

Suprascapular nerve lesions

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Purpose. To present four etiologically different subscapular nerve lesions and the treatment used to address them.

Case reports. The lesions in our series were brought about by the compression of a ganglion in the infraspinatus fossa; by irritation caused by a screw used to fix a collar-bone fracture; by a bilateral entrapment at the level of the transverse scapular ligament; and a neurogenous tumor in the brachial plexus.

Results. After surgery, all four patients experience clinical relief of their pain and an improvement in shoulder mobility. Muscle atrophy persisted in those cases in which it was already present.

Conclusion. Suprascapular nerve lesions are a rare pathology. The severity of its symptoms and its poor prognosis underscore the need for an early diagnosis. The problem is that diagnosis is often made late, once the supraspinatus and/or infraspinatus muscles have become atrophied. Surgical treatment normally consists of open surgery since it is a safe and straightforward procedure.

Key words: *suprascapular nerve, screw, schwannoma, ganglion, surgical treatment.*

Lesiones del nervio supraescapular

Objetivo. Exponer 4 lesiones del nervio supraescapular de etiología distinta y el tratamiento que se empleó.

Casos clínicos. En nuestra serie las lesiones son producidas por la compresión de un ganglión en la fosa infraespinosa, la irritación provocada por un tornillo de osteosíntesis en una fractura de clavícula, un atrapamiento bilateral a nivel del ligamento escapular transverso y un tumor neurógeno en el plexo braquial.

Resultados. Los 4 pacientes después de la cirugía experimentan mejoría clínica del dolor y de la movilidad del hombro; la atrofia muscular en los casos que está instaurada persiste.

Conclusión. Las lesiones del nervio supraescapular son una patología infrecuente, la gravedad de los síntomas y su pronóstico obligan a tener una sospecha clínica temprana y un diagnóstico precoz. El diagnóstico habitualmente se suele hacer de forma tardía una vez que la atrofia de los músculos supraespinoso y/o infraespinoso ya está instaurada. En el tratamiento quirúrgico empleamos la cirugía abierta, por lo segura y fácil que resulta.

Palabras clave: *nervio supraescapular, tornillo, schwannoma, ganglión, tratamiento quirúrgico.*

The suprascapular nerve is a mixed motor and sensory nerve that originates in the upper trunk of the brachial plexus arising from the C5 and C6 roots. It runs through the upper scapular border, specifically through the suprascapular notch; the roof of this notch is formed by the transverse scapular ligament¹⁻³.

The suprascapular nerve innervates the supraspinatus muscle, the acromioclavicular joint, surrounds the lateral aspect of the scapular spine, crosses the spinoglenoid notch, underneath the spinoglenoid ligament, advances to the infraspinous fossa and terminates in two branches, one for the infraspinatus muscle and the other for the glenohumeral joint and the skin covering the external aspect of the shoulder⁴.

Diagnosis of suprascapular nerve injuries is based on symptoms and confirmed by abnormal electromyography (EMG) and Nerve Conduction Velocity (NCV) findings, which do not become apparent until several weeks have elapsed since the lesion⁵. A magnetic resonance imaging study (MRI) helps bring to the surface potential neighboring lesions that may be compressing or irritating the nerve and

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can also show alterations caused by the denervation of the muscles innervated⁶.

Clinically these patients present with diffuse deep-seated pain located in the posterior and lateral aspects of the shoulder, which can irradiate to the arm, forearm and neck. Depending on the level and severity of the injury, it is typical to find atrophy in the supraspinatus and/or infraspinatus muscles. These signs tend to appear late and are related to the symptoms.

A differential diagnosis must be performed to rule out other pathologies like shoulder joint tendinitis and bursitis or a radiculopathy.

When the suprascapular nerve is entrapped or injured distally to its origin in the brachial plexus, an open posterior surgical approach is used to release it. If the injury is more proximal at the level of the brachial plexus we use approach it from the lateral neck. Good results have recently been reported of the use of arthroscopic surgery to address compressions of the nerve by ganglion cysts located at the level of the spinoglenoid notch, as well as entrapments at the level of the transverse scapular ligament or the spinoglenoid ligament^{2,3}.

CLINICAL CASES

Case 1

The patient is a 38-year old healthy male, who has experienced a diffuse deep-seated pain in the right shoulder for 23 months. An ultrasound helped rule out a capsuloligamentous shoulder joint lesion. Two months ago the patient started feeling atrophy in the region of the infraspinatus muscle (fig. 1A). An electromyographic study confirmed the involvement of the suprascapular nerve. An MRi revealed the existence of a ganglion cyst in the infraspinous fossa (fig. 1B). A surgical resection of the cyst was carried out by open surgery (fig. 1C). Clinically, shoulder pain has abated although infraspinatus muscle atrophy still persists one year postoperatively.

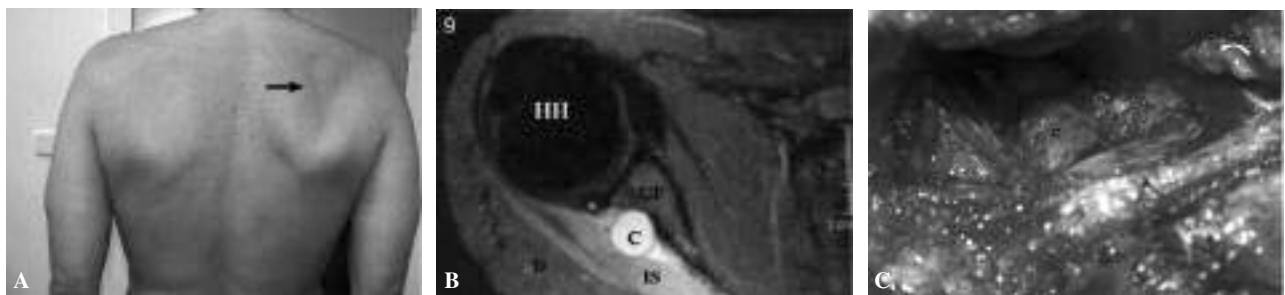


Figure 1. (A) View of the left infraspinatus muscle atrophy (arrow). (B) Magnetic resonance: transverse STIR sequence showing the ganglion cyst — C—, 1.5 cm in size, with an edema caused by infraspinatus muscle (IS) denervation. (C) Intraoperative image. A: acromion; C: ganglion cyst; D: deltoid muscle; GF: glenoid fossa; HH: humeral head.

Case 2

The patient is a 23-year old healthy female who has played volleyball since the age of 14. Twenty months ago she started feeling pain in both shoulders, which has increased and become continual with time. Three months ago she her infraspinatus muscles atrophied (fig. 2). An MRi yielded normal results. An EMG showed a bilateral suprascapular nerve conduction delay. A surgical exploration was carried out, releasing the nerve by sectioning the transverse scapular ligament that was compressing it. Pain disappeared, but muscle atrophy still persists 4 years postoperatively.

Case 3

The patient is a 28-year-old male, operated for a right clavicle fracture sustained in a road accident. Open reduction and osteosynthesis were used with screw and plate fixation. Late into the postoperative period, the patient reported intense shoulder pain as well as a limitation to move the said joint. An MRi and an angiography were performed to study the vessels in the neck. During surgery, an irritation of the subscapular nerve was detected, caused by an overhanging screw, which had been used to fixate the osteosynthesis plate in the clavicle (fig. 3). The screw was exchanged for a shorter one. Both pain and mobility improved in the immediate post-op period.

Case 4

The patient is a 43-year-old male without any prior medical history. For 11 months the patient has experienced left shoulder pain. A shoulder ultrasound was performed together with plain shoulder films to rule out capsuloligamentous lesions to the glenohumeral joint. An MRi showed a fusiform retroclavicular mass, suggestive of a neurogenous tumor, with an edema resulting from supraspinatus muscle denervation (fig. 4A). An examination of the brachial plexus revealed the presence of a schwannoma at C7 that was compressing C5-C6 as well as the suprascapular nerve. We



Figure 2. View of the atrophy of the infraspinatus muscles (arrows).

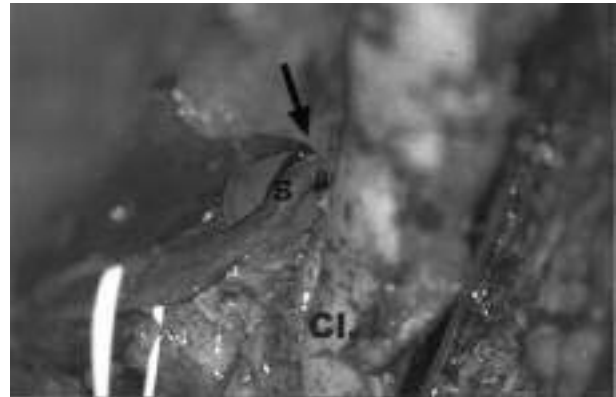


Figure 3. Irritation of the suprascapular nerve caused by a screw (arrow) used to fixate the osteosynthesis plate. Cl: clavicle; S: suprascapular nerve.

excised the tumor (figs. 4B and 4C). Six years postoperatively the patient reports that he experiences no pain when at rest, but that pain persists on arm abduction and elevation.

DISCUSSION

Lesions to the suprascapular nerve are infrequent, of variable etiology and confusing symptoms, which means that they are extremely challenging to diagnose⁷.

Several authors have described the formation of ganglion cysts in the shoulder joint in young patients that do sports (volleyball, weight-lifting, tennis, etc.), given that abduction and external rotation movements can slightly tear the posterosuperior glenoid labrum in the glenohumeral joint, leading to the outflow of synovial fluid and the formation of a ganglion cyst that could compress the neighboring suprascapular nerve, and provoke partial infraspinatus muscle atrophy together with pain and functional limitation in the shoulder^{8,9}.

Bilateral injuries to the suprascapular nerve are rare but have been well described. They are related to manual work-

ers that lift weights and athletes that have to lift their arms frequently¹⁰.

Few cases have been published of suprascapular nerve lesions caused by penetrating mechanisms or surgical trauma; in our case intense pain and inability to move the arm after clavicle fracture surgery made us carry out a surgical exploration.

The case of the neurogenous tumor (schwanoma) began with the symptoms that characterize the involvement of the suprascapular nerve. MRI images showed involvement of the supra and infraspinatus muscles, caused by denervation. At the onset of symptoms, the neurophysiological study was inconsequential. Surgery was carried out rather late, when in addition to shoulder involvement there were already signs of plexus root irritation¹¹.

As regards the treatment of choice for the resection of ganglion cysts in the shoulder joint, knowing the location of the injury and the physiopathology of its formation can help us decide between arthroscopic or open surgery. The appearance of ganglion cysts in the shoulder joint has been associated to exercises that require the arm to abduct and to externally rotate, with an etiological pattern secondary to microtrauma that could injure the posterosuperior glenoid



Figure 4. (A) Transverse STIR sequence showing the tumor—N— and the disruption of the signal corresponding to the suprascapular muscle—S—in relation to a denervation edema. (B) N: the schwannoma compresses the C5 and C6 roots and the suprascapular nerve—S—. (C) The schwannoma—N—in isolation.

labrum and lead to the outflow of synovial fluid. Even if arthroscopic surgery permits an accurate visualization of the posterosuperior glenoid labrum and therefore its repair by means of suture, it only allows the surgeon to address cysts that lie in the close vicinity of the glenoid labrum, i.e. those in the spinoglenoid notch. This means that the effectiveness of such procedures will be limited to the excision of ganglion cysts located in that area and to intraarticular repairs so as to prevent the extravasation of synovial fluid⁶. If the ganglion cyst is located at the level of the infraspinous fossa, the glenoid labrum can be repaired arthroscopically and, subsequently, the cyst may be excised by means of a lateral approach¹².

For surgical treatment we use a posterior approach since it is safe, straightforward and only causes the detachment of the trapezius muscle at its insertion into the scapular spine. Morbidity is minimal, except for the serious risk of injuring the spinal nerve.

We discard the anterior approach advocated by other authors because we believe it is difficult and could lead to iatrogenic injury¹³.

In cases of bilateral entrapments, compression tends to occur at the level of the transverse scapular ligament; releasing the nerve by sectioning the said ligament leads to satisfactory results. Optimal results have recently been reported of the use of arthroscopy for the surgical treatment of these lesions since the said technique affords good visualization of the nerve and its surrounding structures and reduces both OR and postoperative times^{2,3}.

If brachial Plexus root involvement is suspected, an exploration of the nerve must be carried out from its origin. We use the lateral neck approach with the exposure of the nerve trunks of the plexus, performing a dissection until we find the cause for the irritation or the lesion.

In the majority of cases, once a diagnosis has been made, we are in favor of open surgical treatment since it permits a fast abatement or even disappearance of pain, a rapid restoration of shoulder motion and the recovery of arm function.

Advances made in shoulder arthroscopic surgery make it possible to treat more and more lesions to the suprascapular nerve with this technique. Nevertheless, arthroscopy should be reserved only for compressions of the nerve by the transverse scapular ligament or the spinoglenoid ligament and for resecting paralabral ganglion cysts^{2,3}.

If an elongation lesion is suspected (neuropraxia or axonotmesis) treatment must be conservative, limited to muscle strengthening exercises, until the patient's evolution dictates the next step^{14,15}.

In summary, lesions of the suprascapular nerve are infrequent and occur because of very different reasons. Diagnosis is difficult and is normally deferred until symptoms become intense and disabling or until the muscles innervated become atrophied. When involvement is more proximal,

diagnosis is especially difficult because there is an overlapping of the clinical signs of brachial plexus root involvement.

MRI can help us make an early diagnosis of masses that irritate or injure the nerve and can also show early involvement (atrophy with no fatty infiltration) caused by denervation of the supra and infraspinatus muscles. EMG is also invaluable since it helps confirm nerve involvement. However, EMG could be normal in the initial stages, so clinical suspicion and physical examination are always of the essence. Once the lesion has been diagnosed, we recommend urgent surgical treatment to prevent atrophy of the muscles it innervates and permit the improvement of symptoms.

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Conflict of interests

The authors have declared that they have no conflict of interests.