

MRI Cervical Spine

CPT: 72141, 72142, 72156

IMPORTANT NOTES

Red Flags Disregard any requirement for prior management if any of the following are part of the clinical history:

- Abnormal CBC, Sed Rate, etc.
- Bladder and Bowel dysfunction
- Fever
- Cancer, History of
- Immunocompromised state
- IV drug use
- Major weakness of a limb
- Pain increased at rest
- Saddle anesthesia
- Trauma
- Unexplained weight loss
- Urinary tract infections

The requirement for Medical or Conservative Management prior to imaging is satisfied if the following are met:

1. Nonsteroidal anti-inflammatory drugs for at least four weeks (Requirement is waived if NSAIDS are not tolerated or contraindicated, or if condition worsens while under treatment.)
2. Activity modification or physical therapy if appropriate

1 Major Symptom or Complaint presented as primary indication

1.1 Bilateral radiculopathy SEE MYELOPATHY

1.2 Bladder dysfunction This is a RED FLAG. No conservative management is required.

1.3 Burning sensations (dysesthesias)

1.3.1 Failed Conservative Management

1.4 Bowel incontinence This is a RED FLAG. No conservative management is required.

1.5 Clumsiness, increasing with time

1.6 Gait disturbances

1.6.1 Myelopathy suspected

1.7 Numbness, in nerve root distribution

1.7.1 Failed Conservative Management

1.8 Pain

1.8.1 Pain, in neck

1.8.1.1 Failed conservative management

1.8.1.2 Known malignancy elsewhere This is a RED FLAG. No conservative management is required.

1.8.2 Pain, local to spine or radiating in root pattern ONE

1.8.2.1 No RED FLAGS, Failed conservative management

1.8.2.2 Suspected epidural abscess

1.8.2.2.1 AIDS

1.8.2.2.2 ESR elevated

1.8.2.2.3 Fever

1.8.2.2.4 Immunosuppressed

1.8.2.2.5 White count elevated

References:

1. AS Baker, RG Ojemann, MN Swartz, and EP Richardson Spinal epidural abscess; N. Engl. J. Med., Sep 1975; 293: 463 – 468.
2. Davis DP; Wold RM; Patel RJ; Tran AJ; Tokhi RN; Chan TC; Vilke GM The clinical presentation and impact of diagnostic delays on emergency department patients with spinal epidural abscess. J Emerg Med 2004 Apr;26(3):285-91.
3. Darouiche RO; Hamill RJ; Greenberg SB; Weathers SW; Musher DM; Bacterial spinal epidural abscess. Review of 43 cases and literature survey. Medicine (Baltimore) 1992 Nov;71(6):369-85 [abstract]
4. David T Durack, MD, DPhil Daniel J Sexton, MD Epidural abscess UpToDate 15.2 accessed 07/09/07
5. Severe pain, not responding to opiates or worsening, This is a RED FLAG. No conservative management is required.

1.8.4 Shooting pain, in nerve root distribution

1.8.4.1 Radiculopathy or disc disease suspected. Failed conservative management

1.9 Paralysis of upper extremity

1.10 Shooting pain, in nerve root distribution

1.10.1 Failed Conservative Management

1.11 Tingling sensations (paresthesias)

1.11.1 Failed Conservative Management

1.12 Weakness, in nerve root distribution

1.12.1 Failed Conservative Management

2 Working Diagnosis or Rule Out presented as primary indication

2.1 Brachial Plexus Pathology (Plexopathy) MRI of shoulder or C spine with contrast preferred.

- 2.1.1** Note Plexopathy refers to an abnormality of the complex of nerve roots exiting the spine and organizing into the nerves serving the arm, trunk or legs. Symptoms may include burning, tingling, or numbness in a circumferential or dermatomal distribution. The symptoms may radiate to the hand or remain localized in the neck.

2.1.2 Indications BOTH

2.1.2.1 History

2.1.2.1.1 Breast or lung cancer

2.1.2.1.2 History of radiation therapy to the chest, breast or axilla

2.1.2.1.3 Palpable mass in neck or shoulder area

2.1.2.1.4 Trauma, including at birth

2.1.2.2 Symptoms of upper extremity

2.1.2.2.1 Numbness

2.1.2.2.2 Paresthesias

2.1.2.2.3 Radiating pain

2.1.2.2.4 Weakness

References:

1. ACR Appropriateness Criteria Plexopathy p10 Accessed 12/28/08
2. Aliya Qayyum, A. David MacVicar, Anwar R. Padhani, Patrick Revell, and Janet E. S. Husband Symptomatic Brachial Plexopathy following Treatment for Breast Cancer: Utility of MR Imaging with Surface-Coil Techniques Radiology 2000 214: 837-842.
3. BC Bowen, A Verma, AH Brandon, and JA Fiedler Radiation-induced brachial plexopathy: MR and clinical findings AJNR Am. J. Neuroradiol., Nov 1996; 17: 1932 – 1936. Neurosurgical Focus Posted 04/02/2007 Accessed 1/4/09 @ http://www.medscape.com/viewarticle/553963_1
4. Bowen B, Seidenwurm DJ, Davis P, et al, Expert Panel on Neurologic Imaging, American College of Radiology, Appropriateness Criteria, Plexopathy, accessed at http://www.acr.org/SecondaryMainMenuCategories/quality_safety/app_criteria/pdf/ExpertPanelonNeurologicImaging/PlexopathyDoc12.asp 12/28/08
5. Devin K. Binder, M.D., Ph.D.; Justin S. Smith, M.D., Ph.D.; Nicholas M. Barbaro, M.D Primary Brachial Plexus Tumors: Imaging, Surgical, and Pathological Findings in 25 Patients Neurosurgical Focus Medscape Radiology accessed 12/28/08
6. Edward Fathers, David Thrush, Susan M Huson, and Andrew Norman Radiation-induced brachial plexopathy in women treated for carcinoma of the breast Clinical Rehabilitation, Feb 2002; 16: 160 – 165.
7. Neoplastic Brachial Plexopathy Author: Mark A Wren, MD, MPH, Medical Director, Department of Physical Medicine and Rehabilitation, HealthSouth Rehabilitation Hospital of Texarkana eMedicine Specialties > Physical Medicine and Rehabilitation > Plexopathy Updated: Jan 19, 2010 Accesed 3/15/10
8. Vincent J. Miele, M.D.; John A. Norwig, A.T.C.; Julian E. Bailes, M.D. Sideline and Ringside Evaluation for Brain and Spinal Injuries
9. Walker, AT, Chaloupka, JC, de Lotbiniere, AC, Wolfe, SW, Goldman, R, Kier, EL Detection of nerve rootlet avulsion on CT myelography in patients with birth palsy and brachial plexus injury after trauma Am. J. Roentgenol. 1996 167: 1283-1287
10. T. Yoshikawa, N. Hayashi, S. Yamamoto, Y. Tajiri, N. Yoshioka, T. Masumoto, H. Mori, O. Abe, S. Aoki, and K. Ohtomo Brachial Plexus Injury: Clinical Manifestations, Conventional Imaging Findings, and the Latest Imaging Techniques RadioGraphics, October 1, 2006; 26(suppl_1): S133 – S143.
11. A. TAVAKKOLIZADEH, A. SAIFUDDIN, and R. BIRCH Imaging of Adult Brachial Plexus Traction Injuries J Hand Surg Eur Vol., June 1, 2001; 26(3): 183 – 191

2.2 Epidural abscess, Suspected or Known MRI with gadolinium is preferred unless contraindicated

2.2.1 Suspected BOTH

2.2.1.1 Symptoms ANY ONE

2.2.1.1.1 Loss of bowel or bladder control

2.2.1.1.2 Muscle weakness

2.2.1.1.3 Pain, local to spine or radiating in root pattern

2.2.1.1.4 Paralysis

2.2.1.1.5 Sensory abnormality confirmed by examination

2.2.1.1.6 Tenderness over spine

2.2.1.2 Clinical Findings ANY ONE

2.2.1.2.1 AIDS

2.2.1.2.2 ESR Elevated

2.2.1.2.3 Fever

2.2.1.2.4 Immunosuppressed

2.2.1.2.5 Infection elsewhere

2.2.1.2.6 Positive blood culture

2.2.1.2.7 Recent spinal surgery or procedure

2.2.1.2.8 WBC elevated

2.2.2 Known After treatment

2.2.2.1 Interval Follow up

2.2.2.2 Recurrent or worsening symptoms

References:

1. AS Baker, RG Ojemann, MN Swartz, and EP Richardson Spinal epidural abscess; N. Engl. J. Med., Sep 1975; 293: 463 – 468.
2. Davis DP; Wold RM; Patel RJ; Tran AJ; Tokhi RN; Chan TC; Vilke GM The clinical presentation and impact of diagnostic delays on emergency department patients with spinal epidural abscess. J Emerg Med 2004 Apr;26(3):285-91.
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4. David T Durack, MD, DPhil Daniel J Sexton, MD Epidural abscess UpToDate 15.2 accessed 07/09/07

2.3 Metastasis Suspected, Known malignancy elsewhere

2.3.1 Focal Pain

2.3.2 Neurologic findings

2.3.3 Suspicious findings on other imaging

2.4 Multiple Sclerosis (Suspected)

2.4.1 Symptoms that could be attributable to the cervical cord

2.4.1.1 Clumsiness or paresthesias of the hands

2.4.1.2 Gait disturbance

- 2.4.1.3. Lhermitte's sign (cervical flexion and extension producing electric shocks down the arm and leg)

2.4.1.4 Hoffman's sign (evidence of upper motor neuron lesion from spinal cord compression)

2.4.1.5. Neck stiffness

2.4.1.6 Arm pain

2.4.1.7. Bowel and bladder control issues

2.4.1.8 Hyperreflexia

2.4.1.9 Numbness and/or tingling in the upper extremities

2.4.1.10 Coordination loss

2.4.2 MRI of the brain inconclusive and Spinal MRI required to meet MacDonald criteria for diagnosis

- SB Kelly, K Kinsella, M Duggan, N Tubridy, C McGuigan, and M Hutchinson; A proposed modification to the McDonald 2010 criteria for the diagnosis of primary progressive multiple sclerosis; Mult Scler July 2013 19: 1095-1100, Polman CH, Reingold SC, Edan G, et al. Diagnostic criteria for multiple sclerosis: 2005 Revisions to the "McDonald criteria". Ann Neurol. 2005;58:840-846.

2.5 Myelopathy Suspected Failed Conservative Management and ONE

NOTE:

"Cervical myelopathy occurs secondary to compression of the neural elements (spinal cord or nerve roots) in the cervical spinal canal. Cervical spondylitic myelopathy is the most common cause of spinal cord dysfunction in persons older than 55 years. The cause of the compression is usually a combination of osteophytes and degenerative disc disease that leads to a decrease in the volume of the spinal canal. The distribution and severity of symptoms depend on the location, duration, and size of the lesion."

References:

1. Current Rheumatology Diagnosis & Treatment, 2nd Edition John B. Imboden, David B. Hellmann, John H. Stone > Chapter 9. Approach to the Patient with Neck Pain David Borenstein, MD

2.5.2 Atrophy of upper extremity musculature

2.5.3 Bladder dysfunction This is a RED FLAG. No conservative management is required.

2.5.4 Bowel incontinence This is a RED FLAG. No conservative management is required.

2.5.5 Burning sensations (dysesthesias)

2.5.6 Clumsiness, increasing with time

2.5.7 Gait disturbances

2.5.8 Hyporeflexia

2.5.9 Numbness, in nerve root distribution

2.5.10 Sensory abnormality objectively observed

2.5.11 Shooting pain, in nerve root distribution

2.5.12 Tingling sensations (paresthesias),

2.5.13 Weakness, in nerve root distribution

2.5.14 Weakness in upper and lower extremities Failed conservative management

References:

1. Rao, Raj D., Gourab, Krishnaj, David, Kenny S. Operative Treatment of Cervical Spondylotic Myelopathy J Bone Joint Surg Am 2006 88: 1619-1640
2. Rao R. Neck pain, cervical radiculopathy, and cervical myelopathy: pathophysiology, natural history, and clinical evaluation. J Bone Joint Surg Am.2002; 84:1872 -81

2.6 Osteomyelitis Suspected

2.6.1 Pain or Fever AND One

2.6.1.1 C reactive Protein elevated

2.6.1.2 Elevated ESR

2.6.1.3 Fever

2.6.1.4 Leukocytosis

2.6.1.5 Positive Blood Cultures

References

1. Parsonnet Jeffrey, "Chapter 120. Osteomyelitis" (Chapter). Fauci AS, Braunwald E, Kasper DL, Hauser SL, Longo DL, Jameson JL, Loscalzo J: Harrison's Principles of Internal Medicine, 17th Edition: <http://www.accessmedicine.com/content.aspx?aID=2893649>.
2. Alok Kapoor, Stephanie Page, Michael LaValley, Daniel R. Gale, and David T. Felson Magnetic Resonance Imaging for Diagnosing Foot Osteomyelitis: A Meta-analysis Arch Intern Med, Jan 2007; 167: 125 – 132
3. J. Herman Kan, Melissa A. Hilmes, Jeffrey E. Martus, Chang Yu, and Marta Hernanz-Schulman Value of MRI After Recent Diagnostic or Surgical Intervention in Children with Suspected Osteomyelitis Am. J. Roentgenol., Nov 2008; 191: 1595 – 1600
4. Kuo-Chen Lee, Yi-Ting Tsai, Chih-Yuan Lin, and Chien-Sung Tsai Vertebral osteomyelitis combined streptococcal viridans endocarditis Eur. J. Cardiothorac. Surg., Jan 2003; 23: 125
5. D Allen, S Ng, K Beaton, and D Taussig Sternal osteomyelitis caused by Aspergillus fumigatus in a patient with previously treated Hodgkin's disease J. Clin. Pathol., Aug 2002; 55: 616 – 618
6. M Ida, H Watanabe, A Tetsumura, and T Kurabayashi CT findings as a significant predictive factor for the curability of mandibular osteomyelitis: multivariate analysis Dentomaxillofac. Radiol., Mar 2005; 34: 86 – 90.
7. Jyri K. Koort, Tatu J. Mäkinen, Juhani Knuuti, Jari Jalava, and Hannu T. Aro Comparative 18F-FDG PET of Experimental Staphylococcus aureus Osteomyelitis and Normal Bone Healing J. Nucl. Med., Aug 2004; 45: 1406 – 1411
8. Susan A. Connolly, Leonard P. Connolly, Laura A. Drubach, David Zurakowski, and Diego Jaramillo MRI for Detection of Abscess in Acute Osteomyelitis of the Pelvis in Children Am. J. Roentgenol., Oct 2007; 189: 867 – 872

2.7 Radiculopathy or Spinal Stenosis

2.7.1 Failed Conservative Management AND ONE

2.7.1.1 Atrophy of upper extremity musculature

2.7.1.2 Burning sensations (dysesthesias)

2.7.1.3 Hyporeflexia

2.7.1.4 Numbness, in nerve root distribution

2.7.1.5 Shooting pain, in nerve root distribution

2.7.1.6 Tingling sensations (paresthesias)

2.7.1.7 Weakness, in nerve root distribution

References:

1. Schwartz's Principles of Surgery, 8th Edition F. Charles Brunicaudi, et al opyright © 2005, The McGraw-Hill Companies, Inc. Chapter 41. Neurosurgery Michael L. Smith, M. Sean Grady
2. Douglas-Akinwande, Annette C., Rydberg, Jonas, Shah, Mitesh V., Phillips, Michael D., Caldemeyer, Karen S., Lurito, Joseph T., Ying, Jun, Mathews, Vincent P. Accuracy of Contrast-Enhanced MDCT and MRI for Identifying the Severity and Cause of Neural Foraminal Stenosis in Cervical Radiculopathy: A Prospective Study Am. J. Roentgenol. 2010 194: 55-61
3. Michael T. Modic, Nancy A. Obuchowski, Jeffrey S. Ross, Michael N. Brant-Zawadzki, Paul N. Grooff, Daniel J. Mazanec, and Edward C. Benzel Acute Low Back Pain and Radiculopathy: MR Imaging Findings and Their Prognostic Role and Effect on Outcome Radiology November 2005 237:597-604
4. Spinal Stenosis SEE Radiculopathy
5. Suspected Fracture

3 Abnormal Physical Exam Finding presented as primary indication

3.1 Atrophy of shoulder or arm musculature

3.1.1 Failed conservative management

3.2 Gait disturbances

3.2.1 Myelopathy suspected

3.3 Hyporeflexia

3.3.1 Radiculopathy or disc disease suspected. Failed conservative management

3.4 Sensory abnormality confirmed by examination

3.4.1 Myelopathy suspected

3.4.2 Radiculopathy or disc disease suspected. Failed conservative management

4 Abnormal Lab or Imaging presented as primary indication

4.1 Fracture seen or suspected on recent x-ray

4.2 Suspected Fracture

5 Significant Prior Medical History presented as primary indication

5.1 Epidural abscess, Suspected or Known MRI with gadolinium is preferred unless contraindicated

5.1.1 Suspected BOTH

5.1.1.1 Symptoms ANY ONE

5.1.1.1.1 Loss of bowel or bladder control

5.1.1.1.2 Muscle weakness

5.1.1.1.3 Pain, local to spine or radiating in root pattern

5.1.1.1.4 Paralysis

5.1.1.1.5 Sensory abnormality confirmed by examination

5.1.1.1.6 Tenderness over spine

5.1.1.2 Clinical Findings ANY ONE

5.1.1.2.1 AIDS

5.1.1.2.2 ESR Elevated

5.1.1.2.3 Fever

5.1.1.2.4 Immunosuppressed

5.1.1.2.5 Infection elsewhere

5.1.1.2.6 Positive blood culture

5.1.1.2.7 Recent spinal surgery or procedure

5.1.1.2.8 WBC elevated

5.1.2 Known After treatment

5.1.2.1 Interval Follow up

5.1.2.2 Recurrent or worsening symptoms

References:

1. AS Baker, RG Ojemann, MN Swartz, and EP Richardson Spinal epidural abscess; N. Engl. J. Med., Sep 1975; 293: 463 – 468.
2. Davis DP; Wold RM; Patel RJ; Tran AJ; Tokhi RN; Chan TC; Vilke GM The clinical presentation and impact of diagnostic delays on emergency department patients with spinal epidural abscess. J Emerg Med 2004 Apr;26(3):285-91.
3. Darouiche RO; Hamill RJ; Greenberg SB; Weathers SW; Musher DM; Bacterial spinal epidural abscess. Review of 43 cases and literature survey. Medicine (Baltimore) 1992 Nov;71(6):369-85 [abstract]
4. David T Durack, MD, DPhil Daniel J Sexton, MD Epidural abscess UpToDate 15.2 accessed 07/09/07
5. Infection or abscess, after treatment
6. Management and assessment of spinal injury.

5.4 Multiple sclerosis (known)

5.4.1 New symptoms attributable to the spinal cord

5.4.1.1 Clumsiness or paresthesias of the hands 2

5.4.1.2 Gait disturbance

5.4.1.3. Lhermitte's sign (cervical flexion and extension producing electric shocks down the arm and leg)

5.4.1.4 Hoffman's sign (evidence of upper motor neuron lesion from spinal cord compression)

5.4.1.5. Neck stiffness

5.4.1.6 Arm pain

5.4.1.7. Bowel and bladder control issues

5.4.1.8 Hyperreflexia 11. Ankle clonus

5.4.1.9 Numbness and/or tingling in the upper extremities

5.4.1.10 Coordination loss

5.4.1.11 Baseline exam or follow-up after treatment

- Adams and Victor's Neurology > Part 4. Major Categories of Neurologic Disease > Chapter 36. Multiple Sclerosis and Allied Demyelinative Diseases > Multiple Sclerosis > Pathologic Findings > Multiple sclerosis. T2-weighted MRIs demonstrating multiple plaques in the periventricular white matter (left), emanating radially from the corpus callosum ("Dawson fingers") (middle), and cervical spinal cord (right). The radial orientation and periventricular location of cerebral lesions is typical of the disease.
- Hannah-Maria Hummel, Wolfgang Brück, Steffi Dreha-Kulaczewski, Jutta Gärtner, and Jens Wuerfel; Pediatric onset multiple sclerosis: McDonald criteria 2010 and the contribution of spinal cord MRI; Mult Scler September 2013 19: 1330-1335, Only 10% of pediatric patients reached the diagnostic criteria because of inclusion of spinal MRI.

5.5 Osteomyelitis Known

5.5.1 Interval follow up during and after treatment

5.5.2 Preoperative

5.5.3 Worsening clinical situation

References:

1. Parsonnet Jeffrey, "Chapter 120. Osteomyelitis" (Chapter). Fauci AS, Braunwald E, Kasper DL, Hauser SL, Longo DL, Jameson JL, Loscalzo J: Harrison's Principles of Internal Medicine, 17th Edition: <http://www.accessmedicine.com/content.aspx?aID=2893649>.
2. Alok Kapoor, Stephanie Page, Michael LaValley, Daniel R. Gale, and David T. Felson Magnetic Resonance Imaging for Diagnosing Foot Osteomyelitis: A Meta-analysis Arch Intern Med, Jan 2007; 167: 125 – 132.
3. J. Herman Kan, Melissa A. Hilmes, Jeffrey E. Martus, Chang Yu, and Marta Hernanz-Schulman Value of MRI After Recent Diagnostic or Surgical Intervention in Children with Suspected Osteomyelitis Am. J. Roentgenol., Nov 2008; 191: 1595 – 1600.
4. Kuo-Chen Lee, Yi-Ting Tsai, Chih-Yuan Lin, and Chien-Sung Tsai Vertebral osteomyelitis combined streptococcal viridans endocarditis Eur. J. Cardiothorac. Surg., Jan 2003; 23: 125.
5. D Allen, S Ng, K Beaton, and D Taussig Sternal osteomyelitis caused by Aspergillus fumigatus in a patient with previously treated Hodgkin's disease J. Clin. Pathol., Aug 2002; 55: 616 – 618.
6. M Ida, H Watanabe, A Tetsumura, and T Kurabayashi CT findings as a significant predictive factor for the curability of mandibular osteomyelitis: multivariate analysis Dentomaxillofac. Radiol., Mar 2005; 34: 86 – 90.
7. Jyri K. Koort, Tatu J. Mäkinen, Juhani Knuuti, Jari Jalava, and Hannu T. Aro Comparative 18F-FDG PET of Experimental Staphylococcus aureus Osteomyelitis and Normal Bone Healing J. Nucl. Med., Aug 2004; 45: 1406 – 1411.
8. Susan A. Connolly, Leonard P. Connolly, Laura A. Drubach, David Zurakowski, and Diego Jaramillo MRI for Detection of Abscess in Acute Osteomyelitis of the Pelvis in Children Am. J. Roentgenol., Oct 2007; 189: 867 – 872.

5.6 Trauma

5.6.1 Abnormal or nondiagnostic prior x-ray

5.6.1.1 This includes inability to visualize lower cervical vertebrae or T1 on x-rays

5.6.2 Midline cervical spinal tenderness

5.6.3 New onset of neurologic findings

References:

1. A Gardner, S Grannum and KM Porter Cervical spine trauma Trauma [London] 2005; 7: 109-121 American College of Surgeons Committee on Trauma. 1997.
2. Advanced trauma life support for doctors. British Trauma Society. 2002. Guidelines for initial management and assessment of spinal injury. Int J Care Injured 34: 405-25.

5.7 Management and assessment of scoliosis

5.7.1 Preoperative evaluation

5.7.2 Neurologic finding

5.7.3 Atypical curve pattern

5.7.4 Congenital scoliosis

5.7.5 Neurofibromatosis

5.8 Neurofibromatosis

5.8.1. Scoliosis

5.8.2 Peripheral neurofibromas

5.8.3 Brain tumor

5.8.4 Spinal cord tumor

5.8.5 Sensory loss

5.8.6 Motor deficit

5.8.7 Bladder or bowel dysfunction