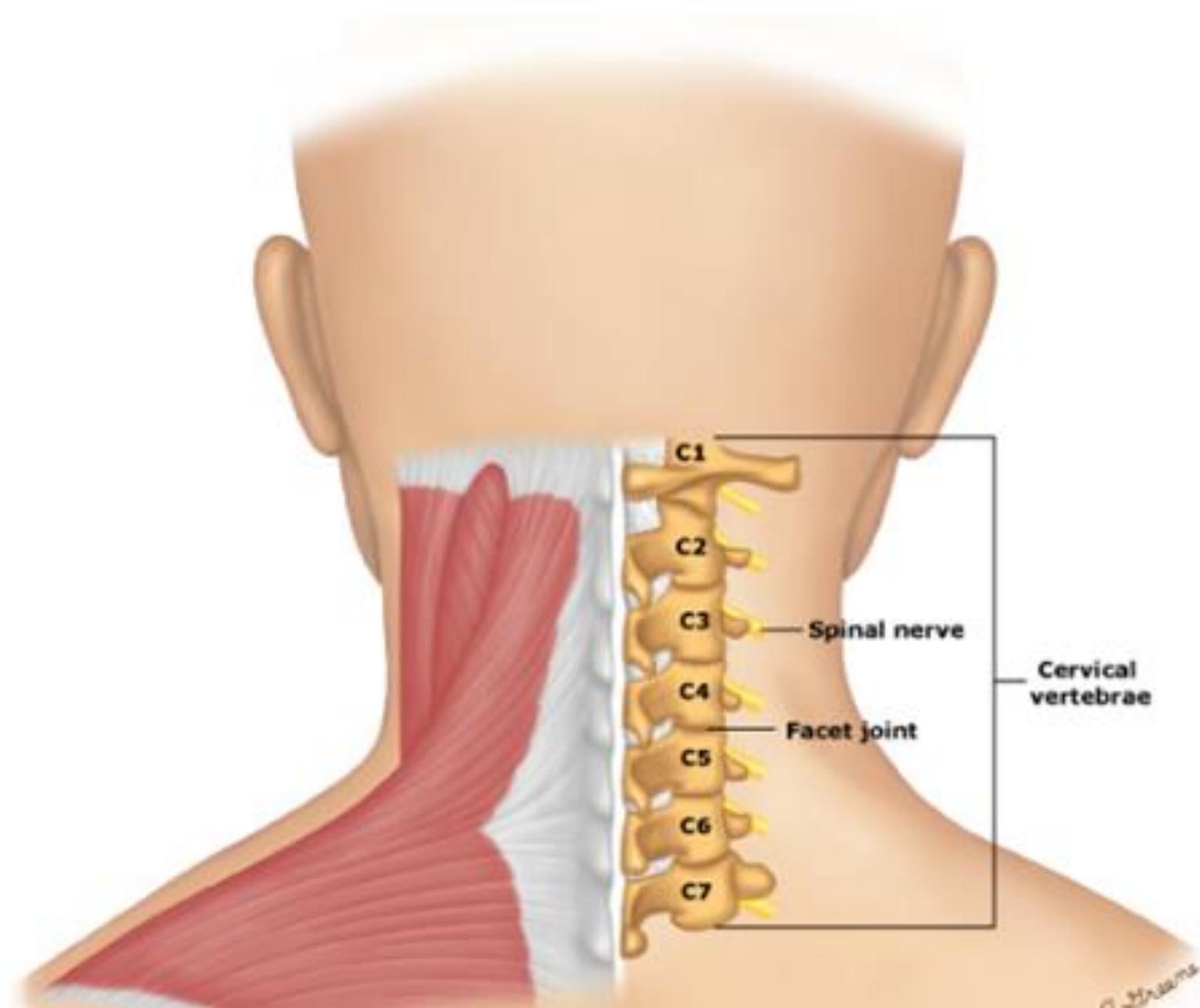


Neurologic approach to neck pain

INTRODUCTION — Neck pain has a prevalence of 10 to 20 percent in the adult population, which is similar to that of low back pain. However, unlike low back pain, lost time from work related to neck pain is infrequent. Degenerative changes of the cervical spine represent the most common cause of acute and chronic neck pain in adults

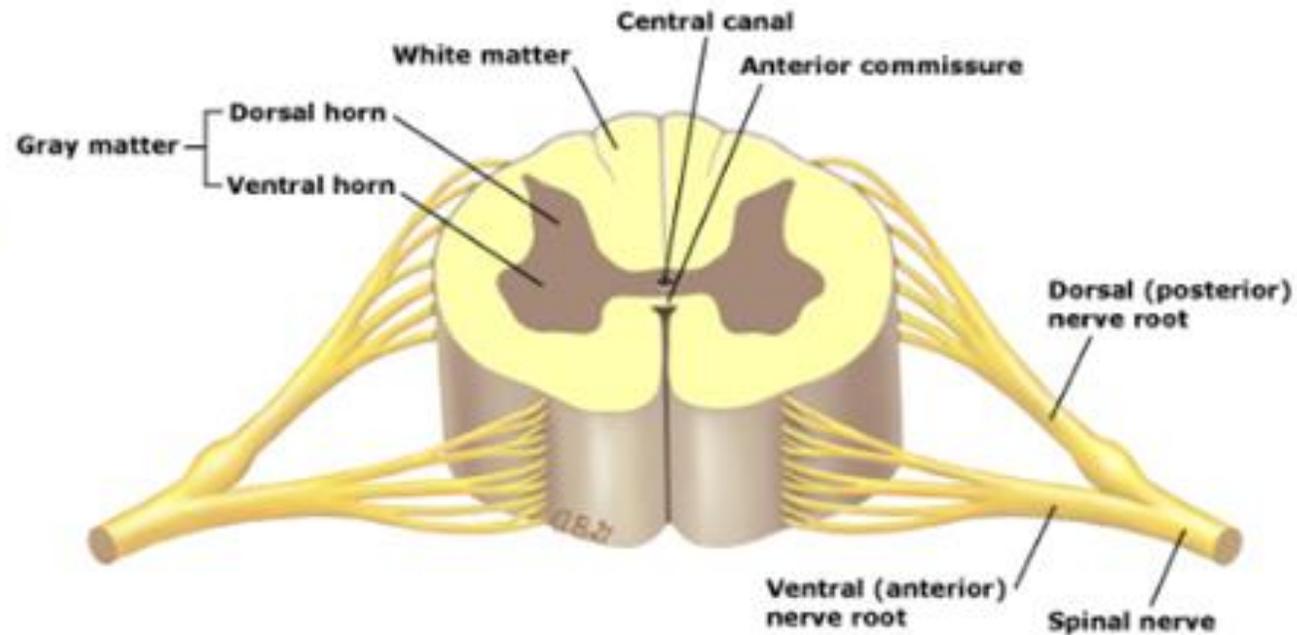
Anatomy of the neck



- Neuroanatomy – There are eight cervical spinal nerves, each arising from the spinal cord and consisting of a ventral and a dorsal root .

The ventral root contains efferent fibers from alpha motor neurons in the ventral horn of the spinal cord. The dorsal root carries primary sensory afferent fibers from cells in the dorsal root ganglion.

Cross-sectional anatomy of the spinal cord



Graphics in this topic

Graphic 65024 Version 3.0

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Symptoms and signs of cervical root lesions

Symptoms and signs of cervical root lesions

Root	Pain	Numbness	Weakness	Reflex affected
C5	Neck, shoulder, scapula	Lateral arm (in distribution of axillary nerve)	Shoulder abduction, external rotation, elbow flexion, forearm supination	Biceps, brachioradialis
C6	Neck, shoulder, scapula, lateral arm, lateral forearm, lateral hand	Lateral forearm, thumb and index finger	Shoulder abduction, external rotation, elbow flexion, forearm supination and pronation	Biceps, brachioradialis
C7	Neck, shoulder, middle finger, hand	Index and middle finger, palm	Elbow and wrist extension (radial), forearm pronation, wrist flexion	Triceps
C8	Neck, shoulder, medial forearm, fourth and fifth digits, medial hand	Medial forearm, medial hand, fourth and fifth digits	Finger extension, wrist extension (ulnar), distal finger flexion, extension, abduction and adduction, distal thumb flexion	None
T1	Neck, medial arm and forearm	Anterior arm and medial forearm	Thumb abduction, distal thumb flexion, finger abduction and adduction	None

CAUSES

While the differential diagnosis of neck pain in adults is broad,

musculoskeletal conditions (eg, cervical strain, cervical spondylosis, cervical discogenic pain)

neurologic (eg, cervical radiculopathy)

non-spinal (eg, infection, malignancy, rheumatologic disease) disorders

It is not always possible to clearly identify the cause, in part because degenerative changes are common and nonspecific. Often, multiple cervical spine conditions occur together (eg, radiculopathy with disc degeneration) such that identifying a single etiology may be difficult

Condition	Symptoms	Physical findings	Provocative maneuvers*	Supportive findings on diagnostic tests [¶]
Musculoskeletal				
Cervical strain	Pain and/or stiffness on neck movement	Tenderness on palpation of neck and trapezius muscles	Negative	None (clinical diagnosis)
"Whiplash" injury	Pain and/or stiffness on neck movement following an abrupt extension–flexion type injury (may present immediately or may be delayed for several days); other symptoms may include headache, shoulder or back pain, dizziness, paresthesias, fatigue, and sleep disturbances	Decreased range of motion associated with neck spasm	Negative	None (clinical diagnosis)
Cervical discogenic pain	Pain and/or stiffness on neck movement; cervical radicular symptoms are sometimes present (refer to cervical radiculopathy below)	Decreased range of motion with associated pain	Variable	Degenerative changes of the discs may be noted on imaging
Cervical facet osteoarthritis	Pain and/or stiffness on neck movement; symptoms can be somatically referred to the shoulders, periscapular region, occiput, or proximal limb	Decreased range of motion associated with neck spasm	Negative	Degenerative changes of the zygapophyseal (facet) joint may be noted on imaging
Cervical myofascial pain	Focal pain and pressure sensitivity; often involves right side of neck and shoulder; pain typically has a deep aching quality, occasionally accompanied by a sensation of burning or stinging	Localized tenderness ("trigger points") on palpation	Negative	None (clinical diagnosis)

Condition	Symptoms	Physical findings	Provocative maneuvers*	Supportive findings on diagnostic tests [¶]
Radiculopathy/myelopathy				
Cervical radiculopathy	Pain, numbness, and/or tingling in a dermatomal distribution, and/or weakness in upper extremity	Decreased or altered sensation, diminished deep tendon reflexes, and/or decreased strength in upper extremity	Positive	Spine MRI or CT myelogram demonstrates cervical nerve root compression
Cervical spondylotic myelopathy	Lower extremity weakness, gait or coordination difficulties, and bowel or bladder dysfunction	Focal neurologic signs in upper and/or lower extremities may be present	Lhermitte's sign ^Δ	Spine MRI or CT myelogram demonstrates cord compression
Ossification of the posterior longitudinal ligament	Typically present in the fifth to sixth decades of life with neck pain, stiffness, and progressive radiculopathy/myelopathy symptoms	Focal neurologic signs in upper and/or lower extremities may be present	Variable	Flowing calcifications along posterior surface of the vertebra on spine radiography or CT

Condition	Symptoms	Physical findings	Provocative maneuvers*	Supportive findings on diagnostic tests [¶]
Nonspinal causes				
Coronary artery disease (angina pectoris, MI)	Chest pain with radiation to neck; pain that worsens with exertion	Normal neck exam	Negative	Evidence of myocardial ischemia on ECG and/or stress testing
Infection (osteomyelitis, discitis, pharyngeal abscess, meningitis)	Fever; other signs vary depending on nature of infection	Vary depending on nature of infection	Negative	Evidence of bony or soft tissue infection on spine MRI or CT (osteomyelitis, discitis, pharyngeal abscess); elevated WBC count and other inflammatory markers (ESR, CRP); CSF pleocytosis on lumbar puncture (meningitis)
Malignancy (metastatic disease)	Unexplained weight loss or prior history of cancer	Localized tenderness on palpation of spine	Negative	Focal enhancing mass involving marrow on spine MRI or CT Lytic or blastic focal cortical lesion on spine CT
Neurologic conditions				
Tension headache	Bilateral dull headache, which may be associated with neck pain; no other neurologic symptoms	Localized tenderness on palpation of scalp and/or neck; no neurologic abnormalities	Negative	None (clinical diagnosis)
Cervical dystonia	Sustained or intermittent muscle spasms of neck	Muscle contractions causing abnormal, often repetitive, movements and/or postures	Negative	None (clinical diagnosis)

Chiari malformation (CM-1)	Neck pain or headache from meningeal irritation is the most common presentation	Variable focal central nervous system signs	Negative	Head and/or cervical spine MRI demonstrates displacement of one or both cerebellar tonsils 5 mm or more below the foramen magnum
Referred shoulder pain (eg, impingement, adhesive capsulitis, rotator cuff tear)	Shoulder pain with radiation to neck	Localized tenderness on shoulder exam with or without decreased range of motion	Negative	
Rheumatologic conditions				
Polymyalgia rheumatica	Aching and morning stiffness in shoulders, hip girdle, neck, and torso	Decreased range of motion of joints in affected areas; normal muscle strength	Negative	Increased inflammatory markers (ESR, CRP)
Giant cell arteritis	Constitutional symptoms, headache, and visual loss	Prominent and/or tender temporal artery; absent temporal artery pulse	Negative	Increased inflammatory markers (ESR, CRP); temporal artery biopsy may be used to confirm diagnosis
Fibromyalgia	Diffuse musculoskeletal pain with fatigue	Multiple soft tissue "tender points"; no evidence of joint or muscle inflammation	Negative	Normal inflammatory markers (ESR, CRP)
Thoracic outlet syndrome	Upper extremity neurologic and/or vascular symptoms (eg, numbness, paresthesias, weakness, swelling, pain, pallor, and/or coldness in the hand)	Focal neurologic signs in upper extremities and/or signs of venous or arterial compression (eg, sensory deficits, swelling, cyanosis or pallor)	Variable	EMG/NCS may demonstrate denervation in ulnar and median innervated muscles; cervical ribs may be seen on plain radiographs; additional imaging (neck and chest ultrasound with Doppler, CTA or MRA) can help confirm the diagnosis

Vascular conditions (vertebral or carotid artery dissection)	Symptoms of cerebral ischemia (eg, sudden onset of focal motor and/or sensory deficits)	Variable focal central nervous system signs	Negative	Head and neck MRI/MRA or CTA demonstrate characteristic findings
Visceral etiologies				
Esophageal obstruction	Dysphagia, which may be associated with throat or neck pain	Normal neck exam	Negative	Fluoroscopic contrast esophagram and/or upper endoscopy show evidence of obstruction
Biliary tract disease	Right upper quadrant abdominal pain with radiation to shoulder and/or neck	Normal neck exam; jaundice and/or right upper quadrant abdominal tenderness may be present	Negative	Abdominal ultrasound, CT, MRI or MRCP shows evidence of biliary tract disease
Apical lung tumor	Cough, hemoptysis, dyspnea, and/or chest pain with radiation to neck may be present	Normal neck exam; pulmonary exam may show focal abnormalities (eg, rales, rhonchi)	Negative	Chest radiograph or CT shows a lung mass

Radiculopathy/myelopathy

Cervical radiculopathy

Cervical radiculopathy refers to **dysfunction of the spinal nerve root**.

Degenerative changes of the spine (eg, cervical foraminal stenosis, cervical herniated disc) are responsible for 70 to 90 percent of cases. Other less common causes include herpes zoster, Lyme radiculopathy, and diabetic polyradiculopathy.

Cervical radiculopathy generally presents with **pain, sensory abnormalities, and/or weakness in an upper extremity.**

Physical examination may show **altered sensation in a dermatomal pattern (, decreased reflexes, and/or localized muscle weakness in a myotomal distribution.**

Provocative maneuvers are often positive .

The diagnosis of cervical radiculopathy is suspected on the basis of clinical presentation. MRI with evidence of cervical nerve root compression is supportive; however, imaging is usually not necessary unless there is progressive neurologic impairment.

Symptoms may persist for up to six to eight weeks and may be recurrent.

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ToDate® evaluation of the adult patient with neck pain

Rate ☆☆☆☆☆

Cervical dermatomes

The image contains two anatomical diagrams illustrating cervical dermatome distributions. The top diagram shows a front view of a human torso and right arm. Lines represent the following dermatomes: C3 (around the eye and ear), C4 (around the neck), C5 (around the shoulder), C6 (around the elbow), C7 (around the wrist), C8 (around the hand), and T1 (around the axilla). The bottom diagram shows a back view of a human torso and left arm. Lines represent the following dermatomes: C2 (around the occiput), C3 (around the back of the neck), C4 (around the upper back), C5 (around the shoulder blade), C6 (around the elbow), C7 (around the wrist), C8 (around the hand), and T1 (around the axilla).

Cervical spondylotic myelopathy

Cervical spondylotic myelopathy refers to **spinal cord injury** or **dysfunction** caused by degenerative changes narrowing the spinal canal.

Patients may present with a **variety of neurologic complaints** including lower extremity weakness, gait or coordination difficulties, and bladder or bowel dysfunction.

Physical examination may show **upper motor neuron signs** in the arms and/or legs

Lhermitte's sign (electric shock-like sensation in the neck, radiating down the spine or into the arms, produced by forward flexion of the neck) may be present.

Provocative maneuvers (eg, Spurling's maneuver) should generally be avoided since this can worsen symptoms.

The diagnosis of cervical spondylotic myelopathy is suspected clinically and confirmed by MRI scan showing cervical spinal canal narrowing, spinal cord compression and signal abnormality .

MRI of cervical spondylitic myelopathy



Cervical spondylitic myelopathy. Sagittal T2-weighted MRI of the cervical spine shows spinal canal narrowing due to disc-osteophyte complexes indenting the ventral aspect of the spinal cord (arrows) and abnormal T2 hyperintense cord signal (arrowhead) confirming

pathogenesis is not known, but it is more common in

Differential diagnosis includes multiple sclerosis, syringomyelia, tumor, epidural abscess, amyotrophic lateral sclerosis, and other causes of spinal cord dysfunction

Distinguishing cervical spondylotic myelopathy from other causes of neck pain is critical because optimal neurologic recovery depends on early surgical decompression.

Spinal Cord Syndromes

Intramedullary Lesions

Primary intramedullary lesions may be **neoplastic, inflammatory,** or **developmental.**

The most common presenting symptom of spinal cord tumor is **pain,** which is present in about two-thirds of patients, **usually radicular** in distribution, often **aggravated by coughing or straining,** and **worse at night**

Cervical myelitis presents with **rapid onset of radicular pain and long-tract symptoms and signs** and may be due to MS, postinfectious encephalomyelitis, or neuromyelitis optica, or it may be without an obvious cause (idiopathic)

Syringomyelia, a cystic intramedullary lesion of variable and unpredictable progression, may present with deep aching or boring pain in the upper limb, often characteristically referred to the ear. Asymmetrical lower motor neuron signs (radiculopathic) in the upper limbs, with dissociated suspended sensory loss (i.e., has an upper and lower border to the impairment of pinprick and temperature sensation), is suggestive of a syrinx.

Extramedullary lesions, whatever the pathology, may result in any **combination of root, central cord, and long-tract signs and symptoms.**

The most common cause of cervical nerve root and spinal cord compression is **cervical spondylosis**. This is a degenerative disorder of the cervical spine characterized by disk degeneration with disk space narrowing, bone overgrowth producing spurs and ridges, and hypertrophy of the facet joints, all of which can compress the cord or nerve roots.

Hypertrophic osteophytes are present in approximately 30% of the population, and the incidence increases with age. The presence of such degenerative changes does not indicate that the patient has symptoms due to these changes; other pathology can also be present. Furthermore, the degree of bony change does not always correlate with the severity of the signs and symptoms

This chronic degenerative process is sometimes referred to as hard disk as opposed to an acute disk herniation or soft disk in which the onset is acute with severe neck pain and brachialgia. Patients with cervical spondylosis often awake in the morning with a painful stiff neck and diffuse nonpulsatile headache that resolves in a few hours. The lesion is most commonly at C5/6 and/or C6/7 and the focal signs are likely to reflect root dysfunction at those levels.

Extramedullary cord compression by **pathology in the epidural space** may be due to a primary or metastatic tumor. A Schwannoma or nerve sheath tumor produces signs and symptoms related to the nerve root on which it arises, and as it enlarges, progressive myelopathic dysfunction occurs. Plain radiographs of the cervical spine may demonstrate an enlarged intervertebral foramen and the MRI is diagnostic. A meningioma may present in a similar fashion and is more frequent in the thoracic region.

The initial presenting symptom of epidural spinal cord compression due to metastatic malignancy is pain in over 90% of patients. Malignant bone pain is usually localized to the vertebra involved and percussion tenderness over the vertebral spine is a good localizing sign. As the pathology spreads to the epidural space radicular pain occurs. Plain radiographs of the cervical spine may show bony pathology with the preservation of disk spaces but the imaging modality of choice is MRI.

Epidural infection may be either acute and pyogenic, or chronic when the organism is likely to be mycobacterial or fungal.

Pyogenic epidural abscess may present acutely with fever, severe pain localized to a rigid neck, radicular pain, and rapidly progressive root and myelopathic signs, but at times the presentation is more subacute with less systemic evidence of infection. Imaging reveals early loss of the disk space which enhances with contrast material, and the infection spreads into the epidural space and then into the bone with vertebral collapse.

The differential diagnosis of a rapidly progressive, painful, epidural lesion also includes spinal subarachnoid, subdural, or epidural hemorrhage.

Brachial Plexopathy in Cancer Patients

Plexopathy in patients with cancer, particularly those with **breast cancer or lymphoma who have been irradiated**, poses a problem

Malignant infiltration is more likely to be extremely painful, and is more likely to involve the lower plexus. There may be an associated Horner syndrome.

Radiation plexitis is less likely to cause severe pain and often involves the upper plexus. Both syndromes are slowly progressive but radiation plexitis is likely to be of longer duration. Neurophysiological studies with EMG can be helpful and myokymia and fasciculations support the diagnosis of radiation plexitis.

	Age	Course	Clinical features	Diagnosis
Cervical spondylotic myelopathy	Usually >60 years	Progressive or stepwise course	Moderate-severe cases demonstrate gait and leg spasticity and amyotrophy of hand or arms	MRI cervical spine
Transverse myelitis (including multiple sclerosis and other causes)	Children, young adults	Subacute	Segmental cord syndrome	MRI and CSF
Viral myelitis	Any age	Acute-subacute	Pure motor syndrome or segmental cord syndrome	MRI and CSF
Epidural abscess	Any age	Subacute; may worsen abruptly	Segmental cord syndrome	MRI
Infarction	Usually >60 years	Abrupt onset	Anterior cord syndrome	MRI with diffusion-weighted sequences
Vascular malformation	>40 years (dural fistula) 20s (intramedullary AVM)	Acute and/or stepwise	Radiculomyelopathy	MRI, spinal angiography
Subacute combined degeneration	Any age	Slowly progressive	Dorsal cord syndrome	Vitamin B12 levels
Radiation	Any age	Slowly progressive; beginning 6 to 12 months after radiation therapy	Segmental cord syndrome or ventral cord syndrome	MRI, clinical history
Syringomyelia	Children, young adults	Slowly progressive	Central cord syndrome	MRI
Epidural metastasis	Usually >50 years	Subacute; may worsen abruptly	Segmental cord syndrome	MRI
Intramedullary tumor	Young adults	Slowly progressive	Central cord syndrome	MRI with gadolinium enhancement
ALS	Usually >60 years	Progressive	Pure motor syndrome	Electromyography

Non-spinal conditions

Many non-spinal conditions can present with a constellation of symptoms that include neck pain . However, in most of these conditions, neck pain is not the most prominent feature and the diagnosis is often evident from other characteristic clinical manifestations (eg, fever, nuchal rigidity, exertional pain, diffuse joint pain)

- **Cardiovascular disease** – Angina pectoris and myocardial infarction
- **Infection** – Osteomyelitis, discitis, deep neck abscess, meningitis
- **Malignancy** – Metastatic disease to the cervical spine
- **Neurologic conditions** – Tension headache, cervical dystonia, Chiari malformations
- **Referred shoulder pain** – Impingement, adhesive capsulitis, rotator cuff tear

- **Rheumatologic conditions** – Polymyalgia rheumatica, fibromyalgia
- **Thoracic outlet syndrome**
- **Vascular conditions** – Vertebral artery or carotid artery dissection
- **Visceral etiologies** – Esophageal obstruction, biliary disease, apical lung tumor

EVALUATION

General approach — It is not always possible to reliably determine the specific cause of neck pain, nor is it necessary to do so in many cases.

The initial evaluation focuses largely on excluding serious conditions that may require intervention. Once these have been excluded, differentiating between the various musculoskeletal conditions is less critical, particularly if symptoms resolve with symptomatic management.

Initial assessment of the patient with neck pain begins with identification of any "red flags,"

Patients with red flags generally require urgent evaluation. This typically includes imaging and/or testing based on the clinical concern (eg, laboratory tests and cultures if infection is suspected, electrocardiogram if angina pectoris is suspected).

For patients without red flags, the evaluation consists of the following:

- A detailed history and physical examination
- Neurologic assessment
- Assessment of radicular symptoms or signs using provocative maneuvers

Most patients with atraumatic neck pain without red flags do not require imaging.

Imaging (eg, cervical spine radiography, computed tomography [CT], or magnetic resonance imaging [MRI]) is generally reserved for patients with

1. red flags

2. patients with progressive neurologic findings

3. patients with moderate to severe neck pain (affecting sleep, daily activities, or occupation) who do not respond to conservative management over six weeks.

Other studies (eg, electromyography/nerve conduction studies, laboratory tests) may be warranted in a limited number of clinical settings

Red flags

The following clinical characteristics suggest the potential for serious disease that requires urgent evaluation :

- Neck pain associated with lower extremity weakness, gait or coordination difficulties, and/or bladder or bowel dysfunction suggests possible cervical cord compression or myelopathy.

Red flags

- A shock-like paresthesia occurring with neck flexion (Lhermitte's sign) suggests compression of the cervical cord by a midline disc herniation or spondylosis but may also be a sign of intramedullary pathology such as multiple sclerosis
- Neck pain associated with fever raises concern for infection. Immunocompromised patients and those with a history of injection drug use are at increased risk of infection and thus there is a low threshold for performing an infectious workup in this setting.
- Neck pain with unexplained weight loss or history of cancer raises concern for malignancy.

Red flags

- Neck pain associated with headache, shoulder or hip girdle pain, or visual symptoms in an older person may suggest rheumatologic disease (eg, polymyalgia rheumatica, giant cell arteritis).
- Anterior neck pain is not typical for cervical spondylosis, and non-spinal causes of neck pain, including angina pectoris and visceral etiologies (esophageal obstruction, biliary disease, apical lung tumor) should be considered

Symptom or finding	Clinical significance
Recent major neck trauma	Raises concern for cervical spine fracture
Neurologic symptoms or signs that suggest spinal cord issue (eg, weakness, gait difficulty, bowel or bladder dysfunction)	Raises concern for cervical cord compression
Shock-like paresthesia (Lhermitte's phenomenon) with neck flexion	Suggestive of cervical cord compression or multiple sclerosis
Fever or chills	Suggestive of infection
History of injection drug use	Raises concern for cervical spine or disc infection
Immunosuppression	Raises concern for infection
Chronic glucocorticoid use	Raises concern for infection or cervical spine compression fracture
Unexplained weight loss	Suggestive of malignancy
History of cancer	Raises concern for metastatic disease to cervical spine
Headache, shoulder or hip girdle pain, or visual symptoms in older patient	Suggestive of rheumatic disease (eg, polymyalgia rheumatica, giant cell arteritis)
Anterior neck pain	Suggestive of a non-spinal cause (eg, angina pectoris)

History and physical examination

The history is aimed at characterizing the pain and excluding red flags . The clinician should ask about the onset, duration, and characteristics of the pain (eg, whether it radiates to the arm, whether there are associated paresthesias) and the extent to which pain limits activity.

Physical examination includes observation of neck movement, range of motion, palpation of the trapezius and paraspinal muscles, neurologic assessment for radicular and upper motor neuron signs, and provocative maneuvers in patients with radicular symptoms

Neurologic examination

A neurologic examination is warranted for all patients with **new-onset neck pain, trauma, moderate or persistent neck pain symptoms, and referred shoulder or arm pain.**

It should include **muscle strength, sensory, reflex and gait testing**, and evaluation for **upper motor neuron signs.**

A negative neurologic examination indicates a low likelihood of nerve root compression; however, positive findings are not specific for root compression .

Motor Signs—Atrophy and Weakness

The examination begins with inspection. Particular attention is paid to atrophy of muscles of the shoulders, arms, and the small muscles of the hands. Fasciculations are often due to anterior horn cell disease, but they may be part of the neurology of cervical spondylosis and radiculopathy. Significant sensory signs would argue against anterior horn cell degeneration.

The finding of hypertonia, weakness, sensory loss, increased tendon reflexes, and/or extensor plantar reflexes indicates cord dysfunction. These signs, when combined with radicular signs in the upper limbs, indicate a spinal cord lesion in the neck.

The distribution of weakness is all important in localizing the problem to nerve root, plexus, peripheral nerve, muscle, or even upper motor neuron (central weakness).

A distribution of weakness that does not conform to a clearly defined anatomical distribution of cervical roots or a single peripheral nerve in the upper limb suggests plexopathy.

Upper plexus lesions cause mainly shoulder abduction weakness, and lower plexus lesions will affect the small muscles of the hand.

Sensory Signs

Skin sensation is tested in a standardized manner starting with pinprick appreciation at the back of the head (C2), followed by sequentially testing sensation in the cervical dermatomes,

down the shoulder, over the deltoid, down the lateral aspect of the arm to the lateral fingers, and then proceeding to the medial fingers and up the medial aspect of the arm .

The procedure is repeated with a wisp of cotton to test touch sensation and test tubes filled with cold and warm water to test temperature sensation. Position sense in the distal phalanx of a finger is tested by immobilizing the proximal joint and supporting the distal phalanx on its medial and lateral sides

and then moving it up or down in small increments. The patient, with eyes closed, reports the sensation of movement and its direction. Loss of position sense in the fingers usually indicates a very high cervical cord lesion

Tendon Reflexes

Examination of the tendon reflexes helps localize segmental nerve root levels, but in cervical spondylosis, which is by far the most common underlying pathology, the reflexes are often preserved or even increased despite radiculopathy, because of an associated myelopathy. An absent or decreased biceps reflex localizes the root level to C5, and an absent triceps reflex localizes the level to C6 or C7. An absent biceps reflex but with spread so that triceps or finger flexors contract is called an inverted biceps jerk and is strong evidence for C5 radiculopathy

Provocative maneuvers

The following maneuvers may be helpful in patients with symptoms or signs of cervical radiculopathy

Provocative maneuvers

- **Spurling's maneuver** – The Spurling's maneuver and modified Spurling's maneuver can be used to reproduce radicular pain. The Spurling's maneuver (also called the neck compression test) is performed by keeping the head in a neutral position and tapping or pressing down on the top of the head. If this fails to reproduce the patient's pain, the procedure is repeated with the head extended and rotated and tilted to the affected side (the modified Spurling's maneuver) . Several other head positions, including flexion, may be tested to provoke nerve irritation. Reproduction of symptoms beyond the shoulder is considered positive, whereas reproduction of neck pain alone is nonspecific.

The modified Spurling's maneuver is most likely to provoke symptoms in patients with foraminal stenosis, central stenosis, or disc herniation involving the foramen.

Spurling maneuver to detect cervical radiculopathy



The Spurling maneuver is used to detect cervical radiculopathy. Several positions of the head may be tested to provoke nerve irritation. First,

This maneuver is highly specific for the presence of cervical root compression, but it has variable sensitivity . Thus, a positive test is helpful, but a negative test does not rule out radicular pain. In a systematic review, the specificity of the Spurling's maneuver was consistently high, ranging from 0.89 to 1.00; sensitivity varied from 0.38 to 0.97 .

The Spurling maneuver should be performed with caution in patients with suspected rheumatoid arthritis, cervical malformations, or metastatic disease since it may cause further injury to the spine

Provocative maneuvers

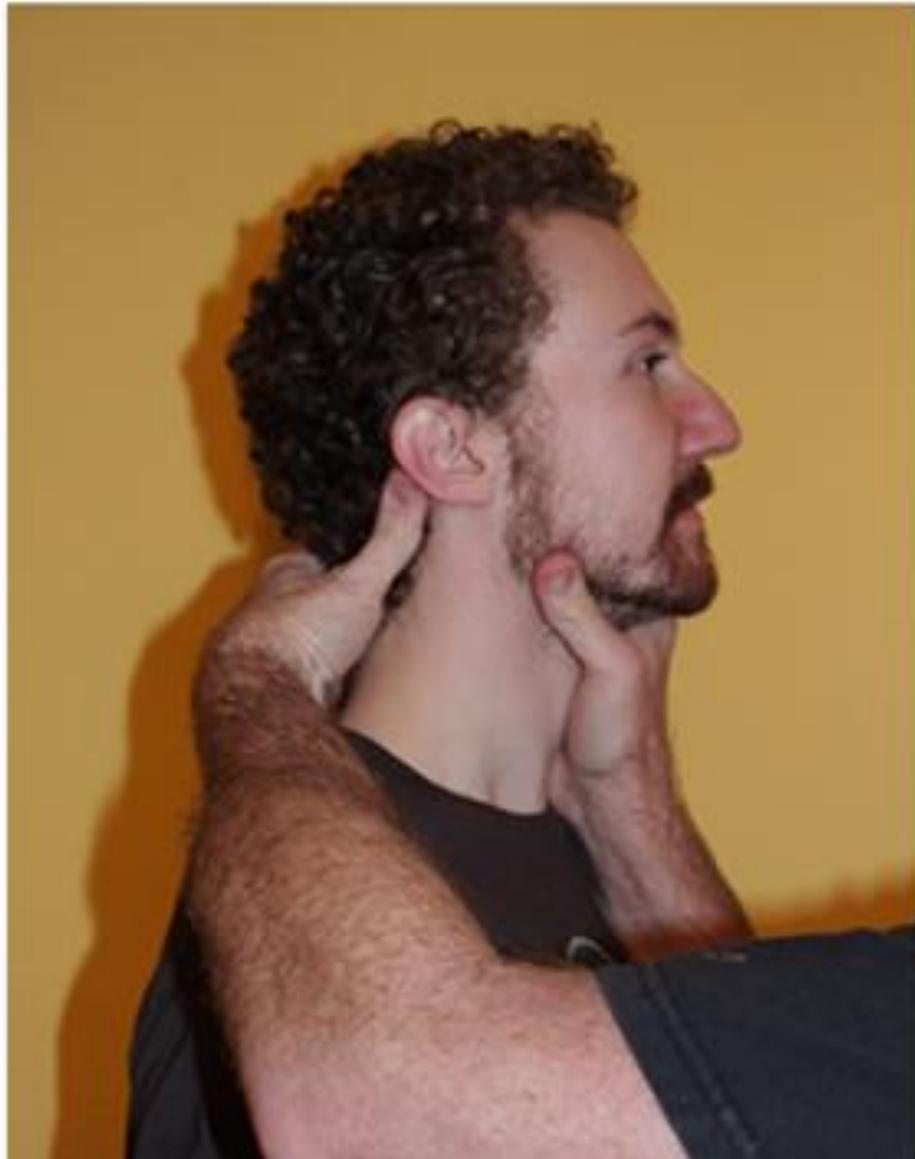
- **Elvey's upper limb tension test** – The Elvey's upper limb tension sign is a root tension sign for the upper extremity, which is akin to the straight leg raise in the lower extremity. The head is turned contralaterally, and the arm is abducted with the elbow extended. Reproduction of arm symptoms is considered positive. In one study, the sensitivity and specificity of Elvey's upper limb tension test were 0.97 and 0.22, respectively

Provocative maneuvers

- **Manual neck distraction test** – Vertical upward traction is applied simultaneously under the jaw and at the occiput, mimicking the effect of traction. This test is positive if the pain is decreased when the head is lifted, indicating pressure on the nerve roots has been relieved .

The sensitivity of testing may be increased by using a combination of these tests rather than a single test

Manual neck distraction test for cervical radiculopathy



Assessment of severity

Assessment of pain severity can help inform decision-making regarding need for imaging and/or treatment.

Mild pain generally refers to pain that does not limit or interrupt daily activities (such as driving, desk work, or sleep), does not affect performance of occupation, and is easily ignored when distracted.

Moderate to severe pain generally refers to pain that negatively affects sleep or the ability to perform daily activities and/or occupation.

A 2007 multidisciplinary task force proposed the following classification schema for patients seeking care for neck pain :

- Grade I – No signs of major pathology and little interference with daily activities
- Grade II – No signs of major pathology but may impact daily activities
- Grade III – Neck pain with neurologic signs or symptoms (radiculopathy)
- Grade IV – Neck pain with major pathology (eg, fracture, myelopathy, neoplasm, spinal infection)

These classifications can help determine urgency of care and appropriateness of intervention. For example, patients with grade I to II findings generally have a benign and self-limited course and initial treatment usually includes simple posture modifications, exercises to maintain range of motion, and/or use of oral analgesics . Patients with grade III symptoms also tend to have a benign course, though some may require specific intervention. By contrast, patients with grade IV findings generally require more urgent evaluation and treatment

Imaging

Imaging is warranted in a small minority of patients with atraumatic neck pain .

In most patients in whom imaging is indicated, cervical spine radiography should be performed first.

If this study identifies an abnormality other than age-appropriate degenerative changes, an MRI should then be obtained.

if there is any concern for a potentially serious diagnosis (eg, infection, malignancy, serious neurologic deficits, or signs of spinal cord compression), an urgent MRI of the cervical spine should be performed instead of radiography

Indications

While most atraumatic neck pain does not require imaging, it is generally indicated in patients with one or more of the following characteristics :

- Progressive neurologic findings suggesting spinal cord compression, myelopathy (eg, muscle weakness or atrophy, sensory deficits, gait disturbance, bladder dysfunction), or severe radiculopathy
- Constitutional symptoms (fevers, chills, unexplained weight loss)
- Infectious risk (eg, injection drug use, immunosuppression) in conjunction with signs of infection such as fever, chills, generalized aches, or leukocytosis (though some patients with immunocompromise may not demonstrate leukocytosis in the setting of infection)
- History of malignancy
- Persistent moderate to severe neck pain (eg, lasting >6 weeks and affecting sleep or ability to perform daily activities and/or occupation)

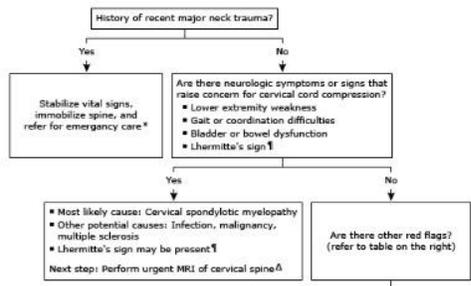
As noted above, MRI imaging should be performed urgently in patients suspected of having an infection, malignancy, or spinal cord compression.

In the absence of red flags , imaging is not necessary in patients with mild acute or chronic neck pain that does not limit or interrupt daily activities, does not affect performance of occupation, and is easily ignored when distracted. Patients who have undergone low-velocity neck trauma (eg, whiplash) also generally do not require imaging

Less commonly used studies

Electrodiagnostic testing

Electrodiagnostic tests (eg, electromyography, nerve conduction studies) are not necessary for the routine evaluation of neck pain. These tests are sometimes used to distinguish cervical radicular pain from other causes of extremity dysesthesia (eg, peripheral nerve entrapment, peripheral neuropathy).



Symptom or finding	Clinical significance
Fever or chills	Suggestive of infection
History of injection drug use	Raises concern for cervical spine or disc infection
Immunosuppression	Raises concern for infection
Chronic glucocorticoid use	Raises concern for infection or cervical spine compression fracture
Unexplained weight loss	Suggestive of malignancy
History of cancer	Raises concern for metastatic disease to cervical spine
Headache, shoulder or hip/girdle pain, or visual symptoms in older patient	Suggestive of rheumatic disease (eg, polymyalgia rheumatica, giant cell arteritis)
Anterior neck pain and/or associated chest pain	Suggestive of a non-spinal cause (eg, angina pectoris)

