

Identifying and Treating the Causes of Neck Pain

Ginger Evans, MD

KEYWORDS

• Neck pain • Cervical spondylosis • Radiculopathy • Myelopathy • Chronic pain

KEY POINTS

- The first step in evaluating neck pain is to look for red flags to suggest serious underlying disease, analogous to the evaluation of low back pain.
- It is important to distinguish mechanical neck pain from radiculopathy or myelopathy based on history and physical examination; techniques are reviewed herein.
- The role of magnetic resonance imaging in mechanical neck pain is dubious.
- Many conservative treatment options are available. Those options with the best support in the literature include educational videos, select exercise interventions, mobilization accompanied by exercise, some medications, and possibly, acupuncture.
- There is no role for surgery in mechanical neck pain.
- Patients with severe or progressive radiculopathy or myelopathy are appropriately referred for surgery; those with mild to moderate radiculomyelopathy have short-term benefits from surgery, but long-term outcomes may be similar to conservative treatment.

INTRODUCTION

Neck pain is a common condition, with approximately 15% to 20% of people reporting neck pain each year and 1.5% to 1.8% of adults seeking ambulatory health care for this complaint annually.¹ Despite the frequency of this presenting complaint, a clear understanding of the cause and the best treatment course is often elusive. This review is aimed at primary care providers evaluating patients in clinic with the complaint of neck pain. Workup of neck pain in trauma victims is outside the scope of this review.

Anatomy

A brief review of the anatomy of the neck sets the stage for a better appreciation of potential causes of pain in the region. There are 7 cervical vertebrae. C1 and C2, atlas and axis, have no intervertebral disk between them. The remaining C3-7 vertebrae are

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Department of Medicine, VA Puget Sound Health Care System, University of Washington, 1660 South Columbia Way, S-123-PCC, Seattle, WA 98108, USA

E-mail address: gingere@u.washington.edu

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connected superiorly and inferiorly to intervertebral disks, and articulate with adjacent vertebrae through 2 important joints:

- Uncovertebral joints (also called the joints of Luschka)
- Zygapophyseal joints (also called z-joints or facet joints)

To help envision the important structures in the vertebrae, we can begin at C4 and imagine moving posterolaterally from the vertebral body as it arches around toward the spinous process. First, a protuberance called the uncinat process is encountered (which abuts the C3-4 intervertebral disk and C3 vertebral body, forming the uncovertebral joints and comprising the anterior wall of the intervertebral foramen for the exiting C4 spinal nerve). Second, the uncinat process is followed by a depression (which forms the inferior wall of the intervertebral foramen). Third, there is another protuberance, called the articular facet (which connects, through a true synovial joint, to the C3 vertebra to form the zygapophyseal joint and the posterior wall of the intervertebral foramen). Therefore, (1) the anteromedial wall of the intervertebral foramen is the uncovertebral joint, which is not a true synovial joint and is a frequent site of bony overgrowth, and (2) the posterolateral wall of the intervertebral foramen is composed of the zygapophyseal joint, which is a true synovial joint and provides stability to the spine.²⁻⁴

There are 8 cervical spinal nerves; C1-7 exit superiorly to their named vertebra. C8 exits between C7 and T1.

- Motor efferent fibers have cell bodies in the anterior horn of the ventral spinal cord, exiting the cord to the ventral root, and then merging with sensory afferents to become the spinal nerve (a short nerve located inside the intervertebral foramen).
- Sensory afferents ascend from the periphery. The cell bodies form the dorsal root ganglion, which is located within the intervertebral foramen, just before merging with the spinal nerve (also inside the foramen). Sensory afferents enter the spinal cord through the dorsal root.^{2,4,5}

Other surrounding structures to highlight include:

- The vertebral artery, which ascends adjacent laterally to the intervertebral foramina
- The intervertebral disks, comprising a gelatinous nucleus pulposus surrounded by an annulus fibrosis, and protected in the midline from herniating into the spinal cord by the posterior longitudinal ligament
- Cervical muscles and soft tissue

Diagnostic Uncertainty

Significant uncertainty still surrounds the pathophysiology of chronic neck pain, and in many cases, the chance of a clinician accurately identifying a specific cause is low.^{1,6} A more critical task is to evaluate patients with neck pain for the following: cervical radiculopathy, cervical myelopathy, and dangerous underlying causes of pain (eg, cancer, fractures, osteomyelitis).^{6,7}

Categorization of Neck Pain and Associated Cervical Spine Disorders

Radiculopathy

Radiculopathy is the constellation of symptoms caused by dysfunction of 1 or more cervical spinal nerve roots. It is less common than mechanical neck pain, with 1 population-based study⁸ showing an average annual age-adjusted incidence of 83.2 per 100,000 people. Although noncompressive causes should be considered (eg, diabetes, herpes zoster, root avulsion), most (approximately 90%) radiculopathies

result from compressive causes. In a large retrospective review at Mayo Clinic,⁸ 21.9% of all radiculopathy cases were believed to have a probable cause of disk herniation (based on radiologic or surgical findings). Spondylosis is the major contributor to the remaining cases. Spondylosis usually refers to progressive, age-associated, degenerative changes of the vertebrae and intervertebral disks. These changes can lead to radiculopathy through bony hypertrophy of the uncovertebral joints and, less commonly, the zygapophyseal joints, both of which may cause narrowing of the intervertebral foramen and consequent compression of the spinal nerve.

Myelopathy

Myelopathy is related to narrowing of the spinal canal, most often from spondylosis (including osteophytes of the uncovertebral or zygapophyseal joints, or degenerative hypertrophy of the ligamentum flavum or posterior longitudinal ligaments). Pathophysiology may involve direct spinal cord or nerve root compression or ischemia from compression of arterial or venous supplies to the cord.⁹

Neck pain

Neck pain in the absence of radiculopathy, myelopathy, or clear serious underlying disease is also called mechanical neck pain, and has less well-understood pathophysiology. Among other things, this type of pain may be labeled as cervical muscle strain, myofascial pain, cervical spondylosis, cervical facet joint pain, and diskogenic pain. Because these structures are innervated, all of the muscles, synovial joints, intervertebral disks, dura mater, and vertebral arteries may theoretically generate pain.^{2,7} Some studies attempting to more specifically delineate which of these features to implicate have focused on zygapophyseal joints and intervertebral disks. Examples of methods used include delivery of noxious stimuli (eg, saline or contrast injection) to specified structures in asymptomatic volunteers,^{10,11} delivery of noxious stimuli to symptomatic volunteers (eg, provocation diskography),¹² and delivery of localized anesthesia in symptomatic volunteers (eg, anesthetic block to zygapophyseal joint either directly or through medial branch blocks).¹³

Some general conclusions from this research include^{7,14,15}:

1. Zygapophyseal joints may be a source of pain in some subsets of patients with chronic neck pain caused by minor trauma or degenerative changes. The zygapophyseal joints may also produce referred pain to the head and upper extremities (referred pain is believed to stem from nociceptive afferents from facet joints that converge in the spinal cord with nociceptive afferents from other distal sites).^{7,14,15} Attempts to map typical locations of pain derived from each zygapophyseal joint have been created and revised.¹⁴ The prevalence of zygapophyseal pain in a primary care clinic population has not been determined. One estimate from a small population of specialty clinic patients (based on serial positive local anesthetic blocks) was reported as 36%.¹⁶
2. Although possible, there is no strong evidence that intervertebral disks (through degenerative or other changes) are a source of pain (diskogenic pain). This area remains controversial.^{17–19}
3. Other potential sources of pain (eg, soft tissue, muscles, arteries) have not been rigorously studied.

These diagnostic techniques and the conclusions drawn from their use remain controversial.^{20,21} Some systematic reviews find adequate evidence to support them,^{15,22} but a recent systematic review and guidelines from the Bone and Joint 2000–2010 Task Force on Neck Pain do not endorse these injection techniques as a diagnostic

maneuver.^{1,19} Furthermore, per the literature review of this task force, there is no “evidence [that was deemed scientifically admissible] demonstrating that disk degeneration is a risk factor for neck pain.”²³ Coauthors of related guidelines concur that there is “no evidence that common degenerative changes on cervical magnetic resonance imaging (MRI) are strongly correlated with neck pain symptoms.”¹⁹

Summary

Recent guidelines state, “in most settings a simple descriptive clinical diagnosis might be preferable to a speculative tissue diagnosis as the origin of pain.”¹ These guidelines propose a clinically practical grading system to guide workup and therapy by categorizing patients as follows:

Grade I: neck pain with no signs of major disease and no or little interference with daily activities

Grade II: neck pain with no signs of major disease, but interference with daily activities

Grade III: neck pain with neurologic signs of nerve compression

Grade IV: neck pain with signs of major disease

SYMPTOMS

Radiculopathy

The hallmark of radicular pain is some combination of diminished motor strength (described by about 15% of patients at presentation), reflexes, or sensation (paresthesias described by about 90% of patients at presentation) in a nerve root distribution. Lower cervical nerve roots (C5-8) are the most commonly involved in compressive radiculopathies. C7 is involved more than half the time; C6 is involved about 35% of the time.⁸ Only a few patients describe trauma or physical exertion preceding their pain.⁸ **Table 1** gives a description of history and examination findings for each nerve root. This table represents a compilation of several sources of information; the most distinguishing and consistently reported findings are in bold type.^{2,3,6,7}

Pain is not a universal symptom of radiculopathy. Pain associated with radiculopathy may occur directly if the dorsal root ganglion is compressed.²⁴ Herniated disks, themselves, may also release inflammatory mediators, which may incite pain.⁴ Although sensory symptoms like tingling may be felt in a dermatomal distribution, pain does not readily follow this same distribution. Instead, it is often deep feeling and is described as extending through the shoulder, arm, forearm, and hand (the hand being more common in C6-8 involvement).^{4,7,8,25}

Myelopathy

Onset of symptoms of cervical myelopathy is often subtle and gradual; years may go by before the patient presents for medical care.^{9,26} However, patients can present with sudden or episodic worsening, especially associated with trauma such as sudden hyperextension. If symptoms are mild at onset, the most common clinical course is to remain stable. Less frequently, a steady progression in symptoms is seen.^{27,28}

Symptoms are variable and may include^{9,29}:

1. Significant pain in the neck, shoulders, or arms (although not present in most patients)³⁰
2. Gait spasticity
3. Upper extremity numbness, which is often in a nonspecific distribution but can be dermatomal, especially with a coexisting radiculopathy

Table 1				
Signs and symptoms of cervical radiculopathy by involved nerve root				
	C5	C6	C7	C8
Pain	Neck Scapula Shoulder	Neck Scapula Shoulder Radial forearm	Neck Scapula Chest Hand	Neck Medial forearm Hand
Sensation	Clavicle, lateral shoulder (Anterior forearm)	(Lateral arm, forearm) Thumb (Index finger)	(Thumb) Index finger Middle finger (Ring finger) (Palm)	(Medial forearm, arm) Ring finger Little finger (Medial hand)
Muscles innervated	Deltoid Biceps brachii Brachialis	Biceps brachii Brachialis Extensor carpi radialis longus and brevis	Extensor carpi radialis longus, brevis Triceps brachii Flexor digitorum superficialis, profundus	Triceps brachii
Motor	Shoulder abduction Elbow flexion	(Shoulder abduction) Elbow flexion (Forearm supination) (Forearm pronation) Wrist extension	Elbow extension Forearm pronation Wrist extension Finger extension	Elbow extension Wrist flexion Finger, thumb extension Finger, thumb flexion Finger, thumb abduction Finger, thumb adduction
Reflexes	(Biceps) (Brachioradialis)	Biceps Brachioradialis	Triceps	

This table represents a compilation of several sources of information^{2,3,6,7}; the most distinguishing and consistently reported findings are in bold type.

4. Loss of fine motor control in the hands
5. Lower extremity weakness
6. Bowel or bladder dysfunction, including urgency, frequency, retention

Mechanical Neck Pain

As discussed earlier, in the absence of these nerve dysfunction syndromes, the cause of neck pain is not well understood. The prevalence of neck pain increases with age,

declining again in late life, and it frequently coexists with other comorbidities such as low back pain, headache, and poor self-rated health.²³ These same comorbidities also portend a worse prognosis. Workers' compensation payments and work-related stress are also reported predictors of persistent pain.⁶ Most people who present to primary care clinic with neck pain experience recurrent or persistent problems.³¹ In one population-based study of primary care patients with neck pain,³² only one-third of patients reported resolution of symptoms at 1-year follow-up. Other studies suggest that between 15% and 50% of people in the general population report resolution at one year.¹

DIAGNOSTIC TESTS/IMAGING STUDIES

Ordering imaging studies for neck pain is tricky. Although neck pain may be causing significant disability, imaging studies are often unhelpful and potentially misleading. A strong correlation between physical examination and imaging studies is paramount.

As most investigators on this subject have advocated, the clinician's first task is to ascertain any symptoms that might suggest serious underlying disease (such as trauma/fracture, osteomyelitis, cancer, inflammatory arthritides, or spinal cord compromise). These red flags,^{6,19} as outlined in **Box 1**, should be similar to those

Box 1

Red flags for serious underlying disease

Cancer or infection

- Fever, chills, weight loss
- History of cancer
- Age >50 years or <20 years
- Intravenous drug use
- Immunosuppression (steroids, human immunodeficiency virus, transplant)
- Recent infection, especially with bacteremia

Pain that is worse when supine

Severe night time pain

Fail to improve >6 weeks

Tenderness over vertebral body

Fracture

Significant trauma

Osteoporosis

Systemic disease

History of ankylosing spondylitis or inflammatory arthritis

Myelopathy

Lower extremity spasticity

Bowel or bladder changes

Upper motor neuron signs (eg, Babinski, Hoffman)

reported in patients with low back pain.³³ Such symptoms warrant appropriate, expedited evaluation.

The second and related task is to discern any potential for spinal cord or nerve root compression. This task may be accomplished via the history and physical examination, as described in the next section (see section on symptoms also).

Radiculopathy, History, and Physical Examination

Findings of radiculopathy on examination might include decreased sensation as well as lower motor neuron signs (weakness, hyporeflexia, and less commonly, atrophy or hypotonia). Classically, sensory findings follow a dermatomal distribution, but in clinical practice, sensory findings on examination only follow this distribution in a few patients,^{3,8} probably because of significant overlap in dermatomes. Pain into the arm rarely follows a dermatomal pattern, but may run more similar to a myotomal pattern.^{4,7,8,25} **Table 1** compiles commonly reported associated findings depending on spinal nerve involved.^{2,3,6,8,34} In practice, the experience of pain is variable, and dermatomal/myotomal boundaries overlap significantly. Lower cervical nerve roots are more commonly affected; C7 is the most frequent.⁸

Several provocative maneuvers have been reported for cervical radiculopathy.^{19,35,36}

The upper limb tension test (ULTT), also called the brachial plexus tension test or test of Elvey, has been reported as the straight leg raise of the upper extremities; Rubinstein and colleagues³⁵ reviewed the literature and concurred that it has high sensitivity (97%), with a reasonable negative likelihood ratio (reported at 0.12, but with a large confidence interval). However, it has low specificity (22%–90%).^{19,36,37} The ULTT is performed with the patient in a supine position. Provide (1) scapular depression with one hand, while (2) abducting the shoulder to 90°, with the elbow in 90° of flexion. (3) Supinate the forearms and wrist. Extend the wrist and fingers. (4) Push forward on the hand to laterally rotate the shoulder. (5) Extend the elbow. (6) Provocation of pain into the arm can also be further elicited in the final position by having the patient bend their head contralaterally (which should elicit or exacerbate pain)^{36,38}; an ipsilateral head bend should diminish pain (**Fig. 1**).³⁶

Neck distraction is performed by grasping under the patient's chin while they are supine and applying a modest upward distracting force, which should relieve symptoms. Wainner and colleagues³⁶ reported low sensitivity (44%) but reasonably high specificity (90%), with a reasonable positive likelihood ratio of 4.4 (although again with a large confidence interval).

Likewise, a positive Spurling sign (**Fig. 2**), Valsalva (pain with 3 seconds of breath holding/bearing down), or abduction relief sign (resolution of pain with placing hand on the patient's head) also have reasonably high specificity (86%–93%, 94%, and 75%–92%, respectively). Their sensitivity is low. They could support a diagnosis of radiculopathy in the context of corroborating history and other examination findings, but their absence does not rule out the disease.^{35,36,39–41}

Myelopathy, History, and Physical Examination

In contrast to radiculopathy, the physical examination hallmarks of myelopathy are primarily upper motor neuron findings in a distribution below the level of compression. These findings may include upper or lower extremity weakness, spastic gait, and hyperreflexia. The plantar reflex (Babinski sign) and Hoffman reflex are important to perform, and their presence should alert the clinician to possible myelopathy.⁶ The Hoffman reflex is performed by applying a quick pressure (flicking) to the middle finger and then looking for reflexive flexion of the thumb. Please note, this response can be

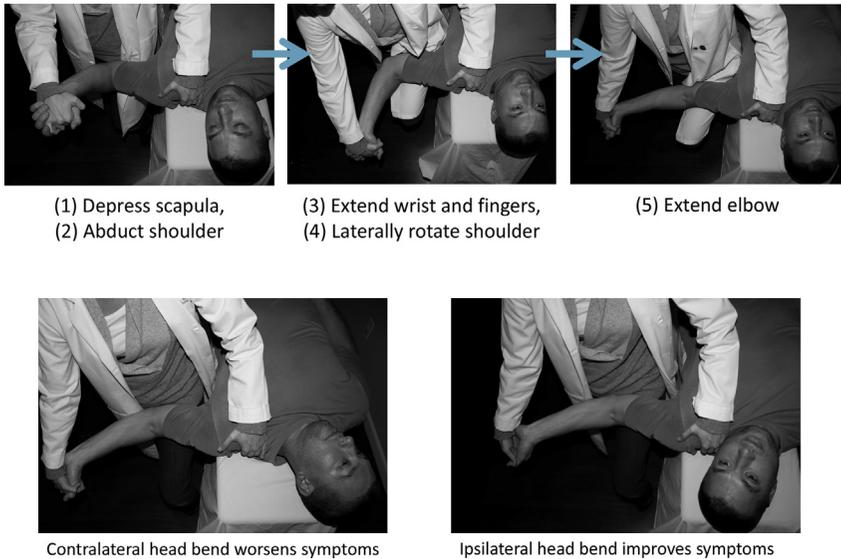


Fig. 1. ULTT. (Data from Wainner RS, Fritz JM, Irrgang JJ, et al. Reliability and diagnostic accuracy of the clinical examination and patient self-report measures for cervical radiculopathy. *Spine (Phila Pa 1976)* 2003;28(1):52–62.)

nonpathologic in naturally hyperreflexic patients. There can be coexisting lower motor neuron findings in myelopathy because of simultaneous nerve root compression; these are classically at the level of involvement, not lower.

Laboratory Tests and Imaging

Blood work is rarely useful in the evaluation of neck pain, except perhaps in the evaluation of someone with red flag symptoms that suggest infection, cancer, and so forth (see [Box 1](#)).

Plain radiographs for the evaluation of nontraumatic neck pain in primary care clinic, are rarely, if ever, useful. They should be considered only in cases in which the history and examination have yielded red flags for serious disease (in which case the need for more advanced imaging might supersede radiographs, depending on the situation).



Fig. 2. Spurling maneuver: pain with axial pressure while head is bent ipsilaterally.

Abnormal curvature does not predict muscle spasm as sometimes believed.⁴² In one series of 85 patients referred for radiographs based on neck pain,⁴³ there were no unexpected findings of malignancy or infection. In another series of 848 patients referred for radiographs,⁴⁴ there were no unexpected serious diagnoses.

MRI is clearly the test of choice if serious underlying disease, such as infection or cancer, is being considered. However, MRI findings of spinal cord or nerve root compression must be interpreted with caution and always correlated with the patient's history and examination. Degenerative changes, herniated disks, and compression of neural structures on MRI are common, age-related findings.¹⁹ Review of cervical spine MRI scans performed in 100 asymptomatic patients showed herniated disks in 57% of patients older than 64 years, with spinal cord impingement in 26%. Asymptomatic spinal cord compression was observed in 7% of all the patients.⁴⁵ MRI can reliably show compression of neural structures, but these findings should then be correlated with any myelopathic or radicular symptoms.¹⁹ Showing degenerative changes in the absence of nerve or cord compression usually does not change management.

Electromyography should be used in conjunction with the physical examination and MRI to evaluate a suspected radiculopathy. It has little role in evaluation of suspected myelopathy, except to rule out alternative explanations of symptoms/findings.⁴⁶

Diskography and diagnostic (anesthetic) injections are controversial, and, although advocated by some investigators, they are generally not recommended based on current evidence for mechanical neck pain.^{1,19}

DIFFERENTIAL DIAGNOSIS

A specific cause for neck pain is frequently not found. Rare causes should be considered, especially if red flags are present in the history or physical examination to suggest these. **Table 2** gives a list of common and rare causes.^{6,7,19,47–49}

TREATMENT

Because neck pain is a common and sometimes disabling problem, it is not surprising that numerous methods of treatment are routinely used to mitigate symptoms. The scientific literature on treatment is often sparse, conflicting or mired in methodological flaws, making it difficult for the practicing clinician to feel confident about what course of action to recommend. It is not even clear what the benefits and harms of giving a diagnostic label (such as degenerative joint disease) may be for a patient.

Multiple challenges exist in both treating and studying the treatment of patients with neck pain. Lack of clarity on the basic understanding of the cause of neck pain without radiculopathy or myelopathy makes targeted interventions challenging. Gold standards for diagnosis of purported causes are murky. Patients with neck pain are probably a heterogeneous group of patients who respond differently to various interventions. For example, response to treatment may vary depending on (1) presence of radiculopathy, myelopathy or neither, (2) comorbid psychiatric disease or personality,⁵⁰ or (3) other premorbid musculoskeletal pains,²³ to name a few. With the inherently subjective nature of pain reporting, it can be hypothesized that a patient's preference for certain treatments (eg, if a friend had a good experience with one type of treatment) may influence a patient's perception or reporting of pain after treatment.

As mentioned earlier, distinctions should be drawn between mechanical neck pain, neck pain with radiculopathy or myelopathy, and neck pain with serious underlying disease (eg, fracture, cancer, infection). Treatment of patients in this final category (serious underlying disease) is often appropriately more aggressive, with excellent

Table 2			
Common and rare causes of neck pain, radiculomyelopathy or both			
	Neck Pain Alone	Neck Pain with Radiculopathy/ Myelopathy	Radiculopathy/ Myelopathy Symptoms Alone
Common			
Disk herniation	x	x	x
Neuroforaminal stenosis (from spondylosis, disk herniation, or both)		x	x
Spinal canal stenosis (from spondylosis, large central disk herniation, ligament calcification, or combination)		x	x
Nonspecific pain (also known as mechanical pain) from unknown cause; sometimes, this is labeled as cervical muscle strain, facet joint pain, and so forth	x		
Rare			
Tumor	x	x	x
Benign tumors (hemangioma, osteoid osteoma, osteoblastoma, osteochondroma, giant cell tumor)		x	x
Serious infections (diskitis, osteomyelitis, epidural abscess, septic arthritis, meningitis)	x	x	x
Vascular causes (eg, vertebral artery, internal carotid or aortic dissection)	x	x	x
Nerve root infarction (vasculitis)		x	x
Trauma: fracture, root avulsion, spinal cord injuries	x	x	x
Polymyalgia rheumatica/ temporal arteritis	x		Stiffness should be primary
Inflammatory arthropathies (rheumatoid arthritis, crystal arthropathy, ankylosing spondylitis)	x		Typically multiple joint involvement and systemic inflammatory symptoms

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Table 2
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	Neck Pain Alone	Neck Pain with Radiculopathy/ Myelopathy	Radiculopathy/ Myelopathy Symptoms Alone	
Fibromyalgia	x			Should not be isolated neck pain
Synovial cyst			x	
Torticollis	x			Not necessarily painful
Diffuse idiopathic skeletal hyperostosis			x	Classically painless, except at risk for cervical fractures from minimal trauma. Stiffness and dysphagia more common symptoms
Paget disease			x	Cervical spine lesions only seen in 11% of patients. In a series of 180 patients, none reported neck pain and only 2 patients had spinal cord compression ⁴⁸
Thoracic outlet syndrome		x	x	
Shoulder diseases	x			
Multiple sclerosis			x	
Amyotrophic lateral sclerosis, Guillain-Barré syndrome, normal pressure hydrocephalus			x	
Noncompressive radiculopathies (rare)				
Diabetic monoradiculopathy			x	
Herpes zoster			x	
Lyme disease			x	
Tuberculosis	x		x	
Syphilis			x	
Brucellosis			x	
Cytomegalovirus			x	
Lyme disease			x	
Histiocytosis X			x	
Sarcoidosis			x	
Human immunodeficiency virus-related neuropathy			x	

support in the literature. This subject is outside the scope of this discussion and we focus instead on the first two categories.¹

Multiple helpful systematic reviews have been published for individual treatment methods, combinations of treatment methods, and overall surgical versus conservative treatment courses.^{51–65}

Conservative Treatments

A panoply of conservative treatments are available. Typically, in the absence of severe myelopathic or radicular motor weakness, these treatments are the first attempted courses of action. Of the available options, those believed to have the weight of evidence in support include educational videos after whiplash injury; select exercise interventions; mobilization when used with exercise; some medications; and possibly, acupuncture.

Although reassurance and education are often given at initial consultations, there is no evidence that such counseling is superior to any other noninvasive treatments for mechanical neck pain.⁵³ Specifically, after whiplash injury, an educational video was shown to predict lower pain ratings at 24 weeks.⁶⁶ There is low-quality to moderate-quality evidence for the use of specific cervical and scapular stretching and strengthening exercises for chronic neck pain,^{55,67,68} but not upper extremity stretching and strengthening or a general exercise program. The improvement from these stretching and strengthening exercises is often limited to immediately after treatment and decreases after the intermediate-term.

Manual therapies encompass a range of hands-on interventions, which might typically be used by a physical therapist, occupational therapist, chiropractor, or doctor of osteopathic medicine. One type of manual therapy is joint mobilization. Joint mobilizations are a type of passive movement of a skeletal joint, graded and distinguished by positioning of the joint and velocity and amplitude of the movement. Within the spectrum of mobilizations, a high-velocity, low-amplitude thrust has several synonymous terms: manipulation, a grade V mobilization, or an adjustment. Multiple systematic reviews have looked at the evidence for joint mobilization, manipulation, or other manual therapies as a treatment of mechanical neck pain and come to slightly different conclusions. Mior⁶⁹ concluded that evidence is limited and that these therapies may or may not be effective. Gross and colleagues⁵⁶ in their Cochrane review concluded that mobilization or manipulation when used with exercise is beneficial, but when performed alone is not. The Bone and Joint Task Force⁵³ concluded that mobilization or exercise sessions alone or in combination with medications are beneficial in the short-term (6–13 weeks).

Several classes of oral medications are frequently used for chronic, mechanical neck pain, including nonsteroidal antiinflammatory drugs, muscle relaxants, opiates, antidepressants, and other analgesics. They all have limited evidence and unclear benefits.⁵⁷

Two systematic reviews of acupuncture^{53,58} reported moderate-quality or inconsistent evidence of benefit compared with sham controls.

Because of limited evidence, conclusions cannot be drawn about the effectiveness of massage,⁵⁹ and multiple investigators have concluded that passive modalities (transcutaneous electrical nerve stimulation, ultrasonography, diathermy, electrotherapy) are not associated with short-term or long-term pain or functional improvements.^{53,60}

Specifically for radiculopathy, traction has been advocated; it is intuitively believed to decrease pressure on the exiting spinal nerve. It is contraindicated in patients with significant or severe spondylosis, who have myelopathy, a positive Lhermitte sign, or

rheumatoid arthritis with atlantoaxial subluxation.⁷⁰ A recent Cochrane review⁶¹ found only one study deemed to have a low risk of bias and concluded that there was no evidence of benefit. Graham and colleagues⁶² also found few high-quality trials and concluded that there was no evidence of benefit to continuous traction and low-quality evidence for intermittent traction. Others have determined that poor methodological quality precludes any conclusions.^{4,63}

In a practice environment with a dearth of high-quality evidence, perhaps patient preference should strongly influence choice of therapy. Future research is critical.

Invasive Treatments

Steroid injections may be considered for radiculopathy, with evidence supporting short-term symptom improvement.^{54,71} For more significant manifestations of radiculopathy, steroid injections do not seem to decrease the rate of open surgery.⁵⁴ Zygapophyseal injections are a controversial therapy for mechanical neck pain (without radiculopathy) and are not endorsed by the Bone and Joint Task Force.⁵⁴

Surgery

For a detailed discussion of surgical outcomes, the reader is referred to the surgical literature. There is not convincing evidence to support the role of surgery in mechanical neck pain,⁵⁴ and there is wide variation in current practice with regards to who is referred for surgery.⁷²

For patients with severe or progressive radiculomyelopathy, surgery is appropriately considered.⁹

In the presence of mild to moderate radiculopathy, short-term outcomes of pain relief, decreased numbness, and weakness are better with surgery compared with conservative management, but that difference disappears with longer-term (1–2 year) follow-up.⁶⁴ In the presence of mild to moderate myelopathy, short-term benefits have been reported, but long-term follow-up (3 years) does not delineate benefits over conservative treatment.^{28,54,64}

MANAGEMENT

Mechanical neck pain is frequently a chronic or recurrent problem for individual patients. Regular follow-up with a provider should focus on vigilance for clues to underlying serious disease and monitoring for the onset or progression of radiculopathy or myelopathy. Conservative management is usually the recommended course, and various options were discussed earlier. Given the lack of evidence that one conservative management tool is superior to another,⁷³ patient preference and availability can figure prominently in the decision. Other pillars of chronic pain management also apply here, such as validating the patient's experience of pain, managing expectations of treatments, refocusing goals of treatment toward functionality, and treating comorbidities such as depression. Although it has not yet been validated in the literature,⁶⁵ considering a multidisciplinary approach seems reasonable.

SUMMARY/FUTURE CONSIDERATIONS

Future studies are needed to further understand the pathophysiology of mechanical neck pain. Robust scientific evidence is sparse on which noninvasive treatments are the most beneficial and how to better select patients for particular noninvasive or invasive treatments.

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