

Evaluation of Cervicalgia With Headache

Know how to find the cause of neck pain to establish a specific diagnosis and expedite treatment.

By Jeffrey Gehret, DO, Sanjay Yadla, MD, John K. Ratliff, MD, and Steven Mandel, MD

Delineation of neck pain can be difficult due to the number of potential pain generators in the head and neck region that have similar referral patterns. Overlapping pain patterns often lead to misdiagnosis. Pain may be multifactorial in this area, especially in the aging patient with degenerative disease in multiple joints.

Cervicogenic headache describes pain referred to the head from a source in the cervical spine.¹ The diagnosis of this disorder is controversial. Some authorities believe that clinical criteria alone are sufficient, while others, including the International Headache Society, require confirmatory tests to establish the diagnosis.¹ A multidisciplinary approach is often required to adequately manage this disorder. A thorough history and physical examination of the neck and occipital region coupled with appropriate diagnostic testing can help to provide an accurate diagnosis of the pain generator or generators.

The following review will examine the differential diagnosis and outline a diagnostic approach for potentially confusing cervical pain syndromes accompanied by headache. It is also aimed at prompting further consultation with an experienced non-operative musculoskeletal specialist or spinal surgeon. With practice and a systematic approach, most physicians can become proficient in the diagnosis of more common neck and headache problems. Further discussion focuses on associated disorders including whiplash associated disorders, a common cause of cervicogenic headache and the largest cause of disability after motor vehicle accidents for employees with neck pain.²

Epidemiology, Classification, and Pathophysiology

As described, neck pain and tenderness are common symptoms present in many headache disorders. When cervical dysfunction or degenerative changes cause headache, it is referred to as cervicogenic headache. Cervicogenic headache prevalence is estimated at 0.5 to four percent, but may be as high as 20 percent of patients presenting with severe chronic headaches. Up to 50 percent of patients have a history of migraine or tension-type headache.^{8,9} The mean age of patients with this condition is 43 years; the condition is more common in women.¹⁰

The International Headache Society defines diagnostic criteria for cervicogenic headache (Table 1). The most useful clinical features are pain that radiates from the neck to the fronto-temporal region and pain that is reproduced with neck movements.^{11,12} The diagnostic criteria may help distinguish between cervicogenic headache and migraine symptoms, especially when a history of neck trauma is present. Approximately 30 percent of cervicogenic headache patients present with a history of neck trauma.^{13,36,37}

The mechanism of pain referral is thought to be a convergence of input of cervical and trigeminal afferents in the trigeminocervical nucleus. Cervical afferents include the C1-C3 spinal nerves and explain upper cervical pain referred to the occipital and parietal regions. The trigeminal nerve afferents would allow for referral into the face and head regions.^{14,15}

The most common source of cervicogenic headache is degenerative changes involving the upper cervical facet joints.¹ Cervical facet joints have been shown by many authors to be a source of neck pain and headache.^{16,17} Zygoapophysial joint pain is the most common cause of chronic neck pain after whiplash

Table 1: IHS diagnostic criteria for cervicogenic headache.⁷

Grade	Criteria
A	Pain referred from a source in the neck and felt in one or more regions of the head and/or face, fulfilling criteria C and D
B	Clinical laboratory and/or imaging evidence of a disorder or lesion within the cervical spine or soft tissues of the neck known to be, or generally accepted as a valid cause of headache
C	Evidence that the pain can be attributed to the neck disorder or lesion based on at least one of the following: 1) evidence of clinical signs that implicate a source of pain in the neck, or 2.) abolition of headache after diagnostic blockade of a cervical structure or its nerve supply with placebo or adequate controls
D	Pain resolves within 3 months after successful treatment of the causative disorder or lesion

injury.^{18,19} Carefully performed anesthetic blocks of the medial branches of the cervical dorsal primary ramus are a specific and sensitive test for the diagnosis of facet joint pain.^{20,34} Each cervical facet joint below C2-C3 is supplied by the medial branch of the dorsal ramus above and below. The C2-C3 facet joint differs in that it is supplied by the third occipital nerve and a small branch from the greater occipital nerve.²¹ The C3-C8 medial branches curve around the articular pillar of the same numbered vertebrae. While the atlanto-occipital and C1-C2 are diarthrodial joints, like facet joints, they differ in that they are located anterior to the facet joint line, are innervated by the C1 and C2 anterior ramus respectively, and their spinal nerves exit posterior to the joint.^{16,22}

Studies have demonstrated that the distention of asymptomatic and symptomatic cervical facet joints with non-ionic contrast medium may provoke neck pain and referred pain. Stimulation of the C2-C3 facet joint provokes occipital head pain, stimulation of the C4-C5 through C6-C7 provokes shoulder pain, and stimulation of the C7-T1 facet joint provokes interscapular pain.²³ Studies have demonstrated that provocation of the first cervical joint provides a variable referral pattern and C1-C2 joint consistently refers pain to the occiput.^{16,22,24}

Initial Evaluation and Differential Diagnoses

A thorough history and physical must be performed to discern which structure is responsible for the pain. The quality of the pain must be assessed. Location of the pain and the presence or absence of paresthesias and weakness must be ascertained. Provocative and alleviating features must also be assessed. Any radiographic studies that are ordered must be evaluated in tandem with the history and physical exam and never in isolation. A detailed history and physical exam by the informed clinician as well as proper imaging studies, when appropriate, can help to confirm or reject alternative diagnoses.

The differential diagnosis of neck and posterior head pain is extensive and includes conditions such as spinal fractures and dislocations, intervertebral disk herniations, radiculopathy, internal disc derangements, cervical spondylosis, cervical spinal stenosis, myofascial pain, and zygapophyseal joint dysfunction. Intra- and extraarticular shoulder pathology can cause neck pain as well as pain into the proximal arm. Syringomyelia, Chiari malformations and posterior fossa tumors may present with similar signs and symptoms as cervicogenic headache. Visceral pathology can result in headache, neck and shoulder pain as well. The most critical diagnosis of neck pain with headache is dissecting aneurysms of the vertebral or carotid arteries.^{3,5}

Pain secondary to neck pathology can result in neck pain and headache and less commonly, pain into the shoulders and low back.⁵ Pain is achy more than sharp and is worse with movement. Causes of cervical spine pathology include osteoarthritis and rheumatologic disorders including rheumatoid arthritis, the seronegative arthropathies (including ankylosing spondylitis, Reiter Syndrome, inflammatory bowel disease and psoriatic arthritis) as well as systemic lupus erythematosus, diffuse idiopathic skeletal hyperostosis, and thyroid dysfunction. Morning stiffness from osteoarthritis often resolves after 15 minutes, while stiffness related to rheumatoid arthritis may persist for an hour or more. A full review of systems must be performed to look for other manifestations of these systemic disorders. Trauma can result in fractures and ligamentous tears. Fractures of the cervical spine present with neck pain,

often exacerbated by activity and sometimes reproduced with palpation.

Visceral pathology must be ruled out; dissecting aneurysms of the vertebral or carotid arteries can present with neck pain and headache.^{3,4} Pancoast tumor can present with pain into the neck and radiating into the ulnar nerve distribution. Myocardial ischemia can radiate pain into the head and neck. The presence of constitutional symptoms must prompt a work-up to rule out serious infection such as meningitis or malignancy.

Vertebral compression fractures are more commonly seen in the thoracic and lumbar spines but can be a cause of neck pain, especially in the elderly. Medical history may include long-term steroid use, osteoporosis or malignancy. Pain can radiate into the head, shoulder or extremity if the fracture is into the endplate or projects near the nerve root. Cervical spine tumors and infection may occur in patients who are immunocompromised or have a history of another infectious site.

Red flags indicating spinal malignancy include night pain, pain at rest, intermittent fevers, weight loss, and/or history of prior malignancy.³² Any of these symptoms should prompt immediate imaging and referral to a specialist.

Chiari malformation is a downward displacement of the cerebellar vermis and tonsils through the foramen magnum. The brainstem, cranial nerves, and cerebellum may be compressed and symptoms related to the compression may occur. Headaches may develop in these patients. Chiari-associated headaches are classically protracted, suboccipital-occipital headaches of variable duration that are aggravated by Valsalva maneuvers, cough, or postural changes.⁶ The headaches may be relieved with suboccipital decompression, although observational therapy is also often appropriate. Migraine and tension-type headaches occur in these patients as well, but at a rate equal to the general population.⁶

Patients with a primary complaint of headache need a thorough evaluation to establish a history consistent with neck pathology. Further evaluation of overall psychological health and presence of emotional stress can help establish a headache cause. Migraine,

tension-type, cluster headaches, and hemicrania continua are less serious but common causes of headache involving the posterior head and neck and may present with unilateral occipital pain. Migraine headaches generally respond to vasoactive medications. Tension-type headaches less commonly have occipital pain or are worsened with neck range of motion.⁷

Physical Examination

Examination of the spine and neck should begin with inspection and palpation of the cervical spine and occiput. Cranial nerves should be evaluated for asymmetry. Skin should be inspected initially. Café au lait spots and neurofibromas can be seen in neurofibromatosis. A papulovesicular rash in a dermatomal pattern may be seen with shingles (herpes zoster). Pain may precede the rash. Inspect the cervical curvature in the lateral and anterior-posterior planes. Many patients with cervicogenic headache have altered neck posture and restricted cervical range of motion. There are six ranges of motions in the neck. They are flexion, extension, bilateral sidebending to approximately 45°, and bilateral rotation to approximately 80°. This may be performed actively by the patient or passively by the physician. Inspect from the side and look for loss of the normal cervical lordosis. Palpation of the spinous processes of the cervical spine may reveal tenderness in patients with fracture. The pattern of the pain and the movement that provokes the pain should be noted to help establish the diagnosis as well as the therapeutic exercise program if therapeutic intervention is indicated. Look for shoulder asymmetry while the patient is standing. Observe the movement patterns. Also evaluate for signs of scoliosis and note the extent of curvature for future monitoring.

For patients with suspected cervical radiculopathy, manual provocation tests that involve elongation of the nerve roots to elicit a pain response may be of benefit. Patients may report pain relief with placing hands on top of head, decreasing neural tension.³¹

The Spurling's test attempts to reproduce radicular arm pain from a cervical disk herniation or spondylosis. The patient is in a seated position and the arms at the side. Assist patient in extending while gently tilting the head to the side. This test narrows the neural fora-

Table 2: QTF classification of whiplash-associated disorders.⁸

Grade	Classification
0	No complaint about the neck. No physical signs.
I	Neck complaint of pain, stiffness or tenderness only. No physical signs.
II	Neck complaint and musculoskeletal signs. Musculoskeletal signs include decreased range of motion and point tenderness.
III	Neck complaint and neurological signs. Neurological signs include decreased or absent deep tendon reflexes, weakness and sensory deficits.
IV	Neck complaint and fracture or dislocation.

men and increases pain in the distribution of the symptomatic nerve root.

A thorough motor and sensory examination must be performed to help establish therapeutic direction as well as to make a diagnosis. Shoulder flexors and abductors are innervated by the axillary nerve, cervical roots C5-C6. The elbow flexors are innervated by the musculocutaneous nerve (C5-C6). The wrist extensors are innervated by the radial nerve (C6-C7). Elbow extensors are innervated by the radial nerve (C6,C7,C8). Finger flexors are innervated by median and ulnar nerves (C8). Finger abductors are innervated by the ulnar nerve (C8-T1). Also, examine for symmetric reflexes. An abnormal elbow flexion reflex can be from C5 root involvement. Abnormal wrist extensor reflex may indicate C6 root pathology. Abnormal elbow extension reflex may be due to C7 root involvement and is one of the most common presenting in the neck. Asymmetric grasp reflex points towards C8 involvement. An abnormal Hoffmann reflex may reveal long-tract spinal cord involvement in the neck. Sensory abnormalities should follow a specific dermatomal and peripheral nerve distribution and correlate with other exam findings. C5- T1 nerve roots innervate the proximal, middle and distal upper extremity. The C5 dermatome can be evaluated by checking pin prick lateral to the biceps tendon at the antecubital fossa, C6 on the proximal thumb, C7 on the proximal middle finger, and C8 on the proximal little finger. T1 is evaluated at the medial humeral epi-

condyle. Proprioception at the elbow and hand should be checked as well.

Diagnostic Imaging

Appropriate diagnostic studies can be ordered once a differential diagnosis has been generated based on the history and physical examination. Standard x-rays of the cervical spine are generally the first test to order when fracture or osteoarthritis of the neck is a consideration. Recent reviews recommend CT scan when imaging is indicated.³¹ X-rays of the shoulder with osteoarthritis may have a narrow joint space, sclerosis of the joint line, osteophyte formation and subchondral cysts. The presence of osteoarthritis without an appropriate history or physical does not mean that the patient is symptomatic from osteoarthritis. On the other hand, there may be arthroscopic evidence of arthritis in patients with normal radiographs.

Detection of a neoplastic lesion based solely on radiography requires substantial tissue erosion. Bone scan and MRI are more sensitive ways to find fractures which are not apparent on plain X-ray. CT scan may be used to look for fractures if MRI can't be performed on a patient with a metallic implant or a pacemaker. Bone scan can be useful in patients with widespread pain when bone metastasis is suspected. MRI with intraarticular gadolinium is used to look for capsule tears. Ultrasound is an excellent modality to look at soft tissue in the area. Muscular tears, tendonitis, and bursitis can be seen with the use of ultrasound.

MRI of the head and cervical spine can be utilized to work up the spine as a potential pain generator. However, radiographic studies do not show pain. Discogenic changes are frequently seen on patients who are asymptomatic. Cervical discography can be used to prove that a given disc or discs are painful. With discography, false positive and false negative responses can occur. While diagnostic imaging with MRI and CT myelography can help support the diagnosis of cervicogenic headache, these radiographic studies are probably more useful in ruling out secondary causes of pain.^{18,19}

Diagnostic facet blocks using fluoroscopic guidance is one means to confirm the diagnosis of cervicogenic headache and possibly predict response to treatment

modalities.²⁰ Diagnostic injection is the “gold standard” for diagnosis of the painful zygapophyseal joint pain.^{17,20} At least two blocks are performed and there must be at least 75 percent relief of pain. There is a false positive rate of 38 percent for one zygapophyseal joint injection.²⁰ History and physical exam can’t be used to reliably diagnose facet joint and cervicogenic headache pain.²¹

Related Disorders

The term whiplash describes a constellation of symptoms and signs associated with bony or soft tissue injury occurring most commonly after a motor vehicle accident.²⁵ The Quebec Task Force (QTF) of whiplash associated disorders developed a classification system based on severity of signs and symptoms (Table 2). In their critical review of the literature, the Neck Pain Task Force (NPTF) proposed that the QTF grading system be adapted to classify neck pain of any etiology including non-traumatic cervicalgia.²⁶ Whiplash remains a common cause of disability and is the most common injury associated with motor vehicle accidents, affecting up to 83 percent of victims.^{27,33}

Current theories of the etiology of whiplash suggest that it occurs as a result of hyperextension of the lower cervical vertebrae in relation to a relative flexion of the upper cervical vertebrae.²⁵ This type of abnormal motion may result from an acceleration-deceleration energy transfer to the spine that is typical of forces experienced by restrained passengers in motor vehicles that are “rear-ended.”

Headaches may be present in 50 to 75 percent of acute whiplash sufferers.⁶ Although the methodology of studies in this area make interpretation difficult, cervicogenic headaches appear to comprise a significant proportion of post-whiplash headache syndromes.²⁸ Treatment for whiplash in the absence of other pathology is primarily focused on physical therapy, self-mobilization, and return to normal activities as soon as possible. Recent studies suggest that early mobilization may lead to improved outcomes and that early motion restriction may have the opposite effect.²⁹ Treatment of whiplash injuries often presents a challenge to the clinician because of the complex interaction of psychosocial, physical, and legal

factors amongst different patients.²⁹

Occipital neuralgia (Arnold’s neuralgia) is paroxysmal lancinating pain in the distribution of the greater or lesser occipital nerves.³⁰ It may be associated with dysesthesia, hypesthesia, or tenderness in the affected area. It may be caused by muscle tension, muscle spasm, migraine headaches, or cranio-cervical junction disease. The pain may be unilateral or bilateral in distribution of the occipital region and the diagnosis can be confirmed by relief with local anesthetic block of the involved nerve.

Cervical internal disc derangement and intervertebral disc herniation can directly cause pain to radiate from the neck into the head and shoulders.³¹ Discogenic pain can radiate further down the arm and is commonly worse with neck flexion.

Pain and/or paresthesias that radiate down the ipsilateral arm may be due to nerve entrapment from an osteophyte or disk herniation causing a radiculopathy. Onset of pain is often rapid and may come after trauma or neck flexion or can develop spontaneously. Pain and paresthesias into the shoulder, arm, forearm and hand can result from the C5, C6, C7, and C8 nerve roots respectively. T1 radiates to the medial arm towards the elbow.

Cervical disc herniations and severe stenosis can rarely result in a cervical myelopathy syndrome that can present with neck pain, motor weakness of the upper and lower extremities, lack of coordination, gait disturbances, and bowel and bladder dysfunction. This may start as urinary retention and overflow incontinence. This is one of the few surgical emergencies in spinal medicine. Thus, all spinal histories must inquire into these symptoms.

Adhesive capsulitis of the shoulder, rotator cuff disease and thoracic outlet syndrome can present with pain in the lateral neck and shoulder region with radiation into the extremity. Metabolic etiologies including osteomalacia, gout, pseudogout, Paget’s disease and hemachromatosis are less common causes of neck pain.

Conclusion

Referral to a musculoskeletal specialist is indicated if head, neck, or shoulder pathology is suspected in

patients who present with a chief complaint of neck pain. A thorough history and physical is critical in deciding which studies should be ordered and interpreting the clinical significance of any studies that are ordered for the patient.

Pain that radiates into the head from the neck especially with movement and history of neck trauma should immediately make the clinician suspicious of cervical pathology and possible cervicogenic headache.

Injections may be used both for diagnosis and treatment purposes. Medications such as Tylenol and NSAIDs may be used initially in most cases. More urgent referral to an orthopedic or neurosurgical service is warranted in the case of patients who are febrile or have a history of trauma, and there is suspicion of fracture or malignancy as well as in patients with acute onset of extremity weakness or bowel or bladder dysfunction.

Though the pathogenesis of cervicogenic headaches is relatively straightforward this disease presents several challenges to the practicing clinician. Even with established guidelines for diagnosis from several prominent specialty committees there is still some controversy on this topic. Although cervicogenic headache is a relatively common cause of chronic headache it is often misdiagnosed or unrecognized. Its differential is broad and includes diseases that can cause significant pathology if not diagnosed in a timely fashion. This requires the examiner to remain attentive to details in the history and physical and obtain appropriate imaging when necessary.

With early diagnosis and management, physicians can help their patients significantly decrease the potential pain and disability associated with this challenging disorder. ■

1. International Headache Society. The International Classification of Headache Disorders: 2nd edition. *Cephalalgia* 24 Suppl 1:9-160, 2004
2. Zubry DS, Lund AK: Preventing minor neck injuries in rear crashes—forty years of progress. *J Occup Environ Med.* 52:428-433, 2010
3. deSousa JE, Halfon MJ, Bonardo P, Reisen RC, Fernandez MM. Different pain patterns in patients with vertebral artery dissections. *Neurology* 64:925-26, 2005
4. Campos CR, Calderaro M, Scaff M, Conforto AB. Primary headaches and painful spontaneous cervical artery dissection. *J Headache Pain* 8: 180-84, 2007
5. Bogduk N, Govind J: Cervicogenic headache: an assessment of the evidence on clinical diagnosis, invasive tests, and treatment. *Lancet Neurol* 8:959-968, 2009
6. Pascual J, Oterino A, Berciano J: Headache in type I Chiari malformation. *Neurology* 42:1519-1521, 1992
7. Haldeman S, Dagenais S. Cervicogenic headaches; a critical review. *Spine J* 1. 31-46, 2001
8. Evers S. Comparison of cervicogenic headache with migraine. *Cephalgia* 28 Suppl 1: 16-17, 2008

9. Sjaatstad O, Cervicogenic Headache: comparison with migraine without aura; Vaga study. *Cephalgia* 28 Suppl 1: 18-20, 2008
10. van Suijlekom HA, Lame I, Stomp-van den Berg SG, Kessels AG, Weber WE. Quality of life of patients with cervicogenic headache: a comparison with control subjects and patients with migraine or tension-type headache. *Headache* 43: 1034-1041, 2003
11. van Suijlekom HA, de Vet HCW, Stomp-van den Berg SG, Weber WE. Interobserver reliability of diagnostic criteria for cervicogenic headache. *Cephalgia* 19: 817-823, 1999
12. van Suijlekom HA, de Vet HCW, Stomp-van den Berg SG, Weber WE. Interobserver reliability in physical examination of the cervical spine in patients with headache. *Headache* 40: 581-86, 2000
13. Antonaci F, Ghirmai S, Bono S, Sandrini G, Nappi G. Cervicogenic headache: evaluation of the original diagnostic criteria. *Cephalgia* 21: 573-82, 2001
14. Bogduk N. The neck and headaches. *Neurol Clin N Am* 22: 151-71, 2004
15. Bogduk N, Bartsch T. Cervicogenic headache. In Silberstein SD, Lipton RB, Dodick DW, eds. *Wolff's Headache*, 8th ed. New York: Oxford University Press, 551-570, 2008
16. Dwyer A, Aprill C, Bogduk N. Cervical zygapophyseal joint pain patterns I: A study in normal volunteers. *Spine* 6:453-457, 1990
17. Barnsley L, Bogduk N. Medial branch blocks are specific for the diagnosis of cervical zygapophyseal joint pain. *Reg Anesth* 18:343-350, 1993
18. Lord SM, Barnsley L, Wallis BJ, Bogduk N. Third occipital nerve headache: a prevalence study. *J Neurol Neurosurg Psychiatry* 57: 1187-90, 1994
19. Lord SM, Barnsley L, Wallis BJ, Bogduk N. Chronic cervical zygapophyseal joint pain after whiplash. A placebo-controlled prevalence study. *Spine* 21: 1737-44, 1996
20. Barnsley L, Lord S, Wallis B, Bogduk N. False positive rates of cervical zygapophyseal joint blocks. *Clin J Pain* 9: 124-30, 1993
21. Bogduk N. The clinical anatomy of the cervical dorsal rami. *Spine* 7: 319-330, 1982
22. Fukui S, Ohseto K, Shiotani M et al. Referred pain distribution of the cervical zygapophyseal joints and cervical dorsal rami. *Pain* 68:79-83, 1996
23. Maigne JY. Chronic cervical zygapophyseal joint pain after whiplash—A placebo-controlled prevalence study. *Spine* 22:1420-1421, 1997
24. Dreyfuss P, Michaelsen M, Fletcher D. Atlanto-occipital and lateral atlanto-axial joint pain patterns. *Spine* 19:1125-1131, 1994
25. Yadla S, Ratliff JK, Harrop JS: Whiplash: diagnosis, treatment, and associated injuries. *Curr Rev Musculoskelet Med* 1:65-68, 2008
26. Nordin M, Carragee EJ, Hogg-Johnson S, Weiner SS, Hurwitz EL, Peloso PM, et al: 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 (Phila Pa 1976)* 33:5101-122, 2008
27. Cote P, Hogg-Johnson S, Cassidy JD, Carroll L, Frank JW, Bombardier C: Initial patterns of clinical care and recovery from whiplash injuries: a population-based cohort study. *Arch Intern Med* 165:2257-2263, 2005
28. Sjaatstad O, Fredriksen T, Bakketeig L: Headache subsequent to whiplash. *Curr Pain Headache Rep* 13:52-58, 2009
29. Borchgrevink GE, Kaasa A, McDonagh D, Stiles TC, Haraldseth O, Lereim I: Acute treatment of whiplash neck sprain injuries. A randomized trial of treatment during the first 14 days after a car accident. *Spine (Phila Pa 1976)* 23:25-31, 1998
30. Ward JB: Greater occipital nerve block. *Semin Neurol* 23:59-62, 2003
31. White M, Holland JP: Approaching Neck Pain from a Multidisciplinary Perspective: A Comprehensive Approach to an Important Public Health and Societal Issue. *J Occup Environ Med* 52: 421-461, 2010
32. S Hogg-Johnson, PhD, G van der Velde, DC, LJ Carroll, PhD, JD Cassidy, DC, PhD, et al. Burden and Determinants of Neck Pain in the General Population. Results of the Bone and Joint Decade 2000-2010 Task Force on Neck Pain and Its associated Disorders.
33. Spitzer WO, Skovron ML, Salmi LR, Cassidy JD, Duranceau J, Suissa S, et al: Scientific monograph of the Quebec Task Force on Whiplash-Associated Disorders: redefining "whiplash" and its management. *Spine (Phila Pa 1976)* 20:15-735, 1995
34. Blume HG. Cervicogenic headaches: radiofrequency neurotomy and the cervical disc and fusion. *Clin Exp Rheumatol* 18 Suppl 19: 53-58, 2000
35. Fredriksen TA, Fougner R, tangerud A, Staastad O. Cervicogenic headache; radiological investigations concerning headache. *Cephalgia* 9: 139-146, 1989
36. Pfaffenrath V, Dandekar R, Pollmann W. Cervicogenic headache, the clinical picture, radiological findings and hypotheses on its pathophysiology. *Headache* 27: 495-99, 1987
37. Pikus HJ, Phillips JM. Characteristics of patients successfully treated for cervicogenic headache by surgical decompression of the second cervical root. *Headache* 35: 621-29, 1995