening program begins as soon as healing occurs.

STRENGTHENING

Each muscle of the rotator cuff is capable of being, and should be, strengthened individually. The supraspinatus can be exercised apart from the other cuff musculature in the examination posture; that is, the subject should be seated with the arms abducted 90°, horizontally flexed 30°, and internally rotated. While in this position, he can raise (con-

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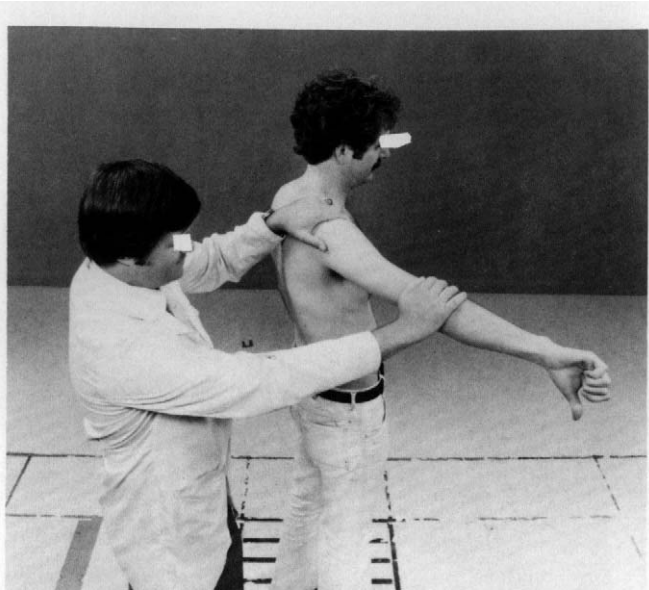


Figure 1. Examination of supraspinatus muscle strength is best carried out with shoulder abducted 90° and horizontally flexed 30° with internal rotation.

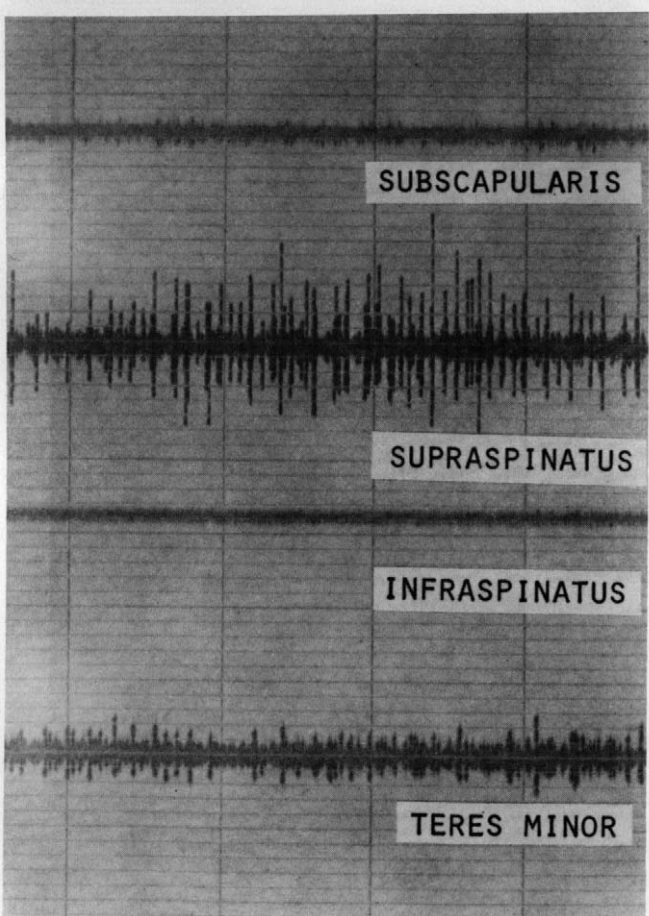


Figure 2. As seen in this EMG record, when the patient is placed in the examination position described in Figure 1 the supraspinatus is the predominant muscle firing in the rotator cuff.

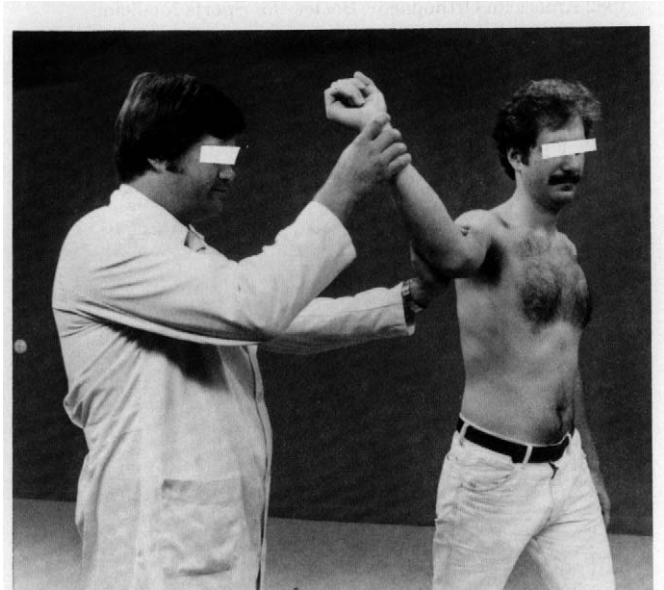


Figure 3. In another important examination posture the examiner applies stress or resistance in the position of maximal shoulder excursion during pitching.

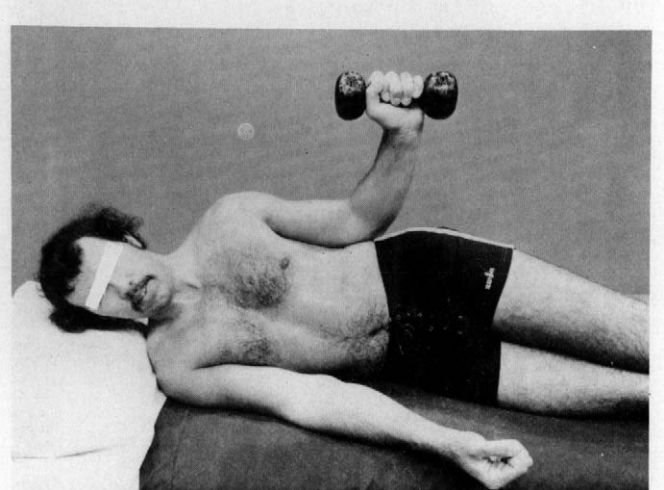


Figure 4. The infraspinatus and teres minor are exercised in the side-lying position with the arm held close to the side and elbow flexed 90°.

centric contraction) and lower (eccentric contraction) his arms, beginning with small weights and progressing to larger ones.

The infraspinatus and teres minor can be exercised in the side-lying position with the arm held close to the side and elbow flexed 90° (Fig. 4). The motion is up and into external rotation with the elbow remaining close to the body throughout. As the weight is brought back down to the table, the infraspinatus and teres minor are working eccentrically to control the motion.

The subscapularis can be strengthened with the patient in the supine position, again with the affected arm held close to the side and the elbow flexed 90° (Fig. 5). The motion is up and into internal rotation; returning the arm slowly to the starting posture incorporates eccentric activity.

TABLE I
Rotator cuff impingement

Stage	I	II	III	IV
Description	No defect Edema/inflammation Temporary thickening of bursa and rotator cuff	No defect Fiber disassociation Permanent thickening of bursa and rotator cuff with scar formation	1 cm or less defect Possible partial tear Permanent thickening of bursa and rotator cuff with scar formation	Greater than 1 cm defect Permanent thickening of bursa and rotator cuff with scar
Treatment	Conservative	Conservative; surgery	Surgery	Surgery



Figure 5. Again with the affected arm held close to the side and the elbow flexed 90°, the subscapularis can be strengthened as shown here, with the patient in the supine position.



Figure 7. A second stretching exercise, also in the supine position, has the arm externally rotated, elevated 135° in the frontal plane, and the elbow extended. One must make certain that the shoulder is free to move into as much horizontal extension and external rotation as possible.

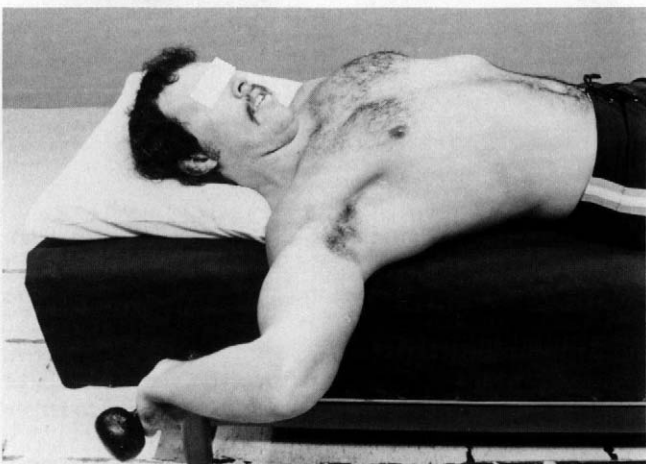


Figure 6. For stretching, the arm is in 90° of shoulder abduction, 90° of elbow flexion, and as much external rotation as can be achieved at the glenohumeral joint.

Other methods of strengthening the cuff muscles, e.g., using surgical tubing for resistance in lieu of hand-held weights, also can be used. The important thing is to ensure that each muscle is dealt with individually and adequately.



Figure 8. This posture may require the patient to lie diagonally on the table to allow head support while the shoulder is over the edge. The arm is put as far overhead as possible, with the palm toward the ceiling—weight in hand—and the elbow extended. A gentle passive or active stretch can be achieved.

STRETCHING

The stretching exercises can be done in the supine position on an exercise table with the patient holding a 2 to 5 pound weight in his hand. The first exercise should be with the arm in 90° of shoulder abduction, 90° of elbow flexion, and as much external rotation as can be achieved at the shoulder (Fig. 6). Care should be taken to ensure that the movement at the glenohumeral joint is not impeded by the edge of the table. This exercise can be either a static stretch or a gentle active one, allowing gravity and the weight in the patient's hand to gradually elongate the tissues. The second stretching exercise can be done in the supine position also, this time with the arm externally rotated and elevated 135° in the frontal plane with the elbow extended. One must make certain that the shoulder is free to move into as much horizontal extension and external rotation as possible. Again, a small weight may be placed in the patient's hand (Fig. 7). The next progression of the stretch is to put the arm as far overhead as possible, with the palm toward the ceiling—

weight in hand—and the elbow extended. This posture may require the patient to lie diagonally on the table so that the shoulder is over the edge (Fig. 8). Again, a gentle active or passive stretch can be achieved.

SUMMARY

Injury to the rotator cuff, most commonly the supraspinatus portion, is a frequent occurrence in the athletic population. With the help of the examination techniques described we are now able to be more accurate in diagnosis than in the past. This better understanding of the rotator cuff function gives us an improved rehabilitation program which incorporates individualized stretching and strengthening exercises for each of the cuff muscles.

REFERENCES

1. Jobe, FW: Overuse of throwing arm and shoulder. Presented at 49th Annual Meeting of the American Academy of Orthopaedic Surgeons, New Orleans, Louisiana, January 1982.