NECK PAIN/STRAIN –
EVALUATION AND TREATMENT

Background
1. Definition: a nonspecific term including a group of diagnoses consisting of pain in the neck region resulting from mechanical injury to cervical anatomic structures.
   - Structures include the cervical vertebrae (C1-C7), cervical paraspinal muscles and muscles of the anterior neck, and associated ligaments.
2. General Information: A classification system for neck pain was established in 2007 by a multidisciplinary task force to better guide assessment and intervention
   - Grade I: No signs of major pathology; little impact on daily activity
   - Grade II: No signs of major pathology; may impact daily activity
   - Grade III: Neck pain with neurological signs or symptoms
   - Grade IV: Neck pain with major pathology
   Patients with Grade IV pain should be evaluated emergently for suspected condition.

Pathophysiology
1. Etiology of disease:
   - Acute
     - Injury causing mechanical stress to anatomic structures.
     - Structures strained beyond physiologic/anatomic barriers.
   - Chronic
     - Previous acute injury without healing.
     - Repetitive microtrauma to anatomic structures.
2. Pathology of disease:
   - Muscle strain/ligament sprain result in microvascular bleeding/ irreversible cell damage.
   - Tissue necrosis/inflammatory response follow.
   - Tissue remodeling then occurs with formation of scar tissue.
   - Soft tissue damage (particularly the alar ligaments) has been demonstrated by MRI in patients 6 years post whiplash injury
   - Sensitization and hyperstimulation of peripheral nerves can decrease threshold for pain in chronically affected tissue.
3. Incidence, Prevalence:
   - 66% of all people will experience neck pain in their lives
   - In any given year, 30-50% of adults experience neck pain
   - Prevalence of neck pain highest in middle age
4. Risk Factors:
   - Trauma: sports injury, MVA
   - Everyday life: poor posture, sleeping position, nature of work (maintaining non-neutral positioning for long periods of time), depression and anxiety, neck strain
   - Middle age
   - Risk factors predisposing to chronic neck pain
     - Age >40
     - coexisting low back pain
     - long history of neck pain
     - bicycling as regular activity
Risk factors identified for whiplash-associated disorder (WAD)⁶
- female
- rear collision
- prior history of neck pain
- younger age
- stationary vehicle
- severity of collision
- not being at fault
- monotonous work
- Female Sex and rear end collision are the 2 most consistent predictors of neck pain post motor vehicle accident⁶

4. Morbidity:
- Chronic tension headaches, upper back muscle spasm, psychosocial stress
- Accounts for lost work time equal to low back pain in some industries³
- Causes severe disability in 5% of affected people³

Diagnostics
1. Goal: Exclusion of major pathology or injury requiring emergent care. See Differential Diagnosis.
2. History
   - CC: pain, stiffness, tightness in upper back or neck
   - HPI:
     - movement and activity typically make pain worse
     - rest usually provides some relief
     - quality of pain can be sharp/stabbing if acute; or dull/aching if onset is insidious
     - absence of radiating pain. Presence suggests neurological involvement and is discussed elsewhere.
     - onset, duration, and frequency of pain can vary depending on nature of injury
     - recommended to use validated self-report questionnaires (i.e. Neck Disability Index or Patient-Specific Function Scale) to identify baseline pain, function, disability⁵
3. Physical Examination:
   - Observe general movement and resting posture
   - Inconsistency throughout exam may suggest malingering
   - Assess range of motion in all 3 planes of motion (normal values)
     - flexion/extension (60°/75°)
     - lateral flexion (45°)
     - rotation (90°)
     - decreased range of motion is single best predictor of long-term handicap in patients with acute whiplash injury⁷
   - Palpate major muscle groups and bony structures for tenderness indicating involved tissue
     - cervical paraspinal muscles, upper trapezius, sternocleidomastoids
     - spinous processes of C1-C7
articular pillars of C1-C7
nuchal ligament

- Neurological exam of bilateral upper extremities, including muscle strength, muscle tone, reflexes, sensation
  - Abnormal findings here would suggest neurological involvement
  See also Cervical Nerve Root Compression

- Special tests to rule out nerve root compression should be negative
  See also Cervical Nerve Root Compression
  - Spurling's test
  - Cervical Distraction test
  - Upper limb tension test

4. Diagnostic Testing:
   - Imaging: Patients with history of acute trauma and Grade III/IV Whiplash associated injury should undergo radiographic imaging unless cleared per Canadian C-Spine criteria (SOR:A)¹⁸
     - Choice of plain films, CT, or MRI based on suspected injured structures
     See also C-Spine Imaging
     - For uncomplicated neck pain < 4 weeks duration, radiography not initially indicated ²⁹
     - Radiography indicated in patients who fail 4-6 weeks of conservative care ²⁹
     - Radiography indicated in patients with "red flags" ²⁹
       - age <20 or >50
       - non-mechanical pain
       - neck rigidity in the sagittal plane in the absence of trauma
       - dysphasia
       - CNS signs/symptoms
       - arm or leg pain with neck movement
       - sudden onset and/or associate headache
       - History of severe trauma
       - suspected cervical compression myelopathy
       - MRI indicated in suspicion of myelopathy, neoplasm, or infection, radicular symptoms with motor deficits; or radicular symptoms persisting after 6-8 weeks of conservative treatment (SOR:B) ²⁹

Differential Diagnoses

Key Differential Diagnoses:
- Musculoskeletal: vertebral fracture, disc herniation, osteoarthritis, foraminal stenosis
- Neurological: cervical myelopathy, radiculopathy
- Infectious: discitis, meningitis, influenza
- Psychosomatic: depression, fibromyalgia, malingering

Extensive Differential Diagnoses:
- Musculoskeletal: myositis, osteomyelitis, neoplasm, diffuse skeletal hyperostosis
- Neurological: multiple sclerosis, syringomyelia
- Infectious: abscess
- Psychosomatic: Munchhausen’s syndrome
- Rheumatological: rheumatoid arthritis, ankylosing spondylitis, polymyalgia
Therapeutics
1. Goals of treatment:
   o Reduce pain / muscle irritation / muscle spasm
   o Reestablish normal cervical lordosis and range of motion
   o Restore function
   o Coordinated multidisciplinary management approach associated with quicker resolution in whiplash patients

2. Acute Treatment:
   o Posture modification:
     - Avoid slouching, carrying heavy bags over shoulders
     - Adjust sleep position with neutral head and neck position and support
     - Limit strenuous neck rotation movements, and extended time spent driving, reading, or watching TV
   o Pharmacologic:
     - Acetaminophen 2-4 g per day as first line of therapy (SOR:A)
     - NSAIDS: COX-2 specific or non-specific depending on patient tolerability (SOR:A)
     - iii. Muscle relaxants:
       - cyclobenzaprine 10-30 mg per day most effective in first 4 days post acute injury (SOR:B)
       - adding cyclobenzaprine to high-dose ibuprofen does not provide additional pain relief for minor trauma
       - cyclobenzaprine associated with greater prevalence of neurologic side effects
     - Opiods: short term use effective for moderate-severe pain when benefit outweighs risks (SOR:A)
   o Exercise:
     - Early return to normal activity (SOR:B)
     - Supervised exercise (SOR:B)
     - Strengthening vs. endurance exercise showed no difference in clinical outcomes
   o Mobilization/Manipulation:
     - Provide short term benefit
     - 9-12 sessions of cervical manipulation shown to be superior to 3 sessions for cervicogenic headache
     - Single session of thoracic manipulation as additional therapy showed increased function and immediate pain reduction compared to placebo [NNT=5-7]
   o Passive Treatment (i.e. Patient not actively involved in exercises or activities)
     - Most passive treatments were not more effective than placebo or no treatment including:
       - Ultrasound
       - E-stim
       - rest
       - middle frequency electrotherapy and iontophoresis
       - use of patient information sheets
     - Pulsed electromagnetic therapy was better than placebo at decreasing pain levels
1. Low level laser therapy and magnetic stimulation were associated with improved function and decreased pain at 10-12 weeks.  
   - Immobilization  
     - Cervical collars: no evidence of effectiveness; may prove to be detrimental to proper return to function  
     - Use longer than 3 days likely prolongs disability

3. Long-Term Care:  
   - Physical therapy:  
     - Supervised proprioceptive and therapeutic exercise program recommended as beneficial for pain and function (SOR:A)  
     - Multimodal exercise with mobilization and manipulation showed strongest evidence of benefit; [NNT = 4 to 5]
   - Pharmacologic:  
     - Antidepressants and anticonvulsants are supported for chronic and neuropathic pain, especially in patients with concomitant depression (SOR:A)  
     - Daily orphenadrine and paracetamol associated with greater pain reduction in first 8 days  
     - Corticosteroid injections: not associated with greater pain reduction/recovery
   - Modalities:  
     - Pulsed electromagnetic field therapy (SOR:B)  
     - Acupuncture: beneficial and cost effective for chronic neck pain (SOR:A)  
     - Percutaneous neuromodulation therapy: associated with immediate post-treatment decrease in pain, better sleep, and more physical activity after 3 weeks  
     - Mechanical cervical traction (continuous or intermittent) shows no statistically significant evidence of decreased pain or increased function

4. Course of Care – no evidence that particular course of care (longer/shorter, early/late) with any one or combination of non-invasive interventions associated with better prognosis

Follow-Up  
1. Return to Office:  
   - Follow-up in office no later than 4-6 weeks for re-evaluation If no improvement, diagnostic studies may be indicated.  
     - WAD  
       - More frequent follow-up at 1 week, 3 weeks, 6 weeks for WAD indicated if pain persists or worsens  
   - Reductions in treatments should be occurring by 6 weeks if pain / symptoms resolving (30% of cases)  
   - Resolution 50% by 3-month assessment; continue treatment if still improving

2. Refer to Specialist: if unable to efficiently manage pain and multimodal exercise therapy program ineffective

3. Consider hospital admission if signs of major pathology develop:  
   - Fever, chills, headache  
   - Signs of cervical nerve root compression  
     - Paresthesias with neck movement  
     - Focal deficits
Prognosis
1. Most people do not experience complete resolution of symptoms\(^4\)
2. Between 50-85\% will experience some persistent pain at 1 year\(^4,19\)
3. Level of expectations for recovery is important factor for prognosis\(^20\)
4. Predictors of poor prognosis
   - middle age\(^4\)
   - self-reported symptom severity\(^4,19\)
   - regular bicycling\(^4\)
   - prior pain/injuries and poor health\(^4\)
   - psychological distress and passive coping techniques\(^19\)
   - unemployment\(^4\)
5. Predictors of better prognosis\(^4\)
   - young age
   - better psychological health and good social support
6. Broad occupation type is important in prognosis\(^21\)
   - white collar workers recovered quicker than blue collar workers
   - military officers recovered quicker than enlisted troops after cervical disc surgery
   - female seamstresses and factory workers recovered quicker after changing jobs

Prevention
1. There is no evidence showing that any interventions are associated with prevention of neck pain\(^10\)
2. Physical training and stress management specifically show no association with prevention\(^10\)

Patient Education
1. Neck pain algorithm from AAFP

References
8. Douglass, A, Bope, E. Evaluation and treatment of posterior neck pain in family
musculoskeletal complaints in adults-an evidence-based approach-Part 3: spinal
Bone and Joint Decade 200-2010 Task Force on Neck Pain and Its Associated
11. Pain in the neck and arm: a multicentre trial of the effects of physiotherapy, arranged
12. Turturro, MA, Frater, CR, D'Amico, FJ. Cyclobenzaprine with ibuprofen versus
ibuprofen alone in acute myofascial strain: a randomized, double-blind clinical trial.
Systematic Reviews. 2010; 1(CD004249).
Systematic Reviews. 2007; 2(CD003338).
15. Ebell, M. Cochrane Briefs: Exercises for mechanical neck disorders. Am Fam
Cochrane Database of Systematic Reviews. 2008; 3(CD006408).
associated disorders. Sacramento (CA): International Chiropractors Association of
disorders (WAD): results of the Bone and Joint Decade 2000-2010 Task Force on Neck
20. Holm, LW, et al. Expectations for recovery important in the prognosis of whiplash
Bone and Joint Decade 2000-2010 Task Force on Neck Pain and Its Associated

Author: Nick Ruppel, MD, Puget Sound FM Naval Hospital, WA

Editor: James Haynes, MD, USAF Eglin FMR, FL