Peripheral Nerve Entrapment and Injury in the Upper Extremity

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Learning Objectives

• Correlate shoulder anatomy and the patients’ signs and symptoms in order to locate the shoulder lesion(s) and properly record the findings.
Learning Objectives

- Elicit a patient history and record the subjective findings in order to perform differential diagnosis of a shoulder injury and use objective testing to rule-in and rule-out shoulder conditions.
Learning Objectives

• Perform a shoulder evaluation and record the objective findings in order to make an assessment of a shoulder injury to the axillary nerve.
Shoulder Anatomy

The acromion is the top part of your shoulder.

Rotator cuff muscles and tendons hold the shoulder in place.

The clavicle (collarbone) is the bony link that holds the shoulder to the body.

The humeral head is the rounded top (ball) of your arm bone.

The glenoid is a shallow socket.

The capsule is a pocket that provides stability.

The labrum is a rim of cartilage to which the capsule attaches.

The bursa is a lubricating sac.
Peripheral Nerve Entrapment and Injury in the Upper Extremity

• Athletic injuries to the shoulder most commonly involve the rotator cuff, glenohumeral joint, and acromioclavicular joint.

Peripheral Nerve Injuries

• Although less common, peripheral nerve injuries about the shoulder during athletic competition have increased along with the general interest in recreational athletics.

Axillary Nerve Compression

The axillary nerve is the most commonly injured nerve around the shoulder in both athletes and nonathletes.

Axillary Nerve Compression

The axillary nerve originates from the posterior cord of the brachial plexus near the coracoid and is composed of fibers from the fifth and sixth cervical nerve roots.
Axillary Nerve Compression

The nerve passes through the quadrilateral space close to the inferior shoulder joint capsule.
Quadrilateral Space

- Scapula, posterior view
- Humerus
- Teres minor
- Teres major
- Long head, triceps
- Axillary nerve
- Posterior circumflex artery

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Axillary Nerve Compression

The nerve then divides into anterior and posterior branches, which supply the anterior and posterior portions of the deltoid muscles. A small branch that arises posteriorly innervates the teres minor and posterior deltoid muscles and supplies the skin overlying the deltoid muscle insertion.
The Axillary Nerve

- Muscles innervated
  - Deltoid and teres minor
- Motor functions
  - Abduction of arm at shoulder beyond first 15°
- Sensory
  - Skin over the shoulder

Table – Causes of axillary nerve lesions

- Traction injury to the shoulder
- Penetrating trauma to the shoulder region
- Closed blunt trauma
- Quadrilateral space syndrome
- Mass effect with nerve compression (cysts, tumors, aneurysm)
- Brachial neuritis (Parsonage-Turner syndrome)
Axillary Nerve Compression

Axillary nerve injuries most commonly occur after anterior shoulder dislocation, a common athletic injury.

Types of Nerve Injury

**Neuropraxia**
- Injury - Mild
- Recovery

**Axonotmesis**
- Injury - Severe
- Regeneration (1 mm/day)
- Recovery

**Neurotmesis**
- Injury
- Degeneration
- Neuroma Formation
Axillary Nerve Compression

Inferior dislocations, luxatio erectae, have an even higher rate of axillary nerve palsy, reported as high as 60%.

Axillary Nerve Compression

Acute axillary neuropathy has also been associated with backpacking, usually in inexperienced hikers.

Chronic Axillary Nerve Compression

Quadrilateral space syndrome represents a chronic compression syndrome of the axillary nerve in throwing athletes.
Axillary Nerve Compression

- Fibrous bands at the inferior edge of the teres minor have been implicated, as have randomly oriented fibrous bands found in the quadrilateral space.
Axillary Nerve Compression

Axillary nerve entrapment may occur insidiously in the quadrilateral space without history of trauma.
Axillary Nerve Compression

Both the axillary nerve and the posterior humeral circumflex artery are compressed in the quadrilateral space when the arm is placed in the abducted, externally rotated or throwing position.

Acute Axillary Nerve Compression

• In the acute setting, the athlete classically presents with weakness in abduction, decreased sensation along the deltoid muscle insertion, progressive atrophy of the deltoid muscle, and subluxation of the glenohumeral joint.
Acute Axillary Nerve Compression

• Pain is not a prominent complaint, and deltoid weakness is often masked by surrounding muscle groups that compensate for its function.

Quadrilateral Space Syndrome (QSS)

- The athlete who has QSS will typically complain of vague pain in the shoulder and around the shoulder that can radiate as far distally as the forearm in a nondermatomal pattern.
Location of Quadrilateral Space

There is often isolated tenderness in response to palpation over the quadrilateral space.
Quadrilateral Space Syndrome

Active range of motion for external rotation of the shoulder is typically full, but is painful at the end-range.
Axillary Nerve Compression

Conservative management consisting of observation and physical therapy is successful in managing most axillary nerve injuries in athletes.

Conservative Management

- At least six months of conservative management is recommended before surgical intervention is performed.

Quadrilateral Space Syndrome

• Hoskins et al. suggested that the posterior capsule should be addressed as part of the cause of a dysfunctional arthrokinematic pattern of motion.

Case Report

• A 57 year-old male professor woke today with severe neck pain and stiffness after sleeping on a new, memory foam, contoured pillow. In addition, he was unable to abduct, internally or externally rotate his left shoulder due to severe, sharp, stabbing pain in the area of the mid-deltoid muscle. He rated the severity at 10/10 with a previous 10 being severe muscle spasms due to dehydration.
• He had never experienced a similar episode of left shoulder pain but due to a MVA in 1987, which fractured seven teeth, sprained his hands and spine and ruptured two cervical discs (C4-5-6), he has experienced painful episodes of neck pain. Chiropractic spinal manipulation and massage, hot showers and stretching normally reduces the neck pain and stiffness.
Active Learning Task

• List 5 additional questions necessary to gain additional subject data
• List orthopedic and neurological testing necessary to gain additional objective data
• List 5 differential diagnoses
• Record your working diagnosis
•Present and defend your work
Thank You