



SPINE HEALTH

A Pain in the Neck

ABSTRACT

Neck pain is common and disabling. Associated with poor posture, sedentary work and stress it is long lasting and recurrent. Most neck pain is mechanical from the structural elements within the cervical spine and can be referred to a number of remote locations. Radicular arm dominant pain is infrequent. Neck pain is diagnosed on history and confirmed with the physical examination. Routine imaging is inappropriate and the Canadian C-spine rules are recommended. Management focuses on education, range of movement exercises with associated postural improvement and strengthening exercises; neck braces should not be used.

KEYWORDS: cervical spine, neck pain, Canadian C-spine rules, range of movement, exercise



Neck pain is the fourth leading cause of disability worldwide.¹ With a lifetime prevalence of 71%, most adults can expect to experience an attack at some point during their lifetime.^{2,3} During any six-month period, 54% of adults suffer from neck pain and 4.6% experience important activity limitations.² The prevalence of neck pain peaks in middle age and it is more common in women.^{2,3} Every year, 213 per 1000 persons develop neck pain and 6 per 100,000 will experience a cervical spine disc herniation with radiculopathy.^{2,3} The risk factors for neck pain include genetics, poor psychological health and previous musculoskeletal pain.³



Dr. Hamilton Hall, MD, FRCSC, is a Professor in the Department of Surgery at the University of Toronto. He is the Medical Director, CBI Health Group and Executive Director of the Canadian Spine Society in Toronto, Ontario.



Greg McIntosh, MSc, completed his Masters in Epidemiology from the University of Toronto's Faculty of Medicine. He is currently the Director of Clinical Research for CBI Health Group and research consultant to the Canadian Spine Society.



Dr. Julia Alleyne, BHSc(PT), MD, CCFP, Dip. Sport Med MScCH, is a Family Physician practising Sport and Exercise Medicine at the Toronto Rehabilitation Institute, University Health Network. She is appointed at the University of Toronto, Department of Family and Community Medicine as an Associate Clinical Professor.



Dr. Pierre Côté, DC, PhD, Canada Research Chair in Disability Prevention and Rehabilitation; Associate Professor, Faculty of Health Sciences, University of Ontario Institute of Technology (UOIT); Director, UOIT-CMCC Centre for the Study of Disability Prevention and Rehabilitation.



Neck pain is also more likely to develop in individuals with high job demands, low social support at work, job insecurity, low physical capacity and sedentary work positions with poor work posture accentuated by poor ergonomic

THE RISK FACTORS FOR NECK PAIN INCLUDE GENETICS, POOR PSYCHOLOGICAL HEALTH AND PREVIOUS MUSCULOSKELETAL PAIN.

workplace design.⁴ There is no evidence that disc degeneration is a risk factor for neck pain.^{3,4}

The course of neck pain is marked by periods of remission and exacerbation.^{5,6} Contrary to common belief, most individuals with neck pain do not experience complete resolution of their symptoms and disability within the subsequent 12 months. The evidence suggest that if we follow a group of individuals with neck pain for one year, 36.6% will report complete resolution of their pain and disability and 32.7% will report marked improvement.⁵ However, 37.3% will report no change in their symptoms and 9.9% will experience an aggravation. In addition 23% of who completely recover from their pain and disability will experience a recurrence of their symptoms.⁵ A cervical disc herniation with radiculopa-

thy is relatively uncommon and most patients can expect substantial recovery within the first 4 to 6 months post-onset.⁷ Over time symptoms generally resolve completely without surgical intervention. Factors associated with a poor prognosis include older age, passive coping strategies and overall poor psychosocial health.⁶

While the great majority of neck pain is mechanical, arising from the bones, discs, ligaments or muscles of the spine, the potential origins of the pain are numerous and in most cases are probably multiple. The diagnosis is made on the history, confirmed on the physical examination and, when the cause is already suspected, supported by the images. Imaging shows a wide range of abnormalities that may or may not be causing symptoms.

There are significant anatomic differences between the cervical and lumbar spine that make comparisons between neck and low back pain problematic. While the intervertebral discs transmit approximately four fifths of the load in the lumbar area, more than half the weight carried by the cervical spine passes through the posterior elements. To increase mobility, the cervical facet joints do not interlock as they do on the lumbar vertebrae, but are flat, sloping plates that allow a greater degree of unrestricted movement. Stability comes from a massive



Neck Dominant Pain Distribution

Pain can be felt as a headache from **sub-occipital** to **retro-orbital** regions, as well as along **jawline**

Referred axial cervical pain can be most severe along the top of the **trapezius ridge**

Sub-occipital area

Pain can also be severe down the **medial border of the scapula**

Scapula

Trapezius

Pain can spread to the **upper left anterior chest** where it is called "**cervical angina**"



posterior ligament complex. The load bearing function of the cervical spine is more comparable to a suspension bridge than to a support column. The strong enlarged lateral masses running posterior to the small vertebral bodies contain

DIFFERENTIATING NECK DOMINANT PAIN FROM ARM DOMINANT PAIN MEANS DIFFERENTIATING REFERRED PAIN FROM RADICULAR PAIN.

foramina that conduct the vertebral arteries to the brain. Because of the smaller discs and correspondingly narrower disc spaces, adjacent vertebrae frequently develop well defined, direct articulations between the uncinata processes of the inferior segment and the lateral aspect of the bone above, the uncovertebral joints or joints of Luschka.

Neck pain is common but it is not always a pain in the neck. Differentiating neck dominant pain from arm dominant pain means differentiating referred pain from radicular pain. Radicular pain is pain arising from the direct involvement of a cervical nerve root, most frequently as the result of an acute disc herniation, and is felt along the course of the nerve. Referred pain originates from a painful structure within the cervical spine but hurts in a distant

location. This variability can lead to diagnostic confusion.

Mechanical neck pain can certainly occur in the back of the neck. But axial referred cervical pain can be also be most severe along the top of the trapezius ridge and is often confused with shoulder pain. It can spread down the medial border of the scapula where it may be mistaken for thoracic spine pain. Referred cervical pain can be felt as a headache anywhere from the suboccipital region to the retro-orbital area. It can be on one side of the head or be bilateral. The pain may radiate to the face along the jawline, often wrongly diagnosed as a temporomandibular joint problem. When the pain spreads to the upper-left anterior chest, it is labeled “cervical angina” and can lead to unnecessary investigation and anxiety about cardiac problems.⁸

Radicular arm dominant pain is most intense distal to the deltoid insertion, about halfway down the upper arm, and typically extends past the elbow to the forearm. Depending on the irritated root it may involve the thumb or fingers.

Normal cervical movement is a combination of flexion and protraction (sticking the chin forward) or extension and retraction (pulling the chin back). The physical examination tests both movements and records their effect on the typical pain. Other neck movements (rotation, side flexion) can be assessed as dictated by the clinical situation.



Increase in the typical arm dominant pain with axial compression while the neck is rotated and extended to the painful side (Spurling's test) is indicative of root irritation. Similarly, increased arm pain as the shoulder, elbow, wrist

NERVE ROOT CONDUCTION TESTS CAN BE CONFINED TO THE THREE MOST COMMONLY INVOLVED LEVELS, IN ORDER OF FREQUENCY C6, C7, C5.

and fingers of the painful arm are serially extended (the head is side flexed to the asymptomatic side) also suggests radicular pain from increasing root tension.

Nerve root conduction tests can be confined to the three most commonly involved levels, in order of frequency C6, C7, C5. There are a number of possible examinations but it may be sufficient to screen with one well-performed manoeuvre for each level: biceps strength evaluates C6, triceps power judges C7 and shoulder abduction assesses C5.

The physical examination must include careful consideration of upper motor involvement, an indication of cervical myelopathy. Findings can include weakness in the legs as well as the arms, sensory alterations in the lower limbs, loss of fine motor control in the hands and a spastic gait. A positive

Hoffman's sign (recurring flexion of the thumb into the palm as the distal interphalangeal joint of the middle finger is rapidly, repeatedly, passively flexed) indicates possible spinal cord involvement. So does an abnormal plantar response (upgoing great toe and fanning of the other toes). Sustained clonus and hyper-reflexia are additional findings of upper motor involvement.¹¹

The shoulder joint should be cleared to confirm that the symptoms are from the neck. Pain over the lateral deltoid, rather than along the trapezius, strongly indicates the shoulder. Typical pain produced with shoulder abduction, forward flexion and internal rotation is more likely to arise in the joint than in the cervical spine.

Although the risk of a more sinister cause of neck pain is extremely low, non-mechanical possibilities must be considered (Table 1).

The Canadian C-Spine Rules were developed to support clinical decision making in the Emergency Room when assessing stable patients presenting with neck pain.¹² The rules are highly sensitive (100%) and based on three important clinical questions, which are equally applicable to office based practice. The first question is: Are there any high risk factors for trauma (i.e. trauma in a person over 65 years, dangerous mechanism, or paresthesias in extremities)? The second question is: Are there any low-risk factors



present that allow safe assessment of range of motion (i.e. simple rear-end motor vehicle collision, sitting position in the Emergency Department, ambulatory at any time since injury, delayed onset of neck pain, or absence of midline C-spine tenderness)? This question is very relevant to primary care assessment because it allows the practitioner to also reassure the patient that their neck pain is low risk for a serious pathology and assists the clinician in ruling out red flags. The third question is: Is the patient able to actively rotate their neck 45 degrees to the left and right? This manoeuver is only attempted once the clinician has established with questions 1 and 2 that the risk

Table 2: Canadian C-Spine Rules

1. Are there high risk factors for trauma?
2. Are there low risk factors that allow safe assessment of range of motion?
3. Is the patient able to actively rotate their neck 45 degrees bilaterally?

of serious pathology is low. Question 3 allows the clinician to proceed with a key examination that further rules out serious pathology. With these three questions, the clinician can eliminate the need for an x-ray to rule out pathology (Table 2).

The correlation between degenerative changes seen on x-ray and neck pain is tenuous at best and

Table 1: Risk factors of serious pathology (red flags) for neck pain:

Possible cause	Risk factors of serious pathology identified during history or physical examination*
Fracture/dislocation	<ul style="list-style-type: none"> • Positive Canadian C-spine rules
Cancer	<ul style="list-style-type: none"> • History of cancer • Unexplained weight loss • Nocturnal pain • Age > 50
Vertebral infection	<ul style="list-style-type: none"> • Fever • Intravenous drug use • Recent infection
Osteoporotic fractures	<ul style="list-style-type: none"> • History of osteoporosis • Use of corticosteroid • Older age
Carotid/vertebral artery dissection	<ul style="list-style-type: none"> • Sudden and intense onset of headache or neck pain
Brain haemorrhage/mass lesion	<ul style="list-style-type: none"> • Sudden and intense onset of headache
Inflammatory arthritis	<ul style="list-style-type: none"> • Morning stiffness • Swelling in multiple joints

(This list of risk factors of serious pathology was informed from the following peer reviewed articles: Chou et al; Downie et al; Nordin et al).⁹⁻¹¹





SUMMARY OF KEY POINTS

Most neck pain is benign mechanical pain and serious pathology is uncommon.

Neck pain is longer lasting and more disabling than generally recognized.

Referred neck pain can be felt on top the shoulders, between the shoulder blades, along the jaw, in the front of the chest and as a headache.

Nerve root involvement is unusual but when it occurs typically affects C5, C6 or C7.

Routine imaging is unproductive.

Management is based on education, range of movement exercises and strengthening.

offers no indication as to the intensity or location of the symptoms.^{3,4} From the low back literature, we have evidence that unnecessary imaging leads to greater patient anxiety and can create disability by labelling the patient with a degenerative condition that is often asymptomatic.¹³

If your patient has a red flag identified on history then imaging may be necessary but the clinician should be selective about the type of test, selecting the best image for a particular structure or specific pathology. For example, a bone scan can be very sensitive for systemic inflammatory changes, tumours and early osteoporotic fractures that are not apparent on plain x-ray or MRI. Images may assist prognosis in peripheral joints but in neck dominant pain where the risk of serious pathology is low and the rate of false positive finding is high, they offer no added benefit to management.

Mechanical neck dominant pain is best treated with a combination of structured education and range of movement exercises.^{14,15} The patient needs to understand the benign nature of the pain and to be reassured about the favourable prognosis. This can be challenging in the presence of intense neck pain. Maintaining as much normal activity as possible is a significant treatment goal. This can be aided by a brief multi-modal program of stretching exercises, postural correction and manual therapy.¹⁶ A structured education program and active mobility exercises are appropriate to address postural dynamics as they pertain to activity management.

Best practice suggests that postural alteration alone is not effective but improving the head-neck-shoulder position as part of a combined approach is important in reducing mechanical neck pain. Sitting hunched forward with the



head protruded and the shoulders slumped forward will exacerbate the episode. The further the head is pushed forward of the plane of the shoulders the greater the load on the neck and the probability of pain.¹⁷ Postural correction begins in the lumbar spine.¹⁸ Sitting usually flexes the entire spine and the loss of lumbar lordosis accentuates the normal kyphosis of the thoracic spine.¹⁹ This increases both the head forward protracted posture and the neck pain.²⁰

Restoring the curve in the low back, with a lumbar roll for example, allows increased head/neck retraction and improved balance of the head-neck-shoulder axis.¹⁸ Computer screens should be adjusted so that the top of the screen is at eye-level while sitting upright; this will minimize neck flexion and the unwanted head-forward position. Laptop computers should be positioned on a desk or table and not actually in the lap.

A short course of a muscle relaxant such as cyclobenzaprine

may have a beneficial analgesic effect for patients with severe pain and spasm and when the pain interferes with sleep.¹⁶ The chemical structure and the effects of these drugs are very similar to the tricyclics like amitriptyline. They are more “people relaxants” than “muscle relaxants” and should be used accordingly. Side effects include dry mouth, constipation, urinary retention and sedation. Nighttime use is recommended if the symptoms are sufficiently severe. Daytime use requires caution; there is a risk of overuse.

Surprisingly there is no evidence to support the use of NSAIDs.²¹ Narcotics should be avoided. Studies suggest that opioids are not only ineffective and fail to improve function but that their use may actually be harmful.²²

In the acutely painful early stages pain control may be entirely postural, frequently in a supine position. Finding the best pain relieving position is a matter of experimentation and the patient



CLINICAL PEARLS

A careful history to locate the site of the dominant symptoms and a physical examination to assess posture and rule out radiculopathy will identify common mechanical neck pain.

The need for an x-ray should be based on the Canadian C spine rules.

Improving mechanical neck pain starts with educating the patient about the favourable prognosis and increasing the range of neck movement: a cervical collar is contraindicated.





CME

Post-test Quiz

Members of the College of Family Physicians of Canada may claim MAINPRO-M2 Credits for this unaccredited educational program.

must understand that the unsuccessful attempts do not cause harm. Education about the benign but recurrent nature of the problem is indispensable. As soon as the symptoms allow (and generally sooner than the patient wishes) treatment should include movement and gentle exercise to increase the range of motion.

Avoid the use of a neck brace.²³ Prolonging cervical immobility hinders pain control and hampers functional recovery. There has been no evidence that cervical collars are beneficial to recovery or pain control but they can lead to dependency and loss of strength. Modalities such as heat or massage may be useful but need to be combined with the active approach.

Exercise progression is based primarily on patient response. Satisfactory pain control is maintained with the posture adjustments and techniques developed in the acute phase while the patient progresses to strengthening and general fitness routines.²⁴ Core exercises provide the strength to help maintain proper sitting posture. Routines to increase the strength and endurance of the supporting neck musculature are often required; they frequently include machine, free weigh or resistance training. Continuing a regular fitness routine may help reduce the frequency or severity of recurrences.²⁵ But on a more fundamental level patients who take responsibility and actively

participate in their own management have the best results.

References

1. Vos T, Flaxman AD, Naghavi M, Lozano R, Michaud C, Ezzati M et al. Years lived with disability (YLD's) for 1160 sequelae of 289 diseases and injuries 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet*. 2012;380:2163-96.
2. Côté P, Cassidy JD, Carroll LJ. The Saskatchewan health and back pain survey. The prevalence of neck pain and related disability in Saskatchewan adults. *Spine*. 1998;23:1689-98.
3. Hogg-Johnson S, van der Velde G, Carroll LJ, Holm LW, Cassidy JD, Guzman J et al. The Burden and Determinants of Neck Pain in the General Population: Results of the Bone and Joint Decade 2000-2010 Task Force on Neck Pain. *Spine*. 2008;33(Suppl):S39-S51.
4. Côté P, van der Velde G, Cassidy JD, Carroll LJ, Hogg-Johnson S, Holm LW, et al. The burden and determinants of neck pain in workers: results of the Bone and Joint Decade 2000-2010 Task Force on Neck Pain and Its Associated Disorders. *Spine*. 2008;33(Suppl):S60-74.
5. Côté P, Cassidy JD, Carroll LJ, Kristman V. The annual incidence and course of neck pain in the general population: a population-based cohort study. *Pain*. 2004;112:267-73.
6. Carroll LJ, Hogg-Johnson S, van der Velde G, Haldeman, S, Holm LW, Carragee EJ, Hurwitz EL, Côté P, Nordin M, Peloso PM, Guzman J, Cassidy JD. Course and prognostic factors for neck pain in the general population. Results of the Bone and Joint Decade 2000-2010 Task Force on Neck Pain and its Associated Disorders. *Spine*. 2008; 33 (45): S75-S82.
7. Wong JJ, Côté P, Quesnele J, Stern P, Mior SA. Systematic review on course and prognostic factors of symptomatic cervical disc herniation with radiculopathy. *The Spine Journal*. 2014;14:1781-1789.
8. Wells P. Cervical angina. *American Family Physician*. 55 (6): 2262-2264, 1997.
9. Chou R, Qaseem A, Snow S, Casey D, Cross JT, Shekelle P, Owens DK for the Clinical Efficacy Assessment Subcommittee of the American College of Physicians and the American College of Physicians/American Pain Society Low Back Pain Guidelines Panel. Diagnosis and Treatment of Low Back Pain: A Joint Clinical Practice Guideline from the American College of Physicians and the American Pain Society. *Ann Intern Med*. 2007;147: 478-491.
10. Downie A, Williams CM, Henschke N, Hancock MJ, Ostelo RWJG, de Vet HC, Macaskill P, Irwig L, van Tulder MW, Koes BW, Maher CG. Red flags to screen for malignancy and fracture in patients with low back pain: systematic review. *BMJ* 2013;347:f7095 doi: 10.1136/bmj.f7095); 75.
11. Nordin M, Carragee, EJ, Hogg-Johnson S, Schechter Weiner S, Hurwitz EL, Peloso PM, Guzman J, van der Velde G, Carroll LJ, Holm LW, Côté P, Cassidy JD, Haldeman S. Assessment of neck pain and its associated disorders. Results of the Bone and Joint Decade 2000-2010 Task Force on Neck Pain and its Associated Disorders. *Spine*. 2008; 33 (45): S101-S122.



12. Stiell et al. The Canadian C-Spine Rule for Radiography in Alert and Stable Trauma Patients. *JAMA*. 2001;286(15):1841-1848. doi:10.1001/jama.286.15.1841.
13. Webster BS, Bauer AZ, Choi Y, Cifuentes M, Pransky GS. Iatrogenic Consequences of Early Magnetic Resonance Imaging in Acute, Work-Related, Disabling Low Back Pain. *Spine* 2013; 38(22): 1939-46.
14. Hainan Y, Côté P, Southerst D, Wong JJ, Varatharajan S, Shearer HM et al. Does structured patient education improve the recovery and clinical outcomes of patients with neck pain? A systematic review from the Ontario Protocol for Traffic Injury Management (OPTIMA) Collaboration. *The Spine Journal* in press
15. Southerst D, Nordin MC, Côté P, Shearer HM, Varatharajan S, et al. Is exercise effective for the management of neck pain and associated disorders or whiplash-associated disorders? A systematic review by the Ontario Protocol for Traffic Injury Management (OPTIMA) Collaboration. *The Spine Journal* in press
16. Sutton DA, Côté P, Wong JJ, Varatharajan S, Randhawa KA, et al. Is multimodal care effective for the management of patients with whiplash-associated disorders or neck pain and associated disorders? A systematic review by the Ontario Protocol for Traffic Injury Management (OPTIMA) Collaboration. *The Spine Journal* in press
17. Yip CHT, Chiu TTW, Poon ATK. The relationship between head posture and severity and disability of patients with neck pain. *Manual Therapy*. 13 (2):148-154, 2008.
18. Horton SJ, Johnson GM, Skinner MA. Changes in head and neck posture using an office chair with and without lumbar roll support. *Spine*. 35 (12):E542-E548, 2010.
19. Edmondston SJ, Sharp M, Symes A et al. Changes in mechanical load and extensor muscle activity in the cervico-thoracic spine induced by sitting posture modification. *Ergonomics*. 54 (2):179-186, 2011.
20. Mork PJ, Westgaard RH. The influence of body posture, arm movement, and work stress on trapezius activity during computer work. *European Journal of Applied Physiology*. 101 (4):445-456, 2007.
21. Roelofs PD, Deyo RA, Koes BW, et al. Non-steroidal anti-inflammatory drugs for low back pain. In: *The Cochrane Library*, Issue 4, 2009. Chichester, UK: John Wiley & Sons, Ltd. Search date 2007.
22. Chou R et al., The effectiveness and risks of long-term opioid treatment of chronic pain, Agency for Healthcare Quality and Research Evidence Report #218, AHRQ Publication No. 14-E005-EF, September 2014; www.effectivehealthcare.ahrq.gov/ehc/products/557/1971/chronic-pain-opioid-treatment-report-140929.pdf.
23. Kongsted A, Qerama E, Kasch H et al. Neck collar, "act-as-usual" or active mobilization for whiplash injury?: A randomized parallel-group trial. *Spine*. 32 (6):618-626, 2007.
24. Kay TM, Gross A, Goldsmith C et al. Cervical Exercises for mechanical neck disorders. Update in *Cochrane Database Syst Rev*. 2012;8:CD004250; PMID: 22895940.
25. Dumancic AM, Morovic S, Sudarevic DB et al. How to help prevent neck pain caused by posture. *Acta Clinica Croatica*, Supplement. Conference: 53rd International Neuropsychiatric Pula Congress, Pula Croatia. 52:64, 2013.

