Axillary nerve dysfunction in an overhead athlete

A 29 years old volleyball player presented in our practice. Her main complaint was weakness at her right shoulder for 6 months. She could continue playing and training but she had lost 50% of the strength in the smash and could not perform properly her training in the gym (especially overhead weight lifting). The onset was progressive and she reported a feeling of dullness in the area around the shoulder that lasted 4 months and then this pain disappeared 2 months ago. She received a diagnosis of impingement and she was told to
perform strengthening of the shoulder in open kinematic chain using theraband. Exercises did not help because fatigue was felt everytime she increased repetitions. No history of trauma or subluxation.

At the inspection atrophy at the deltoid and teres minor were evident. The postero-lateral area between the scapula and the axilla was tender at palpation and soft tissues tightness could be felt. Active movements revealed great substitution of the pectoral muscle during elevation and abduction. The strength tests revealed weakness in external rotation, abduction and forward elevation. Passive movements of the shoulder were free in all planes. No signs of anterior instability/laxity were present performing the shoulder instability tests.

The cervical spine was also screened as well as well as the thoracic spine and ribs, but without findings or changes in the strength power.

Axillary nerve dysfunction was the main hypothesis. Weakness either in abduction and external rotation lead to the hypothesis of an axillary nerve entrapment at the quadrilateral space with effect on both Teres minor and Deltoid muscles (if both these muscles are involved, then the lesion distal to the quadrilateral space is suspected- Sangkook et al 2011). Quadrilateral space syndrome represents a chronic compressive syndrome of the axillary nerve in athletes whose sports require repetitive overhead movements (throwing, smashing..). Teres minor is the superior margin of the quadrilateral space. If fibrous bands develop at its inferior edge, they can compress both the axillary nerve and the posterior humeral circumflex artery. Complete denervation of the deltoid and teres minor can happen.

Closed kinetic chain exercises and strengthening of the deltoid and teres major were introduced, while theraband exercises were avoided in order not to stress to much the nerve in the quadrilateral space. Soft tissue treatments around the nerve and retraining of the scapular control while performing overhead activities were introduced.

EMG Investigation is now required in order to estimate the entity of the nerve lesion.

Axillary nerve dysfunction is often misdiagnosed until the clinical picture is well evident. This is due to the fact that many patients may be asymptomatic even though they have complete or incomplete lesions. Pain is not the main complaint and deltoid weakness is often masked by compensation of the surrounding muscles. Fatigue can be the main clue, especially noted with overhead activity.
Inspection:
evident atrophy at the right deltoid muscle

Active movements: weakness and substitution with pect muscle
DEFINITION

Axillary nerve dysfunction is a form of peripheral neuropathy. It is characterized by loss of movement of the deltoid muscle and lack of sensation in the shoulder area.

ETIOLOGY

Possible etiologies can be secondary to an acute trauma or overuse, eg. with overhead sports like throwing, volleyball, swimming. The axillary nerve is susceptible to injury at several sites, for example the inferior part of subscapularis muscle and shoulder capsule, the quadrilateral space and within the deltoid muscle.

Traction of the axillary nerve over the humeral head during shoulder dyslocation can be one other possible cause of the nerve dysfunction. Compression of the nerve using crutches or due to casts or splints may be another one.

CLINICAL PRESENTATION

The clinical presentation of the axillary nerve dysfunction is variable and can be often undetected or misdiagnosed. In the case of shoulder dislocation, the symptoms related to the trauma could mask the signs of nerve injury. Many athletes may be asymptomatic with incomplete or complete lesions, with the only complain of weakness and fatigue with exercises. Abduction and external rotation strength is important to assess and muscular atrophy at the deltoid and teres minor is important to localize the lesion. Sensory change can be unreliable according to several reports. EMG evaluation is necessary to make an accurate diagnosis.

SUBJECTIVE Examination

Mild, dull, achy pain in the lateral aspect or around the shoulder. Numbness and tingling of the lateral arm and/or posterior to the shoulder. Weakness especially with flexion, abduction and external rotation.

History may include a trauma of the shoulder (direct trauma or dislocation).

DIFFERENTIAL DIAGNOSIS

- “Unhappy triad”: anterior shoulder dislocation, rotator cuff tear and axillary nerve injury
- Quadrilateral Space syndrome: shoulder pain, paresthesias, point tenderness in the quadrilateral space, symptoms with the arm in overhead position (late cocking or early acceleration phases of throwing)
- Personage turner syndrome: idiopathic condition characterized by an acute onset of symptoms and then weakness of muscles, without a mechanisms of symptoms
- Thoracic outlet syndrome
- Posterior cord of the Brachial plexus injury
- C5-6 Cervical Radiculopathy

**PHYSICAL EXAMINATION**

Inspection: atrophy to the deltoids & teres minor

Active movements and passive movements: after prolonged paralysis there is loss of shoulder mobility (flexion, abduction & external rotation), with mild dysfunction active/passive movements can be ok

Muscle strength tests: weakness/paralysis of the deltoid muscles, can be associated to teres minor weakness (then the lesion is distal to the quadrilateral space)

Neurologic testing: sensation can be altered at the lateral deltoid region or may be normal, weakness of the deltoid muscles, reflexes intact

Special Tests (in case of shoulder dislocation/instability): sulcus sign, apprehension test, Jobe relocation test, anterior release test, deltoid extension lag, EMG.

**TREATMENT**

Chronic axillary nerve compression in the quadrilateral space is reported to respond to conservative management, including change in the mechanics of the sport specific task (Duralde 2000). The rate of recovery can be different for everyone and it depends on the amount of nerve lesion (neuroapraxia, axonotmesis, neurotmesis). It can take several months to recover. Functional recovery include PNF, screening of the neighbouring areas (Cx, Tx), soft tissue treatment (subscapularis, teres minor, major..), muscle balance (scapular muscles, arm and trunk muscles), specific exercises. Job changes, modification in the sport-specific gesture or sport-specific training may be needed.

Surgery for nerve decompression can be considered if there is no recovery with conservative treatment.

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