

**American College of Radiology
ACR Appropriateness Criteria®**

Clinical Condition: Chronic Neck Pain

Variant 1: Patient of any age, without or with a history of previous trauma, first study.

Radiologic Procedure	Rating	Comments	RRL*
X-ray cervical spine	9	AP, lateral, open mouth, both obliques.	Low
X-ray myelography cervical spine	2		None
CT cervical spine without contrast	2		Med
Myelography and post myelography CT cervical spine	2		High
MRI cervical spine without contrast	2		None
NUC Tc-99m bone scan neck	2		Med
INV facet injection/arthrography cervical spine selective nerve root block	2		Low
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

Variant 2: Patient of any age, history of previous malignancy, first study.

Radiologic Procedure	Rating	Comments	RRL*
X-ray cervical spine	9	AP, lateral, open mouth, both obliques.	Low
CT cervical spine without contrast	2		Med
MRI cervical spine without contrast	2		None
NUC Tc-99m bone scan neck	2		Med
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

Variant 3: Patient of any age, history of previous neck surgery, first study.

Radiologic Procedure	Rating	Comments	RRL*
X-ray cervical spine	9	AP, lateral, open mouth, both obliques.	Low
CT cervical spine without contrast	2		Med
MRI cervical spine without contrast	2		None
NUC Tc-99m bone scan neck	2		Med
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

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Clinical Condition:**Chronic Neck Pain****Variant 4:****Radiographs normal. No neurologic findings.**

Radiologic Procedure	Rating	Comments	RRL*
X-ray myelography cervical spine	2		Med
CT cervical spine without contrast	2		Med
Myelography and post myelography CT cervical spine	2		High
MRI cervical spine without contrast	2		None
NUC Tc-99m bone scan neck	2		Med
INV facet injection/arthrography cervical spine selective nerve root block	2		Low
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

Variant 5:**Radiographs normal. Neurologic signs or symptoms present.**

Radiologic Procedure	Rating	Comments	RRL*
MRI cervical spine without contrast	9		None
Myelography and post myelography CT cervical spine	5	If MRI contraindicated.	High
X-ray myelography cervical spine	2		Med
CT cervical spine without contrast	2		Med
NUC Tc-99m bone scan neck	2		Med
INV facet injection/arthrography cervical spine selective nerve root block	2		Low
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

Variant 6:**Radiographs show spondylosis. No neurologic findings.**

Radiologic Procedure	Rating	Comments	RRL*
X-ray myelography cervical spine	2		Med
CT cervical spine without contrast	2		Med
Myelography and post myelography CT cervical spine	2		High
MRI cervical spine without contrast	2		None
NUC Tc-99m bone scan neck	2		Med
INV facet injection/arthrography cervical spine selective nerve root block	2		Low
X-ray discography cervical spine	1		Low
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

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Clinical Condition:**Chronic Neck Pain****Variant 7:****Radiographs show spondylosis. Neurologic signs or symptoms present.**

Radiologic Procedure	Rating	Comments	RRL*
MRI cervical spine without contrast	9		None
Myelography and post myelography CT cervical spine	5	If MRI contraindicated.	High
X-ray myelography cervical spine	2		Med
CT cervical spine without contrast	2		Med
NUC Tc-99m bone scan neck	2		Med
INV facet injection/arthrography cervical spine selective nerve root block	2		Low
X-ray discography cervical spine	1		Low
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

Variant 8:**Radiographs show old trauma. No neurologic findings.**

Radiologic Procedure	Rating	Comments	RRL*
X-ray myelography cervical spine	2		Med
CT cervical spine without contrast	2		Med
Myelography and post myelography CT cervical spine	2		High
MRI cervical spine without contrast	2		None
NUC Tc-99m bone scan neck	2		Med
INV facet injection/arthrography cervical spine selective nerve root block	2		Low
X-ray discography cervical spine	1		Low
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

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Clinical Condition:**Chronic Neck Pain****Variant 9:****Radiographs show old trauma. Neurologic signs or symptoms present.**

Radiologic Procedure	Rating	Comments	RRL*
MRI cervical spine without contrast	9		None
Myelography and post myelography CT cervical spine	5	If MRI contraindicated.	High
X-ray myelography cervical spine	2		Med
CT cervical spine without contrast	2		Med
NUC Tc-99m bone scan neck	2		Med
INV facet injection/arthrography cervical spine selective nerve root block	2		Low
X-ray discography cervical spine	1		Low
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

Variant 10:**Radiographs show bone or disc margin destruction.**

Radiologic Procedure	Rating	Comments	RRL*
MRI cervical spine without contrast	9		None
X-ray myelography cervical spine	2		Med
CT cervical spine without contrast	2		Med
Myelography and post myelography CT cervical spine	2		High
NUC Tc-99m bone scan neck	2		Med
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

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CHRONIC NECK PAIN

Expert Panel on Musculoskeletal Imaging: Richard H. Daffner, MD¹; Barbara N. Weissman, MD²; D. Lee Bennett, MD³; Judy S. Blebea, MD⁴; Jon A. Jacobson, MD⁵; William B. Morrison, MD⁶; Charles S. Resnik, MD⁷; Catherine C. Roberts, MD⁸; David A. Rubin, MD⁹; Mark E. Schweitzer, MD¹⁰; Leanne L. Seeger, MD¹¹; Mihra Taljanovic, MD¹²; James N. Wise, MD¹³; William K. Payne, MD.¹⁴

Summary of Literature Review

The patient with chronic neck pain presents both diagnostic and therapeutic dilemmas for the clinician [1-8]. There is considerable controversy in the literature over its etiology. The literature focuses on two general categories: post-traumatic and degenerative. Post-traumatic etiologies include the so-called “whiplash” syndrome. Degenerative conditions include spondylosis, including degenerative disc disease and acute disc herniation.

There is little in the literature on the use of imaging modalities in the evaluation of patients with chronic neck pain. Most of the studies cite the use of radiographs, particularly to diagnose spondylosis, degenerative disc disease, or post-traumatic malalignment [7,9]. From a radiographic standpoint, a diagnosis of spondylosis may be made if any one of three findings is present: 1) osteophytes, 2) disc space narrowing, or 3) facet disease.

There are many anecdotal reports in the literature about other etiologies of chronic neck pain that include carotid or vertebral artery dissection, arteriovenous malformations, and neoplasms.

For this review, 27 papers are included in the bibliography. Three of these papers: Mäkelä et al (7,270 patients) [5], the Quebec group led by Spitzer et al (3,014 patients) [8], and van der Donk et al (5,440 patients) [9], evaluated chronic neck pain. The Quebec study focused entirely on “whiplash.” The other two studies discussed the etiology of neck pain in relation to other contributing factors.

The Mäkelä study, in a representative sample of Finnish adults, found the chronic neck syndrome occurring in

10% of men and 14% of women. Contributing features of symptoms included previous history of trauma and mental and physical stress at work.

The Quebec Task Force on “whiplash” evaluated their experience with the disorder. It was an excellent cooperative study using consensus methods similar to those used by the ACR Committee on Appropriateness Criteria. They developed a flow sheet defining whiplash-associated disorders and made recommendations for diagnosis and management.

The van der Donk study confirmed observations made by other investigators on smaller patient populations that disc disease is more likely to cause neck pain in men but not in women. In patients with spondylosis, the presence of pain is related more closely to personality traits, neuroticism, and the presence of previous injury.

The overwhelming theme throughout our review was that there were no reliable radiologic or laboratory data to confirm or refute the diagnosis of “whiplash” [6,10,11]. Furthermore, there was little correlation between the presence of cervical spondylosis or degenerative disc disease and the severity or duration of patient symptoms. Personality traits and secondary gain (particularly in patients with post-traumatic neck pain) are prominent findings. While spondylosis and disc disease increase with age and are frequently asymptomatic, “whiplash” can accelerate these processes and lead to symptoms [3,7]. For these reasons, no variant specifically addressed “whiplash” per se. The variants cover the scenarios of chronic neck pain without considering the etiology (trauma, arthritis, or neoplasm).

In recent years there has been an increased emphasis on the use of provocative diagnostic discography and facet joint injections [12-18]. These studies are purportedly indicated for those patients who have multilevel facet or disc disease, in which the offending disc or facet joint cannot be identified. Facet injection, with or without arthrography, may help identify the location of pain source. Of particular note, however, is that extensive research by Carragee and associates [12,19,20] (with lumbar discography) has demonstrated that pain intensity during disc injection is most influenced by the emotional and psychological profiles of the patient as well as the influence of any ongoing compensation claims. They concluded that discography could not be used to reliably confirm the location of a pain source.

Most recently, investigators have reported the use of magnetic resonance imaging (MRI) for evaluating patients with chronic neck pain [21-25]. Their findings indicate that MRI is the single best method for detecting and distinguishing between the various clinical diagnostic

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possibilities that may cause neck pain.

Our review considered a number of clinical scenarios in which patients presented with chronic neck pain. These included situations in which we attempted to determine the optimal first study to be performed. These included patients younger than and older than age 40 without or with a history of remote trauma and patients of any age with a history of previous malignancy or previous remote surgery.

Finally, seven clinical scenarios were considered that included patients in whom radiographs were normal or showed cervical spondylosis, evidence of old trauma or deformity, or bony or disc margin destruction. Variants included patients without and with neurologic signs and symptoms.

Recommendations

These guidelines apply to imaging of patients with chronic neck pain regardless of the etiology (trauma, arthritis, neoplasm):

- Patients of any age with chronic neck pain without or with a history of remote trauma should initially undergo a 5-view (anteroposterior [AP], lateral, open mouth, both obliques) radiographic examination.
- Patients with a history of previous malignancy should initially undergo a 3-view radiographic examination. Radionuclide bone scanning should not be the initial procedure of choice [26].
- Patients with a history of neck surgery in the remote past should initially undergo a 3-view radiographic examination.
- Patients with normal radiographs and no neurologic signs or symptoms need no further imaging.
- Patients with normal radiographs and neurologic signs or symptoms should undergo MRI [21-25]. If there is a contraindication to the MRI examination such as a cardiac pacemaker or severe claustrophobia, computed tomography (CT) myelography, preferably using spiral technology and multiplanar reconstruction, is recommended.
- Patients with radiographic evidence of cervical spondylosis or of previous trauma without neurologic signs or symptoms need no further imaging.
- Patients with radiographic evidence of cervical spondylosis or of previous trauma and neurologic signs or symptoms should undergo MRI [21-25]. If there is a contraindication to MRI, CT myelography is recommended.
- Patients with radiographic evidence of bone or disc margin destruction should undergo MRI. If an epidural abscess is suspected, the examination should be performed with intravenous contrast. CT is indicated only if MRI cannot be performed.

- Facet injection and arthrography are useful for patients with multilevel disease diagnosed by any imaging modality to identify the specific level(s) producing symptoms.
- Discography is not recommended [1,27].
- Patients with chronic neck pain from “whiplash” should undergo imaging following the guidelines above.

Summary

There are no existing guidelines for evaluating the patient with chronic neck pain.

All investigators generally agree that radiographs should be the initial study performed for evaluating these patients. However, there is no consensus on exactly which views should be obtained for the initial study. We recommend a basic 3-view study, with oblique radiographs added at the discretion of the attending physician.

MRI should be performed on all patients who have chronic neck pain with neurologic signs or symptoms, or both. If there is a contraindication to MRI, CT myelography is recommended.

The use of additional imaging procedures should be determined in a case-by-case manner, and the evaluation of patients with chronic neck pain should follow this “tailor-made” approach. Discography is not recommended.

Relative Radiation Level Information

Potential adverse health effects associated with radiation exposure are an important factor to consider when selecting the appropriate imaging procedure. Because there is a wide range of radiation exposures associated with different diagnostic procedures, a relative radiation level (RRL) indication has been included for each imaging examination. The RRLs are based on effective dose, which is a radiation dose quantity that is used to estimate population total radiation risk associated with an imaging procedure. Additional information regarding radiation dose assessment for imaging examinations can be found in the ACR Appropriateness Criteria® [Radiation Dose Assessment Introduction](#) document.

Relative Radiation Level Designations	
Relative Radiation Level	Effective Dose Estimate Range
None	0
Minimal	< 0.1 mSv
Low	0.1-1 mSv
Medium	1-10 mSv
High	10-100 mSv

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