



HSS Manual Ch. 19 - Neck Pain

From the HSS Manual of Rheumatology and Outpatient Orthopedic Disorders

Thomas P. Sculco, MD

Surgeon-in-Chief, Hospital for Special Surgery

Professor of Orthopaedic Surgery, Weill Medical College of Cornell University

James C. Farmer, MD

Assistant Attending Orthopaedic Surgeon, Hospital for Special Surgery

Assistant Professor of Orthopedic Surgery, Weill Medical College of Cornell University

David A. Bomback,
Orthopedic Surgeon
Connecticut Neck and Back Specialists

KEY POINTS

- Degenerative of the cervical spine, or cervical spondylosis, is an age-related process that affects many components of the cervical spinal column.
- The spectrum of cervical spondylosis ranges from axial neck pain to radiculopathy to frank myelopathy.
- Physical examination findings correlated with diagnostic imaging studies can aid in diagnostic evaluation.
- Almost all patients with symptomatic cervical degenerative disease without neurologic involvement can be managed non-operatively.

- Surgery for myelopathic patients is a reasonable option to prevent disease progression. Neck pain is a common complaint and tends to occur with increasing frequency after the age of thirty. Most episodes of neck pain are short-lived and tend to respond to non-operative management.

The clinical manifestations of neck disorders range from midline posterior neck pain to the neurologic sequelae of cervical nerve root or spinal cord compression. Axial neck pain may radiate from the base of the skull down to the upper trapezius region. Cervical radiculopathy involves compression of a nerve root with pain radiating down the arm in an anatomic distribution. Cervical myelopathy is characterized by dysfunction of the spinal cord. This may be caused by cord compression, vascular abnormalities, or a combination of both.

ETIOPATHOGENESIS

- I. **Degeneration of the intervertebral disk** can lead to pain referred to the neck, posterior skull and/or upper shoulders. This occurs as a natural consequence of the normal aging process with a resulting decrease in the water content of the disk. Disk degeneration can be affected by many external factors including repetitive occupational mechanical strain, and a history of diving or heavy lifting. The structures affected within the neck include the intervertebral disk, zygapophyseal joint with associated facet capsules, ligaments, musculature, and the neural elements. Changes can be acute (e.g. traumatic), chronic, or acute on chronic.
- II. **Acute herniation of the disk** material posteriorly may result in impingement of the nerve root and/or spinal cord. The distribution of pain in cervical radiculopathy often fits a dermatomal distribution characteristic for each particular nerve root. When cord compression occurs, the changes within the cord can be caused by acute compression by the disk material as well as compression of the vascular supply to the cord.
- III. **Cervical spondylosis** involves loss of disk space height. As a result of the degeneration within the disk and the decreased intervertebral height, altered spinal biomechanics ensue: osteophytes form along the area of the disk space as well as posteriorly along the facet joints. This can be associated with nerve root and spinal cord compression.

PREVALENCE

Prevalence of neck and referred shoulder/brachial pain has been reported to be 9%. In a series of 205 patients who presented with neck pain and were managed non-operatively, 79% were noted to be asymptomatic or improved at a minimum of 10-year follow-up. Thirteen percent were unchanged, and only eight percent had worsening of their symptoms. Radiographically, 25% of patients in their fifth decade have been shown to have degenerative changes in one or more disks. By the seventh decade, this number increases to over 75%.

CLINICAL MANIFESTATIONS

I. Neck Pain

- a. **Signs and Symptoms.** Neck pain is a pain that is perceived by the patient as existing primarily within the axial portion of the spine. Pain may radiate to the base of the skull or to the mid-upper periscapular region. The pain may involve the posterior

trapezius muscles or the posterior deltoids. The pain itself may be limited to a focal area or may involve a more global region. Night pain is common because the neck becomes a weight-bearing area. The longer pain exists the more difficult it is for patients to localize it. Because the neck can be a prominent area of referred pain from thoracic organs such as the heart or aorta, the physician must be aware of the patient's co-morbid medical issues.

- b. **Physical Examination:** Examination of the patient with neck pain should include noting the position with which the neck is held. When there is severe neck spasm, the head may be flexed laterally to that side or even rotated. Muscle spasm can often be visualized and can be palpated posteriorly along the paraspinal musculature. Examination should include inspection of the symmetry of the paraspinal muscles as well as the trapezius and shoulder musculature. Any signs of atrophy must be noted. Shoulder range of motion and strength should be tested as well as examination for focal tenderness within the shoulder (to help rule out the shoulder as a source of potential pain or to define co-existent shoulder disease).
- c. **Neck range of motion** should include flexion, extension, rotation, and lateral bending. Normal flexion demonstrates the ability to touch the chin to the chest. Normal neck extension reveals the occiput approaching the prominent C7 spinous process. Rotation is normally 70 degrees bilaterally and lateral bending is 50 to 60 degrees bilaterally. Palpation for carotid artery pulses as well as the presence or absence of supraclavicular adenopathy should be performed.

II. Cervical Radiculopathy

- a. **Signs and Symptoms.** Cervical radiculopathy implies pain traveling to an anatomic distribution to the shoulder or down the arm. Patients describe sharp pain and tingling or burning sensations in the involved area. There may be sensory or motor loss corresponding to the involved nerve root, and reflex activity may be diminished.
- b. **Physical Examination:** The shoulder abduction relief sign is characterized by having the patient place the palm of his hand flat onto the top of his skull; this causes symptomatic relief of the radicular pain. Spurling's test is performed by having the patient extend the neck and rotate and laterally bend the head toward the affected side; an axial compressive force is then applied to the top of the patient's head. The test is positive when the maneuver reproduces the patient's typical radicular arm pain.
- c. **Herniation or degeneration of an intervertebral disk** may produce specific radicular patterns, depending on the level of involvement. Considerable overlap exists among the patterns outlined below. C5–6 and C6–7 are far more commonly involved than C7-T1 or C4–5.
 - 1. **C5–6 (C-6 nerve root affected).** Pain will radiate to the shoulder or lateral arm and dorsal forearm. Anesthesia and paresthesias may be present in the thumb and index finger. Weakness, if present, will involve the biceps and wrist extensors. The brachioradialis or biceps reflex is often decreased or absent.
 - 2. **C6–7 (C-7 nerve root affected).** The pain distribution is similar to that of a C-7 radiculopathy. Anesthesia and paresthesias, when present, involve the index and long fingers. Weakness, if present, is noted in the triceps, wrist flexors, and finger extensors. The triceps reflex is often decreased or absent.

3. **C7-T1 (C-8 nerve root affected).** Pain may occur along the medial aspect of the upper arm and forearm. Anesthesia and paresthesias involve the ring and small fingers. Weakness, if present, is noted in the finger flexors and intrinsic musculature of the hand. The triceps reflex may be reduced.

III. Cervical Myelopathy

- a. **Signs and Symptoms.** Cervical myelopathy alone (e.g. in the absence of radiculopathy) is painless. This is due to the fact that there is spinal cord compression only. The pain becomes apparent only when compression of the spinal cord is accompanied by compression of the nerve root (myeloradiculopathy). Symptoms associated with spinal cord compression include gait disturbances with balance difficulty, fine motor dysfunction in the hands, and motor weakness. Bowel and bladder dysfunction is found late in the progression of cervical myelopathy. Physical findings often include difficulty with tandem gait (dysdiadochokinesia), hyperreflexia, and various sensory and motor changes.
- b. **Physical Examination:** The Hoffmann reflex is often present, which is elicited by flicking the middle finger of the patient and observing forced finger and thumb interphalangeal joint flexion. There can be upgoing toes (a positive Babinski reflex) as well as associated clonus at the ankles. Myelopathy-related hand abnormalities include atrophy of the thenar musculature and an inability to maintain the ring and small fingers in an extended and adducted position (finger escape sign). Lhermitte's sign involves flexion of the neck with an electric-shock like sensation extending down the axial spine and/or extremities. In addition to the physical examination for neck pain, a thorough neurologic evaluation is necessary. This includes motor testing of all pertinent motor groups including the deltoid, biceps, triceps, wrist flexors/extensors, finger flexors/extensors and the interossei. Additionally, lower extremity strength needs to be tested including hip flexors, knee extensors and flexors, hip abductors and adductors, ankle dorsiflexion and plantarflexion as well as function of the extensor hallucis longus and peroneals. Sensory examination should include light touch, pinprick, and vibration using a tuning fork. Reflex examination should include the biceps, triceps and brachioradialis, quadriceps and Achilles. Another abnormal finding is the inverted radial reflex, characterized by spontaneous finger flexion when the examiner attempts to elicit a brachioradialis reflex. Gait should be tested during normal gait as well as with toe to heel walking.

DIAGNOSTIC EVALUATION

- I. **Laboratory Studies:** Laboratory studies should include routine blood work, namely a complete blood count with differential, an erythrocyte sedimentation rate, and C-reactive protein. These most commonly will be abnormal when an infectious or malignant process is involved.
- II. **Electrophysiological Testing:** An electromyogram (EMG) may be helpful in defining a specific anatomic level when nerve compression is present. Such a study may also be helpful in ruling out other neurologic disorders including peripheral neuropathy. At times a double-crush syndrome may exist when cervical radiculopathy can co-exist with carpal tunnel syndrome.

IMAGING STUDIES

- I. **Plain X-rays:** A plain X-ray series should include an anterior/posterior view, a lateral view, and oblique views. Degeneration can often be noted within the disk spaces and the facet joints. There are often osteophytes noted along the area of the disk space and foraminal narrowing can be noted on oblique views. Clinical correlation with patient symptoms is often poor over the age of 40 years. Instability has been defined as greater than 3.5 millimeters of translation or 11 degrees of angulation between adjacent vertebral segments.
- II. **Myelography:** Myelography can be used to help evaluate nerve root compression as well as compression of the spinal cord. Root compression is manifested by an extradural filling defect with obliteration of the nerve root sleeve. Flattening of the spinal cord can be appreciated on the lateral view. In cases of severe compression, there will be complete obstruction of flow of the myelogram dye. In most clinical situations, this test has given way to the Magnetic Resonance Imaging (MRI) described below.
- III. **Computerized Tomography:** Computerized tomography is helpful in evaluating the degree of foraminal stenosis caused by bony osteophytes. In combination with myelography, it provides superior imaging compared to myelography alone. It permits the visualization of the specific levels (e.g., C6-7) and location (e.g. lateral recess, foraminal) of nerve root compression; filling defects allow for the determination of the extent of spinal cord compression. Measurement of the diameter of the spinal canal can be made to help define preexisting stenosis. Individuals with an antero-posterior spinal canal diameter less than 13mm are considered to have congenital cervical stenosis. In addition, patients with a cord compression ratio (anterior-posterior cord diameter divided by transverse cord diameter) less than 0.40 tend to have worse neurologic function.
- IV. **Magnetic Resonance Imaging:** MRI is perhaps the primary imaging modality overall for cervical spine disorders. It provides excellent visualization of the spinal cord and soft tissues. Measurements of sagittal and axial canal diameters as well as cord-compression ratios can be calculated from an MRI.

DIFFERENTIAL DIAGNOSES

- I. **Differential diagnoses** to consider with cervical disk disease are numerous. When a history of **trauma** is present, cervical sprain, traumatic injury to the brachial plexus, fracture, dislocation, or posttraumatic instability need to be considered.
- II. **Inflammatory conditions** including rheumatoid arthritis and ankylosing spondylitis can also present with cervical pathology. An infectious process including discitis, osteomyelitis, or soft tissue abscess (especially in light of a suspicious clinical history that includes fever or chills) must be ruled out.
- III. **Tumors** can be a cause of neck and upper extremity symptoms. These may include metastatic tumors, primary bone tumors, and tumors within the spinal cord itself. Additionally, tumors involving the upper lung (Pancoast tumor) may cause symptoms consistent with a C8 radiculopathy and/or a Horner's syndrome. The presence of a history of weight loss, night pain and present or past malignancy should increase the physician's sensitivity to this possibility.
- IV. **Shoulder disorders** including rotator cuff disease, instability, and impingement may cause pain referred to the neck and can be confused with a C5 radiculopathy. More commonly, the neck refers pain to the shoulder and may actually be associated with the development of frank shoulder pathology.

- V. **Neurologic** disorders such as the demyelinating disease multiple sclerosis as well as diseases involving the anterior horn cells must be considered in the differential.
- VI. **Finally, many other conditions** such as peripheral nerve entrapment syndromes, reflex sympathetic dystrophy, thoracic outlet syndrome, as well as coronary artery disease with angina pectoris may simulate radicular type symptoms. Pathology in the neck or shoulder may make those areas more likely sites to which visceral pain refers.

TREATMENT

- I. **Conservative care** is the primary treatment for patients with neck pain with or without radicular symptoms. Lifestyle modifications should be instituted to avoid activities that tend to create neck and arm symptoms.
 - a. **Typical activities to modify** include athletic activities, sitting at a desk with neck flexion (e.g. reading, typing) for extended periods of time, and driving. An ergonomic assessment of the modern computerized office is often helpful in decreasing day-long stresses to the neck. A soft cervical collar can be used to limit motion and allow the spasm to settle down. The use of two or three pillows at night in order to decrease reflux symptoms or breathing problems exacerbate cervical spine problems and should be avoided. Thus, use of a cervical pillow under the nape of the neck at night may help decreased spasms and pain as it tends to optimize the position of the neck during sleep. Other modalities such as moist heat and light massage may prove beneficial.
 - b. **Use of medications** including anti-inflammatory medications help decrease the amount of inflammation and provide pain relief. In cases of severe pain, mild narcotics may be useful. Muscle relaxants may also help decrease the amount of spasm and allow for more comfortable periods of rest. Short courses of steroids are sometimes needed to calm down the inflammatory process.
 - c. **Physical therapy** is often useful in the treatment of neck and radicular arm pain, once the severe pain and radicular problems resolve. Modalities including, traction, ultrasound or diathermy can give pain relief. Once the patient's symptoms have begun to decrease, exercise can be added. This should not exacerbate the neck or arm pain symptoms. Active range of motion exercises along with some isometric exercises can help regain strength within the neck.
- II. **Surgery** is indicated in cases of significant radicular pain which has failed conservative treatment or in the presence of significant neurologic deficits. Only a small percentage of patients with cervical spine problems eventually demand surgery. However, if necessary, the surgical procedure is either an anterior cervical discectomy and fusion or a posterior laminoforaminotomy. For cases of myelopathy with significant disability, surgery can be a reasonable alternative. The goal of surgery with myelopathy is to prevent progression of the disease. Post-operatively, some patients show improvement in their pre-operative neurologic status. For myelopathy, surgery consists of either multiple anterior cervical discectomies/corpectomies and fusion versus posterior procedures such as laminectomy alone, laminoplasty, or laminectomy and fusion. A small percentage of patients with significant multi-level disease or poor bone quality are good candidates for a combined anterior/posterior procedure. Surgery should be done emergently in the setting of an epidural abscess.

PROGNOSIS

- I. **The prognosis for patients with axial neck pain** is in general good. In a series of 205 patients followed with neck pain treated non-operatively, 79% were noted to be either asymptomatic or improved at 10-year follow-up. Thirteen percent were noted to be unchanged, and 8% were felt to be worsen. Surgery for axial neck pain, in and of itself, is rarely indicated except perhaps in the setting of instability.
- II. **The prognosis for patients with cervical radiculopathy** again is in general favorable. A significant number of patients tend to respond to non-operative measures and are significantly improved two to three months after the onset of symptoms. A series of 26 patients with cervical disk herniation and radiculopathy managed non-operatively with traction medications, and education showed successful non-operative management in 24 of the 26 patients at one year follow-up. For patients who have persistent radicular symptoms despite two to three months of non-surgical treatment or who have significant weakness, surgery is a reasonable option. The prognosis for improvement with surgery is generally favorable. The majority of patients experience significant improvement in their radicular pain.
- III. **Cervical myelopathy** with early myelopathy and no significant neurologic deficits can initially be followed in an outpatient setting. The prognosis for cervical myelopathy in general tends to show that a high percentage of these patients slowly deteriorate over time. The deterioration is often slow and occurs over years; a small percent of cases may display signs and symptoms of rapid progression. In patients with gross findings of myelopathy with significant cord compression and impairment, surgery is a reasonable option. The goal of surgery is to prevent deterioration and potentially promote improvement in their overall neurologic status. In a series of patients treated surgically for cervical myelopathy, 90% of patients had significant neurologic improvement and 80% had significant pain relief.

posted 7/26/2006

This page can be found on HSS.edu: http://www.hss.edu/professional-conditions_13673.asp

©2007 Hospital for Special Surgery. All rights reserved.