EXAMINATION OF THE ATHLETE: CERVICAL SPINE AND UPPER EXTREMITY

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Workshop handouts are prepared as background didactic material to complement a hands-on workshop session. This workshop handout was originally prepared in October 2001. The ideas and opinions in this publication are solely those of the author(s) and do not necessarily represent those of the AANEM.
INTRODUCTION

The neck and shoulder are common sites of injury in the athlete. In many sports, the neck will be injured from a whiplash-type event. This common mechanism of injury is usually from a musculo ligamentous or posterior element (face & joint) origin. The nerve roots or the brachial plexus is another possible pain generator. These lesions are generally called stingers, which are described as pain that radiates from the neck into the arm and hands. The stinger occurs when the player strikes an object between his head and shoulder. In high school athletes stingers tend to be upper trunk brachial plexus injuries. In college and professional players stingers tend to be herniated discs in the C56 level. Some players may have congenital cervical stenosis, which predisposes them to more serious spinal cord injury. The shoulder also plays a role in the differential diagnosis of neck injuries. Shoulder symptoms may mimic neck symptoms or these injuries may occur simultaneously. This workshop will explore the physical exam of the neck and shoulder of an athlete.

HISTORY

The evaluation of a patient with neck pain should have the usual format: chief complaint; history of the present illness; review of past medical and pharmacological history; family, social, functional, and occupational histories; and review of organ systems. As with most illnesses, the history provides more information about the underlying condition than any other single part of the evaluation.

CHIEF COMPLAINT

Cervical conditions in the athlete can present with the chief complaint involving the neck or the upper limb. An individual might complain of upper limb pain, numbness, or weakness. There can be similar symptoms involving the lower limbs. The patient can have headaches, visual disturbances, dizziness, or jaw pain. In very severe conditions, difficulty in performing activities of daily living, bladder dysfunction, or bowel incontinence can also be the presenting concern.

HISTORY OF PRESENT ILLNESS

The history generates a differential diagnosis from a chronological account of the current disorder. Potential conditions leading to neck pain are then included or excluded and later confirmed with physical examination and/or diagnostic testing. The sports medicine physician attempts to identify the nociceptive site and determine whether there is a serious neurologic problem. This information has a significant impact on the initial management and timing of diagnostic testing.

The onset, duration, origin, and distribution of symptoms, as well as the mechanism of injury, can provide significant clues to the pathophysiology of the disorder. For example, acute onset of localized posterior neck pain after a head on collision by a defensive back without neurologic symptoms is most indicative of musculoligamentous or posterior element injury. On the other hand, subacute onset of the neck pain with discretely referred arm pain after repetitive stingers is consistent with a cervical radiculopathy.

Documentation of aggravating or alleviating activities can give additional diagnostic information. For example, the aggravation of neck and upper limb symptoms by lifting, sneezing, and/or coughing typically implies the presence of a disc abnormality. Radicular symptoms from foramenal stenosis usually intensify with positions that further reduce foraminal size, such as cervical extension.

The temporal relationship of symptoms also helps narrow the differential diagnosis. For example, neck discomfort that is worse at the end of the day in an elderly athlete suggests a de-
generative process. Pain that is worse at night is often suggestive of malignancy. The presence of constitutional symptoms is very important when considering malignancy or infection.

Neurologic symptoms associated with cervical pathology may include headaches, dizziness, nausea, vomiting, upper limb paresthesias, concentration difficulties, memory disturbances, and weakness. These are important details of the history, which should not be overlooked by the clinician. Limb weakness, bowel dysfunction, and bladder incontinence can indicate serious neurological compromise, which warrants aggressive evaluation and treatment.

**Past Medical History**

The main purpose of the past medical history is to determine the presence of an earlier injury, disease process, or prior surgical procedure that might have contributed to the present neck complaints or that could affect treatment. Any history of a rheumatologic, metabolic, endocrine, or oncologic process needs to be investigated as a possible cause of neck pain. Prior cervical surgery, such as fusion, raises important issues such as fusion integrity and stability, as well as work limitations and treatment precautions. The presence of general medical conditions such as diabetes, chronic obstructive pulmonary disease, coronary artery disease, depression, or other mental disorders needs to be documented because of their potential impact on therapy and recovery. Information that can affect the prescription of medication is listed, including drug allergies or sensitivities, present medications, and gastrointestinal intolerance.

**Family/Occupational/Functional History**

The clinician needs to be aware of any family history of diabetes, cancer, neck pain, psychological illness, or fibromyalgia. This information is important in determining the differential diagnosis. A family history of multiple chronic musculoskeletal conditions/disability is a psychosocial factor to be considered that may impact outcome. Details regarding a patient’s current occupation are important in determining whether any work restrictions are indicated.

**Review of Organ Systems**

The review of systems should be similar to that for any patient, but certain aspects need to be emphasized in patients with cervical disorders. Bowel and bladder function, difficulty sleeping, psychological problems, extremity weakness, recent weight loss, and night sweats are all important indicators. A previous history of peptic ulcer disease, renal insufficiency, or liver dysfunction is critical information to have before prescribing certain medications. The clinician should inquire about any systemic or metabolic problem that could be causing the neck pain either primarily or secondarily.

**Pain Diagrams**

The history is often supplemented with pain diagrams that the patient completes after instruction. The visual analog scale (VAS) and pain drawing can provide useful information to the clinician. The VAS quantifies pain intensity by placing a point on a line that represents a continuum of pain from none to incapacitating. The completed pain drawing can reveal characteristic symptom patterns consistent for particular disorders and give information regarding the patient’s psychological status.

**PHYSICAL EXAMINATION**

The patient is asked to identify the location of any pain, numbness, or tingling they may have and where they may feel the symptoms originate. The examination typically includes observation and inspection, range of motion (ROM), neurologic evaluation, palpation, and provocative maneuvers.

**Observation/Inspection**

The examination begins as soon as there is patient contact. Gait, facial expressions, and body language are noted during the evaluation. These observations help identify pain behaviors and body mechanics. The neck is inspected for masses, such as from adenopathy or goiter, surgical scars, erythema, lesions, or any skin aberrations. The presence of abnormal cervical positioning is recorded, such as forward posturing, absent cervical lordosis, kyphosis or listing.

**Range of Motion**

The evaluation of cervical range of motion includes flexion, extension, rotation, and lateral bending. An inclinometer method is currently the most reliable for documenting ROM. Normal range of motion of the neck is 60 degrees of flexion, and 80 degrees of rotation. Clinical evaluation of ROM can be done without an inclinometer. The patient with normal neck ROM is able to rest the chin on the chest, look straight up at the ceiling, touch each ear to the shoulder. Patients accomplishing these movements have normal range. These ROM tests are reliable only if the patient does not move the shoulders, the rest of the spine, or the hips.

The cervical spine is assessed for both active and passive ROM. The patient is asked to actively move the neck and then the examiner gently tries to passively increase the range. The neck should not be forced into a nonphysiological or painful range that can cause an increase in symptomatology. Range-of-motion testing is contraindicated in the presence of spinal instability. The lack of active motion can be secondary to pain or muscle guarding. Decreased active and passive ROM can be secondary to spondylosis or ankylosis.
Shoulder ROM testing is included in cervical spine evaluations to detect any loss that may affect cervical spine function. Disorders such as adhesive capsulitis, rotator cuff tendonitis, or shoulder impingement often lead to decreased passive and active shoulder range of motion, which leads to altered biomechanics and increased mechanical stress to cervical spine structures.

**Neurologic Evaluation**

The neurologic examination involves testing of the peripheral and central nervous system to determine the presence or absence of neurologic deficits. Strength, muscle stretch reflexes, sensation, and reflex tests for upper motor neuron lesions are performed on every patient presenting with neck problems.

The motor examination can determine the presence of a root, trunk, or peripheral nerve injury when there is involvement of motor fibers. Knowledge of the peripheral nervous system and upper limb innervation pattern allows for localization by eliciting muscle weakness in a root or peripheral nerve distribution. Neck strength is tested in flexion, extension, and rotation to detect neck weakness that is typically present in myasthenia gravis, myopathy, and some rheumatologic conditions.

Reflex testing is useful in evaluating nerve root function and in localizing the lesion. While any level of reflex amplitude can be normal, hyporeflexia is consistent with lesions at the level of the root, plexus, or peripheral nerve. Hyperreflexia is more associated with lesions from the brain to the spinal cord. Hyporeflexia and hyperreflexia can be present together if the lesion involves both the central and peripheral nervous system. Asymmetric hyporeflexia at a specific root level is typical of unilateral reflexia with long tract signs is consistent with a myelopathic process.

When assessing the upper limb reflex, it is important that correct reflexes be elicited and not an inverted reflex. An inverted reflex can occur, for example, if there is a large disc herniation. This could result in elbow flexion rather than extension when checking for the triceps reflex. Actually, the stimulus from the reflex at the C7 level is blocked and travels cephalad one level to produce a biceps response. This often indicates a more serious problem of myelopathy, in addition to a concurrent C7 radiculopathy.

Another significant point about muscle stretch reflex testing is that it must be established whether decrease in the reflex really represents a diminution. For example, a tense patient might not be able to relax, resulting in a diminished or absent reflex. Reflexes should be obtained carefully and repeated with and without facilitation. Facilitation in the upper limbs, similar to Jendrassik’s maneuver for the lower limbs, is best done by asking the patient to tense muscles outside the limb. The patient can bite down hard, squeeze the knees together, or make a fist with the opposite hand. The reflex examination should include attempts to elicit pathological reflexes which typically include the Babinski and Hoffmann tests. These testing methods are conducted to assess the integrity of the long tracts within the central nervous system. The presence of these reflexes is suggestive of a central nervous system lesion such as central cervical disc herniation, cervical spinal stenosis, or other pathology resulting in myelopathy.

The sensory exam is designed to test the competence of the dorsal roots. Pain, tested by pinprick, is usually the last sensory modality to be decreased and is not the most sensitive indication of sensory loss. Vibration fibers are affected more often than the smaller pain fibers in a radiculopathy. Position sense is also likely to be abnormal before pain sensation. Although pain testing is more convenient, vibratory and position sense testing are likely to be the first involved in a radiculopathy. The only problem with vibration is that it cannot be well localized to one dermatome. Specific patterns of sensory change must be documented and assessed to see whether or not these changes actually follow a dermatomal pattern. Cervical spine soft issues also refer pain and unusual sensations into the limbs. These “sclerotomai” symptoms should not be confused with actual dermatomal sensory loss. Sensations referred by sclerotomal sources do not actually produce real sensory deficit.

A cranial nerve evaluation is incorporated in the neurologic assessment of patients with cervical spine disorders. Cranial nerve inquiries can be associated with traumatic or nontraumatic cervical spine conditions. Barrol-Lieu syndrome is a condition associated with cervical spine hyperextension injuries to the vertebral artery, cervical sympathetic chain, or brainstem nuclei, leading to symptoms such as tinnitus, facial numbness, aphony, hoarseness, vertigo, ocular pain and blurry vision.

**Palpatory Examination**

Palpation of the osseous structures of the anterior aspect of the neck should include the hyoid bone and the thyroid cartilage. The hyoid bone should move from side to side as the patient swallows. The carotid tubercles of C6 can be palpated and they are important structures used to identify cervical ganglion sites for sympathetic blocks. The posterior osseous structures of the neck are examined by palpating the occiput, inion, superior nucha line and mastoid processes. These structures are palpated to identify any painful sites. Cervical spine osseous structures such as the facet joints and the spinous processes can be palpated during motion to identify dysfunction in movement, especially in non-obese patients.

Soft tissue palpation is an important part of the cervical spine examination. The cervical and shoulder musculature are evaluated to identify trigger/tender points that can cause muscular-
related referred headache and upper extremity pain patterns. Tenderness of the ligamentum nuchae often indicates a stretched ligament resulting from a neck flexion or direct injury. Lymph nodes in the region of the sternocleidomastoid should be palpated to assess for possible infection in the oropharynx or upper respiratory glands. The greater occipital nerves are commonly affected in flexion/extension injuries, resulting in occipital neuralgia with occipital headaches. Palpation of the nerves commonly causes an increase in the patient’s headache, if it is due to occipital neuralgia. The greater occipital nerves are located at one third of the distance from the occipital protuberance to the ipsilateral mastoid process.

**Provocative maneuvers**

The Spurling test looks for foramenal encroachment on an inflamed cervical nerve root. The patient’s head is extended, laterally flexed, and held down for up to one minute. The sign is present if there is increased symptomatology into the shoulder and/or hand in a radicular pattern.

Lhermitte’s sign was first described in patients with multiple sclerosis. It is elicited by briskly flexing the patient’s neck. Electric-like pain or shock sensations shooting down through the spine as a result of this maneuver are often indicative of spinal cord pathology. This sign is also positive in some patients with herniated cervical discs.

Adson’s maneuver is a test for neurovascular compromise due to a thoracic outlet problem from a cervical rib or a tight scalenus anticus/medius muscle. The symptomatic arm is placed in extension and lateral rotation. The radial pulse is monitored as the patient takes a deep breath and turns the head toward the ipsilateral side. The presence of subclavian artery compression is confirmed if there is a marked diminution or absence of the radial pulse. This test is sensitive but not very specific, so the examiner should be aware of the possibility of a false positive response.

The median stretch test, ulnar stretch test and radial stretch test all provide functional testing for both a cervical radiculopathy and a specific peripheral nerve injury.

The median nerve stretch test is performed on the patient in the supine position with the elbow flexed at 90° and the wrist extended at 90° away from the patient. The elbow is then slowly extended. This may reproduce the patient symptoms. The neck is then side bent to the contralateral side. If it worsens the symptoms it is a positive sign. Ipsilateral side bending should lessen the symptoms. This would be positive for a C67 radiculopathy. See Figure 1 & 2

The ulnar nerve stretch test is performed in the supine with the shoulder at 90° of ER, with the elbow flexed at 90° and the wrist dorsiflexed 90° towards patient. The shoulder is abducted until the hand is next to the face. The neck is then side bent to the contralateral side. If it worsens the symptoms it is a positive sign. Ipsilateral side bending should lessen the symptoms. This would be positive for a C67 radiculopathy. See Figure 1 & 2
The radial nerve stretch test is performed on the patient in the supine position with the arm at the side of the patient with the elbow fully extended and the wrist dorsiflexed maximally away from the patient. The arm is then abducted at 20˚. The neck is then side bent to the contralateral side. Worsening of symptoms is a positive sign. Ipsilateral side bending should lessen the symptoms. This would be positive for a C6 radiculopathy. See Figure 6 & 7.

An examination of the shoulder is important to rule out shoulder pathology with or without cervical spine pathology. The differential diagnoses that can mimic a cervical radiculopathy include a rotator cuff tear, tendinitis, impingement syndrome as well as anterior instability of the shoulder. Besides passive ROM of the shoulder, the following tests are helpful:

Neer impingement sign - Figure 8

With the patient seated, depress the scapula with one hand while evaluating the arm with the other. This maneuver compresses the greater tuberosity against the anterior acromion and elicits discomfort in patients who have a rotator cuff tear or impingement syndrome.

Hawkins impingement sign - Figure 9

This test reinforces a positive Neer impingement sign. Elevate the patient’s shoulder to 90˚, flex the elbow to 90˚, and place the forearm in neutral rotation. Support the arm and then internally rotate the humerus. Pain elicited with this test is indicative of rotator cuff tear or impingement syndrome.
Cross-body adduction for the AC joint - Figure 10

Elevate the shoulder to 90˚ and then adduct the arm across the body in the horizontal plane. Pain over the acromioclavicular joint suggests arthritis of this joint.

Apprehension sign - Figure 12

Place the arm in 90˚ of abduction and then maximal external rotation. Patients with anterior instability may report apprehension and a sense of impending dislocation. A report of pain without apprehension is less specific than relocation sign.

Sulcus sign - Figure 13

A sulcus sign is also important for inferior apply traction in an inferior direction with the arm relaxed at the patient's side. In patients with inferior shoulder laxity, this maneuver causes inferior subluxation of the humeral head and a widening of the sulcus between the humerus and acromion. Comparison should be made to a similar maneuver on the opposite shoulder.
REFERENCES


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