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Editorial Open Access

Suprascapular Neuropathy: An Overview

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Editorial

Abstract

Objective: To present an overview on suprascapular neuropathy (SSN), a compressive neuropathy which leads to a significant upper extremity impairment. **Methods**: A narrative review of international medical literature was conducted in order to depict current concepts of diagnosis and treatment.

Conlusion: Supracapular neuropathy is a rare albeit painful condition affecting mainly overhead athletes. Although not always observable as initial diagnosis it should be included in the differential diagnosis when assessing a shoulder dysfunction.

Keywords: Suprascapular nerve; Neuropathy; Rehabilitation surgery; Overhead athletes

Introduction

Suprascapular nerve neuropathy (SNN) which originally appeared in the literature in 1936, and further described by Thompson and Kopell in 1959, until the last decade it was considered as a rare clinical finding [1,2]. Thus, there is a lack of a sufficient number of studies that focus on the frequency that this aberration is encountered in clinical practice.

The multifactorial nature of the injury, the different root causes as well as its low incidence, make it far from easy to diagnose [3]. However despite its rarity this ailment remains a significant cause of shoulder impairment that should be carefully examined in every case that an inexplicable pain in shoulder area arises.

The purpose of this study is to expedite an overview to describe this interesting phenomenon, to delineate the mechanism of the nerve injury, as well as the means used to confront it and to introduce physical therapy approaches to treat this clinical entity.

Anatomy

Suprascapular nerve originates from the upper trunk of the brachial plexus. More specifically it is conducted of the C5 and C6 roots, but also from C4 in some normal anatomical variations, and it arrives after a distally and laterally oriented course to the suprascapular notch, which lies centrally from the coracoid process [4]. Since leaving its origin from the brachial plexus, the nerve passes within the posterior cervical triangle, which is located right backside from the clavicle, then it heads towards the scapula where it surpasses its upper limit, and passes through the suprascapular notch [5]. The suprascapular notch is a depression in the scapular bone, covered by a transverse ligament connecting its edges, and according to the 6 reported anatomical variations, it may vary from a shallow depression, to a bony notch with an ossified overlying ligament [4,6]. The suprascapular nerve passes through the notch without its accompanying vessels, which surpass the transverse ligament, observably limited when the notch is fully ossified [5].

The nerve, continuing its course through the infraspinatus fossa innervates the infraspinatus muscle, and leaves the fossa through its posterolateral limit, where it passes through the spinoglenoid notch, which is located laterally and below the lower limit of the scapular spine [5]. At that specific point, it veers off and heads towards the midline of the body to the infraspinatus fossa travelling along the bottom surface of the infraspinatus.

Suprascapular nerve, both motor and sensory, provides motor innervation with two or more branches to the infraspinatus and the supraspinatus, and sensory innervation in acromioclavicular, coracoacromial and glenohumeral joints [7]. In a percentage of 15% of the population, apart from the other structures, one cutaneous branch exists which gives sensory innervation in the distal, lateral arm [4].

Pathophysiology

SSN pertains to the suprascapular or the spinoglenoid notch and happens mainly due to traction or compression of the nerve [8], that can occur directly or indirectly, or through another pathology relevant to the shoulder joint [9]. SSN may reflect anatomical deformities, such as narrow suprascapular notch or bone stenoses [6,9], or it may be multifactorial and thus relevant to ganglia [10-12], trauma that could lead to tension of the nerve [13-15], or activities with repetitive lifting of the upper extremity over the level of the head [16-19], or rotator cuff tears [20].

It has been proposed that a combination of friction, traction and twist, causes nerve trauma in volleyball players and pitchers [17,21,22], and especially right after the pitch [22]. Another source of neural compression has been proposed to be the infraspinatus impingement on the nerve, when the humerus performs abduction and external rotation in strenuous overhead activities [23].

Clinical presentation-Symptoms

Symptoms alone are not adequate to lead us to a safe conclusion about the underlying pathology, as they are unclear [3]. Nevertheless, the majority of patient's present pain, weakness in external rotation or even muscle atrophy [2]. Clinical presentation does not lack obstructions of the functionality and the strength of the shoulder, as it

is reported that when performing abduction or external rotation the shoulder joint can remain only with 20-25% of its initial strength [2,24].

Describing the pain is not a difficult procedure, as there is no particular diversity amongst documented cases; Patients report deep, posterior pain, which oftentimes remains during night and gradually becomes constant and can turn to a feeling of heatburn [9,25].

The cervical spine and the contralateral upper limb can also experience pain, as a reflection of the nerve injury that exists the pathological limb [4]. The deep-seated posterior pain is the decisive point in clinical suspicion for SSN and for the exclusion of other pathologies compatible to the patient's clinical presentation [9]. Bilateral pain requires assiduous examination as literature reports cases of overhead athletes and manual workers suffering bilateral nerve lesions [26].

Specifically, when the injury is located at the level of the suprascapular notch, it gives birth to symptoms relative to the infraspinatus and the supraspinatus, in sharp contrast to the isolated infraspinatus atrophy which indicates compression at the level of the spinoglenoid notch [2, 5].

Diagnostic Imaging

The diagnosis is not a simple task, especially at the initial stages of the pathology where there may not be any symptoms. Additional difficulty arises when the point of the damage lies centrally to the cervical spine, since it is proximal to the roots of the brachial plexus; and often the injured and plexal anatomical regions overlap as regards their presented symptoms [7].

Radiological assessment of the shoulder joint, the scapula and the cervical spine proves to be useful for the differential diagnosis of the pathology from other clinical entities with similar clinical presentation; it reveals anatomic variations and numerous degenerative changes contributing to the shoulder pathology [27,28].

For the foolproof screening both of the muscle, tendinous and capsuloligamentous elements of the rotator cuff [29-31], and of pathological masses, such as gagglia [10,12,29,32-34], lipomas [3,35], and enlarged spinoglenoid veins [36] which compress suprascapular nerve, MRI is the most appropriate method since it is sensitive to soft tissue screening.

Electromyography (EMG) and Nerve Conduction Velocity (NCV) are additionally used to determine the condition of the nerve branches of the suprascapular nerve, and the extent of the damage [30,37], with the disadvantage that the first may appear falsely normal if the pathology hasn't yet reached an advanced stage, at the specific point in time that the examination is performed [7].

Finally, the exact location of the nerve entrapment can be determined by the technique of local anesthetic injection, which, if injected in the precise throttling area of the nerve, is expected to cause pain relief [13].

Physical Therapy

Conservative treatment, which incorporates mainly therapeutic exercise, is the initial therapeutic approach for SSN although current literature doesn't provide a detailed treatment protocol for the entire time frame enclosing the rehabilitation of SSN [27].

The exercises, mild isotonic at the initial stages, need to focus on the implementation of external and internal rotation in combination with extension, flexion and abduction, so as to constitute a complete strengthening and retraining program for the muscles of the shoulder girdle. Special attention should be addressed to the infraspinatus and suspraspinatus, in all of their functional roles; both as antagonists and protagonists, as well as assistors and stabilizers, both in closed and in open kinetic chains. The weight should be used from the beginning, and remain stable in the long run, unlike with the repetitions that should increase as the rehabilitation program progresses [25,38-40].

Rehabilitation programs should be accompanied by therapeutic modalities such as Electrical Muscle Stimulation (EMS), manipulation techniques like traction of the cervical spine, and other physiotherapy interventions aiming to stimulate and reserve the optimal operation of cardiorespiratory system [40].

In every case, together with the conservative treatment, the athlete should avoid repeating everyday movements that were so long performed during training, so that the inflammation can diminish [40].

Surgical treatment is warranted after a possible failure of the conservative approach [27].

The postoperative rehabilitation program lasts up to six months and may be started either on the first postoperative day [41], or after two weeks of surgery [21], regardless of the beginning of the programe a follow up is deemed necessary.

Özer, et al. specifically described a conservative rehabilitation protocol based predominantly on precedingly described protocols regarding rotator cuff injury management of overhead athletes [41].

More specifically, in the first two weeks of the treatment the goal is the reduction of pain and inflammation. From the second to the tenth week, the therapy aims to strengthen the upper extremities and to achieve average range-of-motion. Within the following four weeks the exercise protocol Thrower's Ten is followed [42]. Precautions should be taken to avoid excessive loads on the shoulder girdle. Additionally, functional exercises with or without resistance should be performed by the patient, by using a ball, for retraining muscle groups of the shoulder girdle, both for the movements of pitching, and for the ball handling skills required for the gradual reintegration of the patient in the sport [41].

In the last part of the rehabilitation, lasting from the 14th to the 24th week, it is recommended that all the aforementioned exercises are performed. Stretching techniques and those which target to optimize the upper extremity functionality, as well as lower extremity exercises are also necessary, in order to maintain and increase overall strength, endurance and proprioception [41].

Surgical Approach

Surgery is highly recommended when diagnosis is confirmed, in order to prevent or totally forbid the establishment of atrophies or other symptoms, especially in patients with unsatisfactory response to conservative treatment [43]. Surgical intervention can be performed by either open approach or arthroscopic techniques [43-50].

In every case the target action of the surgery is the ligament release that subsequently leads to the nerve release.

The damaged area can be located and released either with posterior or with anterior surgical approach, anteriorly and posteriorly to the

coracoclavicular ligaments, respectively. Surgical manipulations such as notchplasty are contraindicated as they trigger uncontrolled growth of scar tissue which further irritates the nerve [48].

The posterior surgical approach is an appropriate technique for the cases where the damage is distal to the provenance of the nerve in the brachial plexus. On the contrary lateral neck approach is the preferred technique for damages proximal to the brachial plexus and it is suggested in cases of pathology of the plexal roots, where the explorative surgery starts from its region and progresses until the injury can be emerged [7]. The anterior approach is not recommended since it carries greater risk of iatrogenic errors. Thus, the posterior approach is performed because although it can injure the spinal nerve, it is considered safer [7,51].

Suprascapular neuropathy can also be treated arthroscopically with good or excellent results, due to the ability of the arthroscope to provide a good view of the nerve and its surrounding structures, as well as the decrease in preoperative and postoperative rehabilitation time that the arthroscopy provides compared to the open surgical approach [9,43,48,50].

Recorded long term results of the surgical approach remain unclear, especially because there is not adequate evaluation and assessment of the exact pathology of the patients preoperatively. As regards the adequately evaluated patients they seem to show results in the field of pain and functionality [20,45,52], but not in atrophy especially in the cases that the therapeutic intervention started on the chronic phase [44].

Conclusion

SSN, albeit rare, it remains a challenging pathology which causes damage of variable extent, that depends on the time of diagnosis, the specific area of the compression and the treatment followed.

In every case that a shoulder girdle or a rotator cuff pathology is encountered in clinical practice, a sufficient degree of suspicion is needed, especially when infraspinatus or supraspinatus atrophy is present.

The cornerstone of every confirmed and indisputable diagnosis is a scrupulous patient history and a methodical clinical and radiological assessment in order to gain information relevant to the initiation and progress of the clinical entity, as well as an excellent knowledge of anatomy and mechanisms of injury of peripheral nerves [53], especially when coping with symptoms that orient our clinical reasoning towards the neuropathy.

Treatment is primarily conservative, and if ineffective, it is followed by open or arthroscopic surgical intervention.

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