Suprascapular nerve entrapment

A series of 27 cases

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Suprascapular nerve entrapment is an acquired neuropathy secondary to compression of the nerve in the bony suprascapular notch. A series of 27 cases, the largest reported to date, is presented and examined as to the best and most appropriate method of diagnosis and treatment. The entity is described in detail as to its origin, anatomy, and pathophysiology.

KEY WORDS • suprascapular nerve • entrapment neuropathy • pain

Entrapment of the suprascapular nerve as it passes through the suprascapular foramen primarily presents as chronic shoulder pain and weakness. This entity is infrequently considered in the differential diagnosis of shoulder pain and, therefore, is probably underdiagnosed. Surgical release of the entrapped nerve can provide long-lasting relief of this painful problem. The entity was initially described in 1959 by Kopell and Thompson; since that time there have been several small series reported in the literature.\(^1\)\(^-\)\(^5\)\(^,\)\(^8\)\(^-\)\(^11\)\(^,\)\(^15\)\(^-\)\(^18\) The largest series published to date consists of seven patients reported by Hadley, et al.\(^6\) in 1986. We report our experience with 23 patients in an effort to further identify this clinical problem.

Summary of Cases

Case Material

The medical records were analyzed of those patients with suprascapular nerve entrapment who were treated surgically at the Indiana University Medical Center between 1979 and 1989. In this series there were 23 patients (seven men and 16 women) who underwent a total of 27 operations. The patients ranged in age from 17 to 63 years (mean 37 years). The duration of symptoms prior to surgery varied from 6 months to 11 years (mean 2 years 10 months). Twenty procedures were performed on the left side and four on the right; one patient underwent bilateral entrapment release and in one case the side was not indicated (although prior left-sided surgery is recorded). Our compilation of 27 procedures over 10 years is the largest series reported to date. Of the 23 patients, 12 had the onset of symptoms (primarily pain) after an episode of trauma or heavy lifting. One patient suffers from an ill-defined collagen-vascular disease and has undergone multiple operations for entrapment neuropathies, and another patient has congenital torticollis. The remainder of the patients developed the insidious onset of shoulder pain. Prior to the diagnosis of suprascapular nerve entrapment, six patients had undergone thoracic outlet procedures and three had received anterior cervical discectomies without relief of their symptoms. The primary complaint of all of the patients was posterolateral shoulder pain. Nineteen patients presented with tenderness on palpation over the suprascapular notch while 15 had a positive cross-adduction test. In 13 patients, examination also showed evidence of muscular atrophy and motor weakness.

Diagnostic Studies

The patients were initially evaluated by obtaining a comprehensive medical history and physical examination. Following this, each underwent an electromyogram (EMG) of the painful upper extremity. The EMG's were positive for suprascapular neuropathy in six cases; these positive studies occurred in patients who had clinical evidence of atrophy. However, seven other
patients had evidence of atrophy with negative EMG's. It must be stipulated that during the early years of the series not all the EMG's were performed with a coaxial needle or specifically to investigate the suprascapular nerve. A diagnostic nerve block of the suprascapular nerve with a local anesthetic agent was carried out in all cases and in every instance resulted in transient but complete relief of the patient's pain.

**Surgical Technique**

After the diagnosis suprascapular nerve entrapment was made, the patients were treated conservatively for 3 to 6 months with rest, nonsteroid anti-inflammatory drugs, analgesic agents, and physical therapy. If conservative therapy failed, the patient was offered surgical release of the entrapped nerve.

All of the procedures were conducted under general anesthesia via a posterior approach, with 16 of them performed in the prone position and 11 in the decubitus position. A preoperative dose of antibiotics was given to each patient. An incision is made 2 cm rostral and parallel to the spine of the scapula. The trapezius muscle is split in the direction of the fibers (Fig. 1 left). The supraspinatus muscle is then identified in the fossa. The suprascapular notch is located by palpation of the superior border of the scapula from medial to lateral. The suprascapular artery and vein are identified as they course over the transverse scapular ligament to ensure that they are preserved (Fig. 1 right). The ligament is then transected, allowing herniation of the nerve and fat pad out of the notch. No attempt is made to dissect the nerve free. During two of the initial procedures (performed in 1979 and 1980) the suprascapular notch was enlarged in addition to cutting the ligament, but enlargement of the notch was not performed in any subsequent case. Postoperatively, the patients were observed overnight and released the next day.

**Clinical Improvement**

Of the original 23 patients, 21 (91%) were pain-free immediately after surgery. Two patients had minimal residual shoulder pain but felt markedly improved and sought no further treatment; the follow-up periods for these patients were 2 and 4 years. Of the other 21 patients, 17 (81%) remained pain-free with complete resolution of any preoperative weakness. The follow-up period ranged from 14 months to 9 years (mean 3 years 11 months). Four patients had recurrence of their symptoms, particularly pain, 2 months to 4 years postoperatively; three of these underwent reoperation, and in each the nerve was found to be encased in scar tissue. These three patients underwent neurolysis with immediate relief of their symptoms and have remained so for 9 months, 2 years, and 3 years. The fourth patient with recurrence sought outside consultation and was lost to follow-up review. Overall, 20 (87%) of 23 patients had excellent results with complete relief of their pain and resolution of their weakness. Two patients had a good result with resolution of their weakness and marked reduction in their pain, and one was lost to follow-up review. There was no incidence of wound infection or other postoperative complication.

**Discussion**

**Anatomy**

The suprascapular nerve is a mixed peripheral nerve which arises from the superior trunk of the brachial plexus (C-5 and C-6 nerve roots). The motor component innervates the supraspinatus and infraspinatus muscles. The sensory component has no cutaneous innervation but does supply the acromioclavicular and glenohumeral joints. After taking off from the brachial plexus, the nerve courses through the posterior triangle of the neck parallel to the inferior belly of the omohyoid...
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and deep to the trapezius muscle. It runs to the superior edge of the scapula where it passes through the suprascapular notch into the supraspinatus fossa. While passing through the notch, it travels under the transverse scapular ligament, where the entrapment occurs. The suprascapular artery and vein pass above the ligament to join the nerve in the supraspinatus fossa. After passing into the fossa, the nerve sends branches to innervate the supraspinatus muscle and sensory branches to innervate the glenohumeral and acromioclavicular joints. It then passes around the lateral border of the scapular spine and into the infraspinatus fossa, where it innervates the infraspinatus muscle and sends sensory branches to the scapula.12,14,15

Etiology of Entrapment

In 1979, Rengachary, et al.,13 conducted an anatomic study on cadaveric models and proposed the "sling effect" to explain the etiology of the entrapment. In this theory the clinical symptoms are explained by kinking of the nerve on the transverse scapular ligament. They showed that there was no translational motion of the nerve in the foramen causing a "friction" type of injury. Instead, movement of the shoulder with either abduction or cross-adduction tenses the nerve and causes compression of the nerve on the ligament leading to pain. These observations explain why simple transection of the ligament with corresponding herniation of the nerve and fat pad out of the suprascapular notch relieves the patient's symptoms. It is rarely necessary to resect any of the bony notch as has been reported previously.10

Differential Diagnosis

Suprascapular nerve entrapment should be included in the differential diagnosis of chronic shoulder pain which consists of: cervical disc disease, tendonitis, degenerative joint disease, bursitis, rotator cuff disease, adhesive capsulitis, Pancoast tumor, diffuse peripheral neuropathy, and thoracic outlet syndrome. The patients complain uniformly of chronic shoulder pain which is located posteriorly and laterally and may radiate down the arm or up into the neck. Frequently, the pain has a sudden onset related to trauma or an episode of heavy lifting. On examination, the patient may have evidence of atrophy of the supraspinatus and/or infraspinatus muscles. Often there is weakness and pain associated with abduction and external rotation of the shoulder. Palpation over the suprascapular notch may cause severe discomfort. The cross-adduction test, which is frequently positive, involves adducting the extended arm across the chest. This tenses the nerve on the ligament leading to an increase in the patient's pain.9

In addition to the patient's medical history and physical examination, several diagnostic tests may be necessary and are useful in narrowing the differential diagnosis of shoulder pain and weakness. Some of these tests include plain films of the cervical spine and shoulder, myelography, computerized tomography, magnetic resonance imaging, and/or arthrography of the shoulder. Both an EMG and diagnostic nerve block should always be performed. To aid in the sensitivity of the EMG, it must be stipulated that a nerve conduction study of the suprascapular nerve with a coaxial needle be obtained.9 Many authors advocate the EMG as the definitive test to diagnose suprascapular nerve entrapment.6,8,8,13,16 In our series, patients who had positive EMG's showed symptoms of weakness and atrophy; however, not all of our patients with the diagnosis of suprascapular nerve entrapment had it confirmed with neurophysiological testing. This may partially be explained by the fact that not all of the patients manifested symptoms of motor weakness and atrophy. The most sensitive diagnostic test in our patients was a nerve block with a local anesthetic agent injected into the suprascapular notch. The test is considered positive if the patient's pain is relieved. All of the patients who eventually underwent surgery did receive complete but transient relief of their pain from a nerve block.

Surgical Approach

All 27 of the procedures in this series were performed using a posterior approach to the suprascapular notch. In a recent article, Shupeck and Onofrio17 outlined an anterior approach to the exposure of the suprascapular nerve and notch. In contrast to the anterior approach, our technique requires splitting of the trapezius muscle in the direction of the fibers, but does not require the clavicular attachment of the trapezius to be dissected. The suprascapular muscle is frequently atrophic and is easily retracted, which provides excellent exposure to the suprascapular notch. The posterior approach can also be used to provide exposure to the spinoglenoid notch and infraspinatus fossa in the event that neuropathy is secondary to a mass lesion such as a ganglion cyst or entrapment of the nerve at the spinoglenoid notch.14 In our experience, there were no intraoperative complications associated with the dissection resulting in injury to the neurovascular structures.

Conclusions

Suprascapular nerve entrapment often presents as a chronic pain problem associated with weakness and atrophy of the spinatus musculature. It should always be included in the differential diagnosis of a patient with chronic shoulder pain. An EMG should be obtained in patients suspected of having this entrapment neuropathy, but a negative study does not exclude the diagnosis. All patients should undergo a nerve block which, in our experience, is a far more sensitive test. If conservative therapy fails, surgical release of the entrapped nerve offers an excellent chance at complete relief of the pain and resolution of the weakness.

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