Suprascapular entrapment neuropathy

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The author describes the syndrome of suprascapular nerve entrapment neuropathy that occurs as that nerve passes beneath the transverse scapular ligament, and discusses the anatomy, comparative anatomy, and five case histories. The cardinal findings include pain in the shoulder, weakness, and wasting of spinati muscles, and a positive electromyogram. Treatment is by division of the transverse scapular ligament.

Key Words • suprascapular nerve • entrapment neuropathy • pain

Pain in the shoulder is a common symptom. The differential diagnosis, apart from pathology in the region of the joint itself, includes lesions that give referred pain from both proximal and distal structures. In order to arrive at the correct diagnosis, it is necessary to consider carefully the history, abnormal physical signs, and special confirmatory investigations. The purpose of this paper is to describe a syndrome resulting from entrapment of the suprascapular nerve as it passes through the suprascapular notch below the transverse scapular ligament. This syndrome may be more common than is generally believed, and may be an unrecognized cause of pain in the shoulder. During the past 6 years, five cases of suprascapular entrapment neuropathy have been seen by this author. In comparison, 157 cases of entrapment of the median nerve beneath the flexor retinaculum and 69 cases of ulnar nerve entrapment at the elbow were operated on during the same period.

Anatomy

Anatomy in Man

The suprascapular nerve is a large nerve which arises from the upper trunk of the brachial plexus. It runs laterally deep to the trapezius and the omohyoid muscle, and enters the supraspinous fossa through the suprascapular notch, passing below the superior transverse scapular ligament; it then runs deep to the supraspinatus muscle, and curves around the lateral border of the spine of the scapula in company with the suprascapular artery to gain the infraspinous fossa. In the supraspinous fossa it gives two branches to the supraspinatus muscle, and articular filaments to the shoulder joint and the acromioclavicular joint; in the infraspinous fossa it gives two branches to the infraspinatus muscle, as well as some filaments to the shoulder joint and the scapula (Fig. 1).

Comparative Anatomy

In order to understand the strange course of the suprascapular nerve it is necessary to refer to comparative anatomy. Each vertebrate limb includes not only skeletal elements lying within the free portion of the appendage, but a basal supporting structure, the limb girdle. This lies within the substance of the trunk, acts as a stable base for the motions of the fin, and in land vertebrates forms an intermediary through which the
The weight of the body is transferred to the limb.

The pectoral girdle is, for the most part, a duplex structure including both dermal and endoskeletal elements. The latter form the fin supports; the dermal bones, however, give added strength and help to tie the endoskeletal girdle to the body. In mammals the dermal element is the clavicle, which is peculiarly well developed in primates. These elements are, however, frequently lost or reduced (as in the cat), particularly in running or bounding types where complete freedom of the shoulder blades from the body skeleton is desirable to relieve the jarring otherwise transmitted from front legs to body.

Functionally, the endoskeletal girdle is much more important than the dermal girdle, since it always carries the limb articulation and is used as a major base of attachment of limb muscles. The primitive endoskeletal girdle consists of an articular socket, termed the glenoid fossa, with an area of bone above the limb articulation affording attachment to limb muscles; this area is called the scapular blade, and a similar area below it is called the coracoid plate. In reptiles the major musculature for the limb arises from the coracoid plate. The coracoid plate has a foramen in its center for the passage of nerves and blood vessels. As one progresses through the fishes, reptiles, birds, and mammals, one sees the endoskeletal girdle becoming more complicated. With a different function and versatility of the primate forelimb, the scapula takes on an entirely different aspect and function. This major change in the girdle structure is related to the shift in limb posture in mammals as compared to reptiles, and consequent major changes in the limb musculature. Much of the musculature that once arose from the coracoid plate has shifted towards the scapula blade, rendering the coracoid plate useless. The spine and acromion on the scapula actually represent the original anterior margin of the bone; the supraspinous part of the bone is a new shelf built out in front of the erstwhile front margin to accommodate the part of the musculature that has migrated upward. It is interesting that as in the primitive forms, the nerve still passes through a foramen, though this is now in an entirely different position and form. It is also in-
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eteresting that, in man at any rate, the artery
does not pass through the foramen. It is
presumed therefore that the course of the
suprascapular nerve in man has a
phylogenetic basis and is related to the com-
parative anatomy just described.

Case Reports

Case 1

This 25-year-old man was seen in June,
1969, with a history of pain in the right
shoulder for 1 year, aggravated by activities
such as driving or hammering. Two to 3
months prior to admission the pain started
radiating down the right arm to the elbow,
and he also noticed some hollowing over the
scapular muscles associated with tenderness.
Other history was noncontributory. The only
abnormalities in the physical examination
were related to the right scapular region.
There was obvious decrease in muscle mass
over the right infraspinatus muscle and less so
over the supraspinatus. There appeared to be
some associated loss of muscle in the right
deltoid area also. No obvious fasciculations
were noted, and there were no sensory
changes. There was marked weakness of ex-
ternal rotation at the shoulder joint.

X-ray films of the cervical spine and right
shoulder showed no abnormality. A clinical
diagnosis of right suprascapular entrapment
syndrome was made. On June 4, 1969, under
general anesthesia with the patient lying in a
three-quarter prone position, the supra-
scapular notch and ligament were identified.
The nerve could be seen lying compressed
beneath the suprascapular ligament. Without
difficulty the ligament was divided and the
nerve immediately bulged outwards as a
result of the decompression.

When next seen 3 months later, the patient
had made an excellent recovery. He had had
no further pain and the muscle mass had
returned to normal. An electromyogram
(EMG) showed evidence of considerable
reinnervation of the right infraspinatus mus-
cle. The supraspinatus muscle showed some
evidence of denervation next to the incision
line. The patient has remained asymptomatic.

Case 2

This 70-year-old man was first seen on
January 22, 1970, complaining of a typical ul-
nar nerve palsy. He was subsequently in-
vestigated and treated with a right ulnar nerve
transplant. When seen for follow-up on
March 23, he was no longer complaining of
numbness and paresthesia in his right hand,
but of pain in the right shoulder. On this occa-
sion marked wasting of the spinati muscles
was noted and associated with weakness of
external rotation of the shoulder joint. At the
time that a repeat EMG study was being
carried out on the ulnar nerve, examination of
the spinati muscles was performed and
showed a suprascapular nerve palsy. The
patient did not wish another operation so
soon. He was seen again on June 19, and had
had remarkable improvement from his ulnar
nerve procedure. He still demonstrated con-
siderable wasting and weakness of the supra-
and infraspinatus muscles but since the pain
in the shoulder had subsided, he refused
operation, and has not been seen since.

Case 3

This 45-year-old right-handed man was
first seen on July 16, 1972. His main com-
plaint was of severe pain in his right shoulder.
He had had x-ray studies of the cervical spine
carried out but apart from showing minimal
cervical spondylosis, these were normal. The
pain had begun 3 weeks before, following a
long drive across the continent. He had had
similar symptoms several years previously
after vigorous baseball playing. An EMG
carried out on July 18 was suggestive of a
denervation of muscles supplied by the C-5
nerve root distribution. However, the patient
was extremely apprehensive and the needle
electrode studies were not entirely satis-
factory. He was treated conservatively by
physiotherapy and when seen on August 17
seemed to be improved.

In November the pain in his shoulder was
worse again. A repeat EMG was consistent
with a right suprascapular nerve palsy. The
patient was admitted to the hospital and
because of the previous suggestion that this
might be a C-5 lesion, a myelogram was
carried out. This was normal. On November
22, a right suprascapular nerve decom-
pression was carried out. The patient was
rapidly relieved of pain in his shoulder, and
was discharged 1 week later.

When seen on January 25, 1973, the
previous findings of wasting of the spinati
muscles associated with weakness in external
rotation had disappeared. He had marked in-
crease in muscle strength and the muscle mass was returning to normal. An EMG carried out on March 16 showed some increase in amplitude of motor unit potentials compared with the previous study. The patient was last seen March 30, 1973, at which time he had returned to work and was feeling well.

Case 4

This 51-year-old right-handed man was seen on May 20, 1973. He complained of pain in the left side of his neck radiating into the left scapular region. The pain had begun in July, 1972, and had been getting worse. The pain used to wake him up at night but in the morning it was frequently relieved. The patient's occupation as a parcel sorter in a mail office required his throwing parcels with his left hand, which aggravated the pain. He was initially treated by being given a collar to wear, and he also received chiropractic treatment. A myelogram was carried out and was normal.

On examination there was obvious wasting of both supraspinatus and infraspinatus muscles on the left, associated with weakness of external rotation. Otherwise there were no abnormal neurological findings. The neck movements were full and painless. A preoperative EMG was normal. On June 18, decompression of the left suprascapular nerve was carried out. When seen 2 months later, the patient considered the results of his surgical procedure to be highly successful. He had no more pain in his shoulder and had returned to work. At that time the supraspinatus muscle was still atrophied though the infraspinatus muscle was clinically improved. The patient has remained well since.

Case 5

This 43-year-old man was first seen on July 20, 1973. Several years previously he had injured his left shoulder while relay running and attempting to pass the baton with his left, outstretched arm to the next runner. Pain persisted up to the present time and about 3 months prior to consultation he noticed marked weakness in external rotation of the left shoulder joint. In all other respects he was a perfectly normal, healthy individual; apart from marked wasting of the supraspinatus and infraspinatus muscles on the left and almost complete loss of external rotation, there were no abnormal neurological signs. An EMG confirmed a suprascapular neuropathy and on August 20, decompression of the left suprascapular nerve was carried out. On this occasion the operation was performed with the patient lying in the lateral position, left side up.

Postoperatively the patient has done well and when seen 2 months after surgery was completely relieved of his pain so that he was able to carry a gun and hunt. There was already some minimal recovery in external rotation but this movement was still extremely weak. There was no change in the muscle mass at this time. He has remained free of pain; external rotation of the shoulder, however, remains very weak.

Summary of Cases

Clinical Features

Our patients presented with pain in the shoulder, and a history of trauma of some sort. The trauma was direct to the region of the nerve, or transmitted by means of a stretching force such as exaggerated outstretched of the arm as in Case 5. Repeated movements of the shoulder joint as in Case 1 and Case 4 also appeared to be aggravating factors. The pain radiated in one of several directions; medially and upward into the neck, medially and downward into the interscapular region, laterally down the arm. The pain was of a dull aching character, and aggravated by using the shoulder joint. However, it was not influenced by passive movements of the shoulder joint at the time of the examination except for extreme lateral rotation. On physical examination, movements of the neck were supple and had no influence on the pain. There was always obvious marked wasting of the spinati muscles best observed in a good light. In some cases there was some deltoid wasting as well, and this was usually secondary to disuse. There was marked weakness of external rotation of the shoulder joint. All other muscle groups were normal, with the exception of possible deltoid weakness. There were no sensory changes. X-ray films of the cervical spine and myelography were normal. The abnormal confirmatory investigation in three of our patients was in the EMG, which showed
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denervation of the spinati muscles. All five patients were male.

Treatment

Following a careful history and physical examination, x-ray films of the cervical spine and shoulder joint were carried out. Where any doubt existed a cervical myelogram was done. The most useful confirmatory test was the electromyogram. Conservative measures were tried, including measures directed toward pain relief and shoulder girdle strengthening by means of exercises to elevate the shoulder; these, however, were unsuccessful in four of our five cases. In these cases the suprascapular nerve was released as it passed through the suprascapular notch beneath the transverse scapular ligament.

Operative Procedure

The first three operations were carried out with the patient in a semi-prone position. Subsequently it was found that the lateral position gave a better exposure. A transverse incision is made parallel to and 1 inch above the spine of the scapula. The suprascapular notch lay more lateral than was at first thought. The trapezius muscle was divided along the length of its fibers and where necessary elevated from its insertion to the spine of the scapula. The supraspinatus muscle was identified, and since it was usually atrophic, the upper border of the scapula could be exposed just medial to the origin of the omohyoid muscle. A small flat dissector was passed over the nerve and beneath the transverse scapular ligament which was then divided by cutting down onto the dissector. The nerve immediately bulged up into the defect. The muscles were approximated and the skin closed without drainage. The patient was returned to the ward with the arm held in a sling but passive and active movements of the joint and arm were commenced as soon as the patient was awake. Sutures were removed on the seventh to tenth postoperative day.

Discussion

A search of the English literature has failed to disclose any previous case reports of suprascapular entrapment neuropathy. Kopell and Thompson recognized this condition and mentioned operative release of the nerve. However they were more inclined to recommend treatment by local anesthetic block of the suprascapular nerve with or without hydrocortisone. No case histories were mentioned. Mayfield and True mentioned that the suprascapular nerve may be compromised by traction if there is interference with its passage through the suprascapular foramen. This compromise may be the result of direct trauma to the region of the shoulder joint with or without fracture of the humerus. According to these authors, “fixation of the nerve at the foramen may occur as a late sequela of Colles' fracture if at the time of the fracture physical forces are transmitted up the forearm and arm to the shoulder joint, causing trauma to its tissue investments. Theoretically, in this set of circumstances it will be possible for the healing process to reduce the size of the suprascapular foramen, fixing the nerve, or to cause immediate trauma to the nerve and its branch to the capsule of the shoulder joint. Both these mechanisms can cause what the orthopedists are wont to call the frozen shoulder joint.” They discussed the difficulty of singling out the suprascapular nerve from the multiplicity of other structures located in the immediate area which could also be traumatized and contribute to the clinical picture. Finally, they stated, “the authors have not seen this syndrome, and judging from descriptions of it in the literature, do not feel that it can be considered a true nerve entrapment neuropathy . . .”

Seddon stated that isolated paralysis of the suprascapular nerve is rare, but the nerve can be damaged by traction along with the axillary nerve, and it can also be injured by fracture through the blade of the scapula. He made no mention of suprascapular entrapment neuropathy. Sunderland commented on the relative fixation of the suprascapular nerve at the foramen, which is a constantly moving point because of the excursions of the scapula during movements of the arm. For this reason the nerve is subject to friction at this site and this could lead to inflammatory swelling and constriction of the nerve. He points out that the suprascapular foramen is not only a potential site for compression, but that since the nerve is fixed at this point, it could also be stretched with displacement of the shoulder. This tension could also be transmitted to the upper trunk of the
brachial plexus itself. Sunderland did not mention that he personally has ever seen an entrapment neuropathy of the suprascapular nerve, neither is there any mention of surgical treatment.

This author agrees entirely with all the possible mechanisms just described for the pathophysiology of suprascapular neuropathy. Transmitted forces, direct injuries, and traction all play a part; however, a traction injury may be the most significant. The author believes it is possible to isolate a suprascapular nerve injury. Pain in and around the shoulder is the important symptom; weakness and wasting of the spinati muscles with loss of external rotation of the shoulder is the cardinal sign, while an electromyogram that shows denervation of the spinati muscles is confirmatory.

Physiotherapeutic measures to improve the musculature of the shoulder girdle have been tried in all cases. Surgical decompression of the nerve by releasing it beneath the transverse suprascapular ligament has relieved all patients of pain almost at once. The improvement in function has been coexistent, but slower.

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References


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