

# Suprascapular Nerve Entrapment

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## Abstract

The suprascapular nerve, supplies the supraspinatus and infraspinatus muscles. It also supplies sensory fibers to ligaments, bursa and the glenohumeral joint. When entrapped or stretched, it can cause shoulder dysfunction and pain which over time can cause impingement syndrome and rotator cuff tendon and muscle tears. An examination protocol for this syndrome and suggested treatment approaches (when in its earlier stages) is presented to help relieve this syndrome before it progresses to a stage where surgery is indicated. A small sampling of 10 patients I treated using this protocol is given.

**Key words:** Suprascapular nerve, Nerve entrapment syndromes, rotator cuff.

## Introduction

The suprascapular nerve is a mixed motor and sensory peripheral nerve arising from the 5th and 6th cervical nerves of the brachial plexus with variable contributions from the 4th cervical nerve roots. It supplies the supraspinatus and infraspinatus muscles with sensory branches to the coracohumeral, coracoacromial ligaments, the subacromial bursa, acromioclavicular and glenohumeral joints.<sup>1</sup> When peripheral nerves are stretched or compressed, it results in nerve ischemia, edema, microenvironmental changes, and conduction impairment.<sup>1</sup> When the suprascapular nerve is either entrapped or stretched, the function of the supraspinatus and or infraspinatus muscles is altered resulting in various patterns of shoulder dysfunction such as impingement syndrome or improper scapulohumeral rhythm with consequent neuropathy.<sup>1,2</sup> This can in turn result in damage to the rotator cuff muscles, tendon degeneration and tearing that may require surgical intervention.<sup>3</sup> The main symptom pattern of suprascapular nerve entrapment is deep diffuse pain that is poorly localized in the posterior and lateral aspects of the shoulder that may be referred to the neck, into the arm or upper chest or localized to the acromioclavicular joint. When the patient complains that shoulder motion aggravates the pain, in this case, it is scapular motion that aggravates the pain but the patient cannot differentiate it from glenohumeral motion.<sup>2,4</sup> Pain is usually present only in cases of entrapment of the common trunk of the nerve at the scapular notch involving both sensory and motor branches of the supraspinatus and infraspinatus muscle. Painless atrophy has been the main finding with injury to the nerve at the spinoglenoid notch which has been frequently observed in high calibre volleyball players.<sup>6</sup>

This entrapment syndrome is most frequently found in volleyball players and athletes who repeatedly stress their shoulder. These include baseball players, weight lifters, tennis players, fencers, hunters using bows, dancers, figure skaters and individuals with occupations requiring a lot of overhead work requiring extreme abduction and external rotation.<sup>1,2,5</sup>

Injury and or compression of the suprascapular nerve may be by a mass, most commonly a ganglion cyst. Other masses that have been described in the literature are as follows; synovial sarcoma, Ewing sarcoma, chondrosarcoma, metastatic renal-cell carcinoma, and a bone cyst.<sup>1</sup>

One speculative article gives a case report on a 57 year old male cadaver in which a hypertrophied subscapularis muscle was covering the entire surface of the suprascapular notch and its related tissues. The authors felt that this type of hypertrophied subscapularis muscle might be a possible source of compression of the suprascapular nerve resulting in friction and inflammatory changes.<sup>7</sup>

This syndrome was first described in the applied kinesiology literature by Leaf in 1993.<sup>8</sup> He first demonstrated that when an unstable scapula was involved due to weakness of scapular stabilizing muscles that a normal testing infraspinatus would test weak with the arm flexed to 90° with anterior rotation of the shoulder. He hypothesized that this position created additional torsion on the suprascapular nerve which resulted in a weak test of the infraspinatus.

My clinical experience has shown that most physical problems of this type appear on a continuum, and as clinicians we see many cases that are of a more of a functional than a pathological nature. The problems begin as functional ones, which if untreated progress to pathological problems that may require the intervention of orthopedic surgeons. Using a conservative approach to therapy, we can intervene in less severe cases involving neuapraxia, or axontemesis. I will discuss an approach to diagnosis that combines that of various authors and some indicators that I felt could be logically associated with the suprascapular nerve syndrome. I will discuss but not describe in detail the treatment protocols that I have used with success on a series of 10 patients in my office presenting with shoulder pain and dysfunction.

## Material and Methods

Examination for suprascapular entrapment, (according to various authors) is as follows:

- Pain elicited by applying digital pressure to the supraspinatus muscle in the general region of the suprascapular notch and or spinoglenoid notch.<sup>2, 6</sup>
- When the condition is chronic there may be atrophy of the supraspinatus and or infraspinatus muscle.<sup>2</sup>
- Have the patient bilaterally protract and retract the scapulae and observe for symmetrical motion.<sup>2</sup>
- Have the patient move the arms bilaterally in abduction and flexion and observe for symmetrical motion.<sup>2</sup>
- Have the patient move the arm into the painful position and analyze the shoulder complex motion. If the syndrome is present, there will usually be excessive scapular motion that stretches the suprascapular nerve, especially with flexion and or abduction across the chest. This test can be enhanced with simultaneous external rotation of the humerus.<sup>2, 6</sup>
- Have the patient bring his arm across the anterior portion of the body to bring the scapula maximally around the thorax. (This increases the distance of the suprascapular foramen from the cervical spine origin of the nerve, thereby stretching it). With this movement there is often increased irritation to the nerve and pain in related areas.<sup>2</sup>

- Manual muscle testing as done in applied kinesiology can aid in the diagnosis. The examiner tests the supraspinatus and infraspinatus muscles in the standard test positions. If they test weak initially, treat them in the usual ways to bring them to a normal testing strength. Then have the patient protract the shoulder around the thoracic cage as indicated above and retest them in this position. If they weaken only in this position, when the suprascapular nerve is stretched, it is an indication that the suprascapular nerve is being irritated or its ability to transmit its signals is impaired.<sup>1,2</sup>

When considering the mechanics of the shoulder, it becomes clear that for the scapula to move excessively to a degree that stretches the suprascapular nerve there must be instability of the scapula. The scapula can be unstable for a number of reasons. A dysfunctional or non functioning acromioclavicular joint or sternoclavicular joint can cause an unstable scapula. Muscle imbalances to the muscles that stabilize the scapula can cause an unstable scapula. These muscles are the trapezius muscles, the anterior serratus muscles, the rhomboid muscles, the levator scapula muscles and the subscapularis muscles. In my clinical experience, the most frequent muscle involvements in the suprascapular nerve syndrome, are rhomboids, anterior serratus, levator scapulae, and lower or middle fibers of the trapezius muscles. Therefore, in the examination we need to consider all factors associated with scapular stabilization. The examination should continue as follows:

- Examine the acromioclavicular joints for symmetry, pain on palpation, as well as the influences of various vectors of pressure on the subclavius muscle.
- Do manual muscle tests of the serratus anterior muscle on the involved side. If the anterior serratus muscle on the involved side tests strong in the clear, test it with a head forward posture and or after a compressive pressure is applied to the vertex of the head. If this causes a weakening response, it is an indication that a cervical spine dysfunction is involved. This would indicate involvement of the long thoracic nerve which innervates the anterior serratus and is often due to an anterior C 5 or C6.
- Test the rhomboid muscles on the involved side. If the rhomboid tests strong in the standard test position, have the patient extend their neck in a vector that stretches the scalene muscles on the involved side (especially the medial scalene), and retest the ipsilateral rhomboid in this position. If it tests weak, it is an indication that the dorsal scapular nerve is being entrapped in this posture. This is often due to a scalene muscle that is tense or shortened (likely overfacilitated).
- Test the levator scapula muscles, especially on the involved side. if a test of the levator scapula on the involved side tests strong, have the patient extend their neck in a vector that stretches the scalene muscles on the involved side (especially the medial scalene), and retest the ipsilateral levator scapula. If it tests weak, it is an indication that the dorsal scapular nerve is being entrapped in this posture. This is often due to a scalene muscle that is tense or shortened (likely overfacilitated).
- Test the upper middle and lower trapezius muscles to determine if they have an involvement in the unstable scapula. Weakness in any part of the trapezius may influence the stability of the scapula.
- Test the deep neck extensors individually and bilaterally. If they test weak, it may indicate that the scalene muscles do not have the normal antagonist extensors to work against which can explain their increased tension.
- Test for spinal joint dysfunction in of C5, 6, and possibly C4. for a neurological influence on the peripheral nervous system.

# Results

A series of 10 of my patients with complaints of shoulder area pain and dysfunction were tested as indicated above. The table of findings is below:

**To understand the table, the letters A–L in column 1 are as follows:**

- A. Pain on palpation of the suprascapular notch, and or spinoglenoid notch
- B. Atrophy of the infraspinatus and or supraspinatus (this also applies to minimal atrophy)
- C. Excess scapular motion with active protraction and retraction
- D. Disturbed symmetrical motion such as on abduction the angle of the scapula deviating toward the mid axillary line on the involved side, which can be compared to a usually normal functioning opposite scapula.
- E. Pain with excessive scapular motion. This pain is produced by having the patient put their arm in a position that moves the scapula around the anterior torso putting a stretch on the suprascapular nerve.
- F. Infraspinatus and or supraspinatus muscle test weak with the scapula in a position that causes excessive motion to the scapula as in E above.
- G. Anterior serratus tests weak either in the clear or after vertex pressure was applied to the head, or a head forward posture was assumed.
- H. Rhomboid and or Levator scapula tests weak either in the clear or with the neck placed in extension putting tension on the scalene muscles which if in a over facilitated state would cause some compression of the dorsal scapular nerve.
- I. Trapezius muscles middle or lower, test weak either individually or bilaterally as in a dorso-lumbar fixation pattern.
- J. Deep neck extensor muscles test weak either bilaterally or individually. This would relate to the sacral fixation pattern or sacroiliac fixation pattern, respectively.
- K. Spinal joint dysfunction of C 5, usually or possibly C 4 or 6. The usual finding with the hidden cervical disc pattern in applied kinesiology
- L. Acromioclavicular of sternoclavicular joint dysfunction which would be indicated by asymmetry of the joints, alignment of one joint as opposed to its contralateral joint, and challenge testing to the involved joint.

**Research table for suprascapular nerve syndrome.**

<b>A</b>	Pain to palp of SSN SGN	#1 √	#2 √	#3 √	#4 √	#5 √	#6 √	#7 √	#8 X	#9 √	#10 √
<b>B</b>	Atrophy of IS Or SS	√	√	√	√	X	√	√	√	X	√
<b>C</b>	Excess protraction & retraction	√	√	√	√	√	√	√	√	√	√
<b>D</b>	Disturbed symmetri- cal motion	√	√	√	√	√	√	√	√	√	√
<b>E</b>	Pain with excessive scapular motion	√	X	X	√	X	√	√	√	√	√
<b>F</b>	IS & or SS weakness in excessive scapular motion	√	√	√	√	√	√	√	√	√	√
<b>G</b>	Anterior serratus tests weak IC or with provocation	√	√	X	√	√	√	√	X	X	√
<b>H</b>	Rhomboid & or Lev Scap tests weak IC or with provocation	X	√	√	X	X	X	X	√	√	√
<b>I</b>	Trapezius tests weak any branch	√	√	√	√	√	√	√	X	√	√
<b>J</b>	Neck extensors test weak bi- or un	√	√	X	√	X	X	√	X	X	√
<b>K</b>	SJD C4-5-6	√	√	X	√	√	√	√	X	X	√
<b>L</b>	AC or SC joint dysfunction	√	X	√	√	X	X	√	X	√	X

# Discussion

As seen in my small study the most common reliable indicators for the suprascapular nerve syndrome that I found were as follows:

- Excessive motion on protraction and retraction
- Disturbed symmetrical motion
- A weak test of the infraspinatus and or supraspinatus when tested with the scapula in a position that caused stretching to the suprascapular nerve.
- Pain on palpation to the suprascapular notch and or spinoglenoid notch.
- Atrophy sometimes minimal of the infraspinatus and or supraspinatus muscles.

The rest of the findings related to possible causes of instability of the involved scapula which appears to be a frequent causative factor in the suprascapular nerve syndrome. The type of treatment given each patient was according to the findings and challenge tests done. All patients had improved test strength of the infraspinatus and or supraspinatus after the treatments were administered. All of the patients had improved symmetrical motions which also included protraction and retraction with less excessive motion of the involved scapula. All of the treated patients, reported relief of symptoms and improved function. These findings and indications of sources to look up the specific treatments are as follows:

- Weakness of the serratus anterior (In my experience often caused by an anterior C-5 or C-6, or origin-insertion strains, etc.) The treatment in these cases would be a respiratory adjustment applied prone with the positioning as described by Walther<sup>9</sup> page 107 but without the thrust, just a push done repeatedly using about 3–4 pounds of pressure with inspiration.
- Weakness of the rhomboid and or levator scapula (often caused by entrapment of the dorsal scapular nerve by a hypertonic medial scalene muscle)<sup>2</sup> The treatment administered would be as described by Boehnke<sup>12</sup> in his paper on Dorsal scapular nerve syndrome. (available from the author)
- Weakness of the middle or lower trapezius (In my experience often caused by cranial bone motion disturbance affecting cranial nerve 11, or spinal joint dysfunction of C 3–4 which could be an anteriority or a coupled motion disturbance at C3) The cranial bone motion disturbance is treated as in Walther<sup>9</sup> Pages 385–396. The C 3 anteriority if present would be treated with a respiratory treatment as described by Walther<sup>9</sup> page 107 but without the thrust, just a push done repeatedly using about 3–4 pounds of pressure with inspiration. If a coupled motion disturbance was found, it would be treated with a respiratory treatment done as indicated by challenge to improve the coupled motion. This was described by Schmitt,<sup>13</sup> however I do it with a respiratory adjustment.
- Sprained, loose stretched ligaments of the acromioclavicular or sternoclavicular joints. In my experience this would mostly apply to the acromioclavicular joint. The acromioclavicular joint if involved would be treated as needed either as Leaf,<sup>10</sup> or Hearon,<sup>11</sup> describe. The sternoclavicular joint would be treated as described by Hearon.<sup>11</sup>

Please note: If there is a palpable mass present or the patient is not responding as anticipated, proper imaging for diagnosis and appropriate referral for further evaluation and treatment is strongly recommended.

# Conclusions

The suprascapular nerve syndrome is in my experience a common finding when the scapula shows instability. It is often secondary to a more primary problem, which causes the unstable scapula. It is hoped that this paper gives some additional diagnostic factors to look for and demonstrates that an integrated approach to care is beneficial. A primary tenet of applied kinesiology is that muscle hypertonicity or spasm is frequently related to a functionally weak testing antagonist. This is attributed to Goodheart and described by Walther<sup>9</sup> on pages 12–13. I have used this idea in my approach to some of the causes of the unstable scapula which results in the suprascapular nerve entrapment or stretching by addressing the weak neck extensors—sacral fixation correlation, and or weak lower trapezius addressing the dorsolumbar fixation complex etc. To this can be added exercises to help maintain the corrections and if necessary, nutritional approaches to reduce inflammation.

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