MRI Brain

CPT: 70551, 70552, 70553

1 Major Symptom or Complaint presented as primary indication

1.1 Acute headache with vomiting

References:

1. Frederick Shane, Danzl Daniel F, “Chapter 41. Metabolic & Endocrine Emergencies” (Chapter). Stone CK, Humphries RL: CURRENT Diagnosis & Treatment: Emergency Medicine, 6th Edition:

1.2 Altered level of consciousness, cognitive ability or personality

1.2.1 Headache

1.2.2 Known or suspected infectious process, or abscess

1.2.2.1 Elevated WBC

1.2.2.2 Fever

1.2.3 Multiple Sclerosis (MS)

1.2.4 Stroke

1.2.5 Suspected Pseudotumor Cerebri

1.2.6 Trauma, recent history of

1.2.7 Vasculitis

References

1. Practice parameter: the utility of neuroimaging in the evaluation of headache in patients with normal neurological examinations (summary statement). Report of the Quality Standards Subcommittee of the American Academy of Neurology. Neurology 1994; 44:1353-1354.
2. F. K. Alehan; Value of Neuroimaging in the Evaluation of Neurologically Normal Children With Recurrent Headache; J Child Neurol, January 1, 2002; 17(11): 807 – 809.
3. Maytal, Joseph, Bienkowski, Robert S., Patel, Mahendra, Eviatar, Lydia; The Value of Brain Imaging in Children With Headaches; Pediatrics 1995 96: 413-416
4. Yoshito Tsushima, and Keigo Endo; MR Imaging in the Evaluation of Chronic or Recurrent Headache; Radiology 2005 235: 575-579
5. Dodick, David W.; Chronic Daily Headache;N Engl J Med 2006 354: 158-165
6. Michael E. Detsky, BSc; Devon R. McDonald, BSc; Mark O. Baerlocher, MD; George A. Tomlinson, PhD; Douglas C. McCrory, MD, MHSc; Christopher M. Booth, MD, FRCPC; Does This Patient With Headache Have a Migraine or Need Neuroimaging?; JAMA. 2006;296:1274-1283.
7. Zahid H Bajwa, MD, R Joshua Wootton, MDiv, PhD; Evaluation of headache in adults; UpToDate Online 15.2 accessed 7/18/07
8. Malm, Jan, Eklund, Anders Idiopathic normal pressure hydrocephalus PRACTICAL NEUROLOGY 2006 6: 14-27
9. Marvin A Fishman, MD Hydrocephalus UpToDate 15.2 accessed 7/18/07
10. TE Gammal, MB Allen, Jr, BS Brooks, and EK Mark MR evaluation of hydrocephalus Am. J. Roentgenol., Oct 1987; 149: 807 – 813.
11. C. M. Fisher Hydrocephalus as a cause of disturbances of gait in the elderly Neurology, Dec 1982; 32: 1358.

1.3 Altered Sense of Smell

1.3.1 Suspected tumor affecting Cranial Nerve

1.4 Altered Sense of Taste

1.4.1 Suspected tumor affecting Cranial Nerve

1.15 Dementia [Both]

1.15.1 Prerequisite: Testing for TSH, ELectrolytes, and B12 must be completed and nondiagnostic

1.15.2 Symptoms and Signs

1.15.2.1 Agnosia

1.15.2.2 Aphasia

1.15.2.3 Apraxia

1.15.2.4 Confusion

1.15.2.5 Disorientation

1.15.2.6 Fluctuating cognition

1.15.2.7 Memory loss

1.15.2.8 Mini Mental State score of 24 or less on two occasions

1.15.2.9 Recurrent visual hallucinations

1.15.2.10 Spontaneous motor features of Parkinsonism

1.15.2.11 Trauma, recent history of

References:

1. Knopman DS; DeKosky ST; Cummings JL; Chui H; Corey-Bloom J; Relkin N; Small GW; Miller B; Stevens JC Practice parameter: diagnosis of dementia (an evidence-based review). Report of the Quality Standards Subcommittee of the American Academy of Neurology. Neurology 2001 May 8;56(9):1143-53.

1.16 Diplopia

1.16.1 Pseudotumor Cerebri

1.16.2 Suspect Stroke or TIA

1.16.3 Suspected tumor affecting Cranial Nerve

1.17 Disorientation

1.17.1 Suspect Stroke or TIA

1.18 Dizziness

> **NOTE:**
>
> "The life-time prevalence of dizziness in general population is estimated from 5.5% to 25-30% in the United States depending on the criteria adopted (Kroenke and Mangelsdorff, 1989; Colledge et al., 1994; Yardley et al., 1998b)."

> **NOTE:**
>
> While vertigo is more than dizziness, lightheadedness or imbalance, vertigo requires the patient to experience a sense of spinning, of either the patient, or the surroundings, for the purposes of prior authorization the terms are interchangeable and approval should be issued if any of the following are present:

1.18.1 Altered mental state

1.18.2 Cranial neuropathies

1.18.3 Diabetes mellitus, by history

1.18.4 Hearing Loss

1.18.5 Loss of vision

1.18.6 Nausea or Vomiting

1.18.7 Nystagmus

1.18.8 Stroke, prior history of

1.18.9 Tinnitus

1.18.10 Weakness or paralysis

References:

1. Kevin Barraclough, Adolfo Bronstein Vertigo BMJ 2009;339:b3493, doi: 10.1136/bmj.b3493 (Published 22 September 2009)
2. David E. Newman-Toker, et al; Spectrum of Dizziness Visits to US Emergency Departments: Cross-Sectional Analysis From a Nationally Representative Sample; Mayo Clin Proc. July 2008 83(7):765-775; doi:10.4065/83.7.765
3. C S K Cheung, P S K Mak, K V Manley, J M Y Lam, A Y L Tsang, H M S Chan, T H Rainer, C A Graham Predictors of important neurological causes of dizziness among patients presenting to the emergency department Emerg Med J 2010;27:517-521 doi:10.1136/emj.2009.078014
4. Ropper AH, Brown RH, “Chapter 15. Deafness, Dizziness, and Disorders of Equilibrium” (Chapter). Ropper AH, Brown RH: Adams and Victor’s Principles of Neurology, 8th Edition
5. Daroff Robert B, “Chapter 22. Dizziness and Vertigo” (Chapter). Fauci AS, Braunwald E, Kasper DL, Hauser SL, Longo DL, Jameson JL, Loscalzo J: Harrison’s Principles of Internal Medicine, 17th Edition:
6. Jeffrey P. Staab; Michael J. Ruckenstein Expanding the Differential Diagnosis of Chronic Dizziness Arch Otolaryngol Head Neck Surg. 2007;133(2):170-176.
7. Irwin Nazareth , Lucy Yardley , Natalie Owen , and Linda Luxon Outcome of symptoms of dizziness in a general practice community sample Fam. Pract. 16: 616-618.
8. M Wasay, N Dubey, and R Bakshi Emerg Dizziness and yield of emergency head CT scan: Is it cost effective? Med J. 2005 April; 22(4): 312. doi: 10.1136/emj.2003.012765. PMCID: PMC1726733
9. Ramos, R Antidepressants and Dizziness Journal of Psychopharmacology 20:5 (sept 2003) p 708

1.19 Drowsiness

1.19.1 Suspect Stroke or TIA

1.20 Dysequilibrium See Dizziness

1.21 Dysarthria

1.21.1 Suspect Stroke or TIA

1.22 Dysphagia

1.22.1 Suspect Stroke or TIA

1.23 Facial weakness or numbness

1.23.1 Suspected tumor affecting Cranial Nerve

1.24 Focal or generalized seizures

1.24.1 Altered pattern

1.24.2 Cerebral Venous Thrombosis

1.24.3 Infection (fever, elevated white count, immunosuppressed)

1.24.4 New onset

1.24.5 Prior to Surgical intervention

1.24.6 Trauma

References

1. L. Santiago Medina, Byron Bernal, Catalina Dunoyer, Luisa Cervantes, Marelis Rodriguez, Esperanza Pacheco, Prasanna Jayakar, Glenn Morrison, John Ragheb, and Nolan R. Altman
2. Seizure Disorders: Functional MR Imaging for Diagnostic Evaluation and Surgical Treatment—Prospective Study Radiology July 2005 236:247-253;
3. William G. Bradley and Randolph B. Shey MR Imaging Evaluation of Seizures Radiology March 2000 214:651-656
4. The evaluation of seizures is a common indication for magnetic resonance (MR) imaging and accounts for 1% of all MR imaging studies performed. While computed tomography (CT) can be used in the detection of some lesions, MR imaging is clearly the more sensitive imaging technique, particularly in the detection of early disease.’
5. U C Wieshmann Clinical application of neuroimaging in epilepsy J. Neurol. Neurosurg. Psychiatry April 1, 2003 74:466-47

1.25 Gait Disturbance

1.25.1 Acoustic neuroma

1.25.2 Hydrocephalus

1.26 Headache ANY ONE

1.26.1 Altered level of consciousness, cognitive ability or personality

1.26.2 Carotid dissection, suspected

1.26.2.1 Horner's syndrome, miosis and ptosis (contraction of the iris, drooping eyelid)

1.26.2.2 Minor neck trauma (includes chiropractic manipulation)

1.26.2.3 Neck pain

1.26.2.4 Transient Ischemic Attacks (TIA)

1.26.2.5 Unilateral facial or orbital pain

1.26.2.6 Unilateral headaches

References:

1. Stewart Lloyd Carotid artery dissection following minimal postural trauma in a firefighter Occup Med (Lond) 54: 430-431.
2. B Thanvi, S K Munshi, S L Dawson, T G Robinson Carotid and vertebral artery dissection syndromes Postgrad Med J 2005;81:383-388
3. Ernst, E Adverse effects of spinal manipulation: a systematic review J R Soc Med 2007 100: 330-338
4. D J M Macdonald, E C A McKillop Carotid artery dissection after treadmill running Br J Sports Med 2006
5. Cerebral Venous Thrombosis
6. Change of established headache pattern
7. Elevated WBC
8. Exercise or exertion lead to headache
9. Fever
10. Horner's Syndrome
11. Hydrocephalus, Suspected obstructive
12. Immunosuppressed
13. Infection elsewhere in body
14. New headaches in persons below age 5 or over 50

1.26.13 Pain

1.26.13.1 Neck

1.26.13.2 Shoulder

1.26.14 Papilledema

1.26.15 Sudden onset after recent trauma, straining or manipulation

1.26.16 Sudden onset of "worst headache"

1.26.17 Suspected Pseudotumor Cerebri

1.26.18 Suspected subarachnoid hemorrhage (SAH)

1.26.19 Syncope

1.26.20 Thunderclap (sudden onset and severe)

1.26.21 Trauma, recent history of

1.26.22 Valsalva or straining worsens headache

1.26.23 Vertigo

1.26.24 Vomiting

1.26.25 Wakens from sleep

References:

1. Evidence Based Guidelines in the Primary Care Setting: Neuroimaging in Patients with Nonacute Headache, p14, accessed at www.aan.com/professionals/practice/pdfs/gl0088.pdf 6/24/07
2. British Association for the Study of Headache Concise Headache Management Guidelines
3. D W Dodick Thunderclap headache J. Neurol. Neurosurg. Psychiatry, Jan 2002; 72: 6.
4. Adams and Victor's Principles of Neurology, 8th Edition Allan H. Ropper, Robert H. Brown Eds. p157
5. Yoshito T, and Endo K, MR imaging in the evaluation of chronic or recurrent headache, Radiology, 2005; 235:575-579.
6. Beithon F, Detlie E, Hult C, et al, Health care guideline: diagnosis and treatment of headache, Eighth edition, January 2007, Institute for Clinical Systems Improvement
7. Frishberg BM, Rosenberg JH, Matchar DB, et al, Evidence-based guidelines in the primary care setting: neuroimaging in patients with nonacute headacheSeptember 20, 2007.
8. Strain JD, Cohen HL, Fordham L, et al, Expert panel on neurologic imaging, ACR Appropriateness Criteria, Headache- Child
9. Jordan, JE, Seidenwurm DJ, Davis PC, et al, Expert panel on neurologic imaging, ACR Appropriateness Criteria, Headache
10. Sandrin G, Friberg L, Janig W, et al, Neurophysiological tests and neuroimaging procedures in non-acute headache: guidelines and recommendations, Eur J Neurology,2004; 11:217-224.
11. Hearing loss, unilateral
12. Hemiparesis

1.29 Impaired vision

1.29.1 Suspect Stroke or TIA

1.30 Lethargy or Coma.

1.31 Lightheadedness See Dizziness

1.32 Memory loss

1.32.1 Suspect Stroke or TIA

1.33 Mental status changes

1.33.1 Cerebral Venous Thrombosis

1.33.2 Hydrocephalus, Suspected obstructive

1.33.3 Suspect Stroke or TIA

1.34 Motor weakness affecting a limb, or one side of the face or body.

1.34.1 Suspect Stroke or TIA

1.35 Optic neuritis

1.35.1 Marcus Gunn pupil Asymmetric pupillary response to light

1.35.2 Ophthalmoplegia paralysis of some or all of the muscles of the eye

1.35.3 Pain with movement of the eye

1.35.4 Scotoma

References

1. Balcer, LJ. Clinical practice. Optic neuritis. N Engl J Med 2006; 354:1273.
2. Riordan-Eva P. Chapter 7. Disorders of the Eyes & Lids. In: McPhee SJ, Papadakis MA, Rabow MW, eds. CURRENT Medical Diagnosis & Treatment 2012. New York: McGraw-Hill; 2012. Accessed November 25, 2012.
3. Hickman SJ, Toosy AT, Miszkiel KA, Jones SJ, Altmann DR, MacManus DG, Plant GT, Thompson AJ, Miller DH Visual recovery following acute optic neuritis–a clinical, electrophysiological and magnetic resonance imaging study. J Neurol. 2004;251(8):996. Rizzo JF 3rd, Andreoli CM, Rabinov JD Use of magnetic resonance imaging to differentiate optic neuritis and nonarteritic anterior ischemic optic neuropathy. Ophthalmology. 2002;109(9):1679. Kupersmith MJ, Alban T, Zeiffer B, Lefton D Contrast-enhanced MRI in acute optic neuritis: relationship to visual performance. Brain. 2002;125(Pt 4):812. G. R. Bonhomme, A. T. Waldman, L. J. Balcer, A. B. Daniels, G. I. Tennekoon, S. Forman, S. L. Galetta, and G. T. Liu Pediatric optic neuritis: Brain MRI abnormalities and risk of multiple sclerosis Neurology, Mar 2009; 72: 881 – 885.

1.36 Pain with movement of the eye

1.36.1 Optic neuritis or MS suspected

1.37 Paresthesias

1.37.1 MS suspected

1.38 Ptosis

1.38.1 Suspected tumor affecting Cranial Nerve

1.39 Recurrence of symptoms after antibiotic therapy

1.40 Scotoma

References

1. Thomas Dhanes, Graham Elizabeth M, “Chapter 15. Ocular Disorders Associated with Systemic Diseases” (Chapter). Riordan-Eva P, Whitcher JP: Vaughan & Asbury’s General Ophthalmology, 17th Edition:
2. R C J M Donders Clinical features of transient monocular blindness and the likelihood of atherosclerotic lesions of the internal carotid artery J. Neurol. Neurosurg. Psychiatry, Aug 2001; 71: 247 – 249.
3. J. Neurol. Neurosurg. Psychiatry E L L M De Schryver, A Algra, R C J M Donders, J van Gijn, and L J Kappelle Type of stroke after transient monocular blindness or retinal infarction of presumed arterial origin J. Neurol. Neurosurg. Psychiatry, June 1, 2006; 77(6): 734 – 738.

1.41 Seizure

1.41.1 Altered pattern

1.41.2 Cerebral Venous Thrombosis

1.41.3 Infection (fever, elevated white count, immunosuppressed)

1.41.4 New onset

1.41.5 Prior to Surgical intervention

1.41.6 Trauma

References:

1. L. Santiago Medina, Byron Bernal, Catalina Dunoyer, Luisa Cervantes, Marelis Rodriguez, Esperanza Pacheco, Prasanna Jayakar, Glenn Morrison, John Ragheb, and Nolan R. Altman
2. Seizure Disorders: Functional MR Imaging for Diagnostic Evaluation and Surgical Treatment—Prospective Study Radiology July 2005 236:247-253;
3. William G. Bradley and Randolph B. Shey MR Imaging Evaluation of Seizures Radiology March 2000 214:651-656
4. The evaluation of seizures is a common indication for magnetic resonance (MR) imaging and accounts for 1% of all MR imaging studies performed. While computed tomography (CT) can be used in the detection of some lesions, MR imaging is clearly the more sensitive imaging technique, particularly in the detection of early disease.’
5. U C Wieshmann Clinical application of neuroimaging in epilepsy J. Neurol. Neurosurg. Psychiatry April 1, 2003 74:466-47
6. ACR Appropriateness Criteria

1.42 Spasticity

1.42.1 MS suspected

1.43 Stiff neck

1.43.1 Headache

1.44 Syncope

1.44.1 Headache

1.45 Tinnitus (See Tinnitus Algorithm Page)

1.45.1 Non pulsatile

1.45.1.1 Suggest MRI with gadolinium

1.45.2 Pulsatile

1.45.2.1 Suggest CTA or MRA of the brain, can approve contrast enhanced CT or MRI

References:

1. Henry, J. A., et. al., General Review of Tinnitus: Prevalence, Mechanisms, Effects, and Management. Journal of Speech, Language, and Hearing Research v. 48 no. October 2005) p. 1204-35
2. Jane L. Weissman and Barry E. Hirsch Imaging of Tinnitus: A Review Radiology August 2000 216:2 342-349
3. Lockwood, Alan H., Salvi, Richard J., Burkard, Robert F. Tinnitus N Engl J Med 2002 347: 904-910
4. Transient visual obscurations,

1.47 Tremor

1.47.1 Recent trauma

1.47.2 Stroke or TIA Suspected

1.47.2.1 Ataxia (unsteady and clumsy motion of the limbs or trunk)

1.47.2.2 Cognitive dysfunction

1.47.2.2.1 Memory loss

1.47.2.2.2 Confusion

1.47.2.2.3 Disorientation or

1.47.2.2.4 Behavioral changes

1.47.2.3 Decreased sensation on one side

1.47.2.4 Difficulty Speaking

1.47.2.5 Dysphagia

1.47.2.6 Impaired vision

1.47.2.6.1 Amaurosis fugax

1.47.2.6.2 Visual field loss

1.47.2.6.3 Diplopia

1.47.2.7 Syncope

1.47.2.8 Vertigo

1.47.2.9 weakness on one side

References:

1. Wintermark, Max, et al Acute Stroke Imaging Research Roadmap Stroke 39: 1621-1628;
2. American Heart Association Council on Cardiovascular Radiology and Intervention, Stroke Council, and the Interdisciplinary Council on Peripheral Vascular Disease Recommendations for Imaging of Acute Ischemic Stroke: A Scientific Statement From the American Heart Association Stroke 40: 3646-3678;
3. Urinary incontinence

1.49 Vertigo (also Dizziness)

> **NOTE:**
>
> While vertigo is more than dizziness, lightheadedness or imbalance, vertigo requires the patient to experience a sense of spinning, of either the patient, or the surroundings, for the purposes of prior authorization the terms are interchangeable and approval should be issued if any of the following are present:

1.49.1 Altered mental state

1.49.2 Cranial neuropathies

1.49.3 Diabetes mellitus, by history

1.49.4 Hearing Loss

1.49.5 Loss of vision

1.49.6 Nausea or Vomiting

1.49.7 Nystagmus

1.49.8 Stroke, prior history of

1.49.9 Tinnitus

1.49.10 Weakness or paralysis

References:

1. Kevin Barraclough, Adolfo Bronstein Vertigo BMJ 2009;339:b3493, doi: 10.1136/bmj.b3493 (Published 22 September 2009) David E. Newman-Toker, et al; Spectrum of Dizziness Visits to US Emergency Departments: Cross-Sectional Analysis From a Nationally Representative Sample; Mayo Clin Proc. July 2008 83(7):765-775; doi:10.4065/83.7.765
2. C S K Cheung, P S K Mak, K V Manley, J M Y Lam, A Y L Tsang, H M S Chan, T H Rainer, C A Graham Predictors of important neurological causes of dizziness among patients presenting to the emergency department Emerg Med J 2010;27:517-521 doi:10.1136/emj.2009.078014 Ropper AH, Brown RH, “Chapter 15. Deafness, Dizziness, and Disorders of Equilibrium” (Chapter). Ropper AH, Brown RH: Adams and Victor’s Principles of Neurology, 8th Edition Daroff Robert B, “Chapter 22. Dizziness and Vertigo” (Chapter). Fauci AS, Braunwald E, Kasper DL, Hauser SL, Longo DL, Jameson JL, Loscalzo J: Harrison’s Principles of Internal Medicine, 17th Edition:
3. Jeffrey P. Staab; Michael J. Ruckenstein Expanding the Differential Diagnosis of Chronic Dizziness Arch Otolaryngol Head Neck Surg. 2007;133(2):170-176.
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5. M Wasay, N Dubey, and R Bakshi Emerg Dizziness and yield of emergency head CT scan: Is it cost effective? Med J. 2005 April; 22(4): 312. doi: 10.1136/emj.2003.012765. PMCID: PMC1726733
6. Ramos, R Antidepressants and Dizziness Journal of Psychopharmacology 20:5 (sept 2003) p 708

1.50 Visual disturbance

1.50.1 Optic neuritis (see entry above)

1.50.2 Suspect Stroke or TIA

1.51 Vomiting

1.51.1 Cerebral Venous Thrombosis

1.51.2 Infection (fever, elevated white count, immunosuppressed)

1.51.3 Trauma

1.52 Weakness

2 Working Diagnosis or Rule Out presented as primary indication

2.1 Acoustic neuroma or cerebellar pontine angle tumors

2.1.1 Altered sense of taste

2.1.2 Facial weakness or numbness

2.1.3 Gait Disturbance

2.1.4 Hearing loss, unilateral

2.1.5 Tinnitus

References:

1. Johnson Jacob, Lalwani Anil K, “Chapter 61. Vestibular Schwannoma (Acoustic Neuroma)” (Chapter). Lalwani AK: CURRENT Diagnosis & Treatment in Otolaryngology-Head & Neck Surgery, 2nd Edition:

2.2 Altered level of consciousness, cognitive ability or personality

2.2.1 Headache

2.2.2 Known or suspected infectious process, or abscess

2.2.2.1 Elevated WBC

2.2.2.2 Fever

2.2.3 Multiple Sclerosis (MS)

2.2.4 Stroke

2.2.5 Suspected Pseudotumor Cerebri

2.2.6 Trauma, recent history of

2.2.7 Vasculitis

References:

1. Practice parameter: the utility of neuroimaging in the evaluation of headache in patients with normal neurological examinations (summary statement). Report of the Quality Standards Subcommittee of the American Academy of Neurology. Neurology 1994; 44:1353-1354.
2. F. K. Alehan; Value of Neuroimaging in the Evaluation of Neurologically Normal Children With Recurrent Headache; J Child Neurol, January 1, 2002; 17(11): 807 – 809.
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4. Yoshito Tsushima, and Keigo Endo; MR Imaging in the Evaluation of Chronic or Recurrent Headache; Radiology 2005 235: 575-579
5. Dodick, David W.; Chronic Daily Headache;N Engl J Med 2006 354: 158-165
6. Michael E. Detsky, BSc; Devon R. McDonald, BSc; Mark O. Baerlocher, MD; George A. Tomlinson, PhD; Douglas C. McCrory, MD, MHSc; Christopher M. Booth, MD, FRCPC; Does This Patient With Headache Have a Migraine or Need Neuroimaging?; JAMA. 2006;296:1274-1283.
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8. Malm, Jan, Eklund, Anders Idiopathic normal pressure hydrocephalus PRACTICAL NEUROLOGY 2006 6: 14-27
9. Marvin A Fishman, MD Hydrocephalus UpToDate 15.2 accessed 7/18/07
10. TE Gammal, MB Allen, Jr, BS Brooks, and EK Mark MR evaluation of hydrocephalus Am. J. Roentgenol., Oct 1987; 149: 807 – 813.
11. C. M. Fisher Hydrocephalus as a cause of disturbances of gait in the elderly Neurology, Dec 1982; 32: 1358.

2.3 Arnold Chiari Malformation

2.3.1 Down Beating nystagmus

2.3.2 Follow up known Chiari

2.3.3 Headache

2.3.4 Incontinence

2.3.5 Lumbar myelomeningocele

2.3.6 Neck or back pain

2.3.7 Progressive cerebellar ataxia

2.3.8 Sensory loss

2.3.9 Spasticity

2.3.10 Syncope

2.3.11 Tethered cord

References:

1. Greenlee JDW, Donovan KA, Hasan DM, et al, Chiari I malformation in the very young child: the spectrum of presentations and experience in 31 children under age 6 years, Pediatrics, 2002; 110:1212-1219.
2. Wu YW, Chin CT, Chan KM, et al, Pediatric Chiari I malformations Do clinical and radiologic features correlate? Neurology, 1999;
3. Bridgette Arnett Arnold-Chiari Malformation Arch Neurol. 2003;60(6):898-900.
4. Masson C, Colombani JM Chiari type 1 malformation and magnetic resonance imaging PRESSE MEDICALE Volume: 34 Issue: 21 Pages: 1662-1667 DEC 3 2005

2.4 Aneurysm Suspected

2.4.1 MRA or CTA preferred. If ordered without MRA or CTA send for physician review

References

1. Kaufmann, Timothy J., Kallmes, David F. Diagnostic Cerebral Angiography: Archaic and Complication-Prone or Here to Stay for Another 80 Years? Am. J. Roentgenol. 2008 190: 1435-1437
2. Philip M. White, Evelyn M. Teasdale, Joanna M. Wardlaw, and Valerie Easton Intracranial Aneurysms: CT Angiography and MR Angiography for Detection—Prospective Blinded Comparison in a Large Patient Cohort Radiology June 2001 219:739-749
3. Mika Okahara, Hiro Kiyosue, Masanori Yamashita, Hirohumi Nagatomi, Hiroyuki Hata, Toshiyuki Saginoya, Yoshiko Sagara, and Hiromu Mori Diagnostic Accuracy of Magnetic Resonance Angiography for Cerebral Aneurysms in Correlation With 3D–Digital Subtraction Angiographic Images: A Study of 133 Aneurysms Stroke 33: 1803-1808,

2.5 ArterioVenous Malformation

2.5.1 Interval reassessment

2.6 Cavernous Sinus Thrombosis See Cerebral Venous Thrombosis

2.7 Cerebral Venous Thrombosis Two Symptoms or ONE Symptom and ONE Risk Factor

2.7.1 Clinical Signs an Symptoms

2.7.1.1 Calvarial mass

2.7.1.2 Decreased vision

2.7.1.3 Exophthalmous

2.7.1.4 Focal neurologic deficits

2.7.1.5 Focal or generalized seizures,

2.7.1.6 Headache

2.7.1.7 Hemiparesis or paraparesis.

2.7.1.8 Lethargy or Coma.

2.7.1.9 Mental status changes

2.7.1.10 Papilledema

2.7.1.11 Seizure

2.7.1.12 Transient visual deficits

2.7.1.13 Vomiting

2.7.2 Risk Factors

2.7.2.1 Cancer

2.7.2.2 Contraceptive medications

2.7.2.3 Dehydration

2.7.2.4 Erythropoetin Use

2.7.2.5 Hypercoagulable state

2.7.2.6 Marasmus

2.7.2.7 Meningitis

2.7.2.8 Post operative status

2.7.2.9 Post Partum

2.7.2.10 Sinusitis or middle ear infections

2.7.2.11 Skull fracture over dural sinus

2.7.2.12 Tamoxifen Use

References:

1. Poon, Colin S., Chang, Ja-Kwei, Swarnkar, Amar, Johnson, Michele H., Wasenko, John Radiologic Diagnosis of Cerebral Venous Thrombosis: Pictorial Review Am. J. Roentgenol. 2007 189: S64-75
2. Greenberg Robert D, Castleberry Jerry, “Chapter 29. Eye Emergencies” (Chapter). Stone CK, Humphries RL: CURRENT Diagnosis & Treatment: Emergency Medicine, 6th Edition
3. Ropper AH, Brown RH, “Chapter 34. Cerebrovascular Diseases” (Chapter). Ropper AH, Brown RH: Adams and Victor’s Principles of Neurology, 8th Edition

2.8 Dementia Testing for reversible causes that are readily treated should be completed prior to imaging. The tests should include TSH, ELectrolytes, B12

2.8.1 Agnosia

2.8.2 Aphasia

2.8.3 Apraxia

2.8.4 Confusion

2.8.5 Disorientation

2.8.6 Fluctuating cognition

2.8.7 Memory loss

2.8.8 Mini Mental State score of 24 or less on two occasions

2.8.9 Recurrent visual hallucinations

2.8.10 Spontaneous motor features of Parkinsonism

2.8.11 Trauma, recent history of

References:

1. Knopman DS; DeKosky ST; Cummings JL; Chui H; Corey-Bloom J; Relkin N; Small GW; Miller B; Stevens JC Practice parameter: diagnosis of dementia (an evidence-based review). Report of the Quality Standards Subcommittee of the American Academy of Neurology. Neurology 2001 May 8;56(9):1143-53.

2.9 Hydrocephalus

2.9.1 Suspected obstructive hydrocephalus

2.9.1.1 Ataxia

2.9.1.2 Diplopia

2.9.1.3 Gait disturbance

2.9.1.4 Headache

2.9.1.5 Mental status changes

2.9.1.6 Papilledema

2.9.1.7 References:

2.9.2 Normal pressure hydrocephalus (NPH) [One of the following]

2.9.2.1 Gait disturbance

2.9.2.2 Tremors

2.9.2.3 Urinary incontinence, urgency, or frequency

2.9.2.4 Dementia

2.9.2.5 Known NPH with worsening symptoms

2.9.3 Suspicion of VP (ventriculoperitoneal) shunt malfunction

2.9.4 Known hydrocephalus in a child

2.9.4.1 Age 0-5 yrs annually

2.9.4.2 Age 5 or older every 2 years

References:

1. Adams and Victor's Neurology Adams and Victor's Principles of Neurology, 8th Edition Allan H. Ropper, Robert H. BrownChapter 30. Disturbances of Cerebrospinal Fluid and Its Circulation, Including Hydrocephalus, Pseudotumor Cerebri, and Low-Pressure Syndromes

2.10 Infectious Process suspected

2.10.1 Fever, elevated WBC (leukocytosis), known infectious elsewhere, or immunosuppressed AND

2.10.2 Any of the following signs or symptoms

- 2.10.2.1 headache
- 2.10.2.2 drowsiness
- 2.10.2.3 confusion
- 2.10.2.4 disorientation
- 2.10.2.5 apraxia
- 2.10.2.6 aphasia
- 2.10.2.7 vomiting
- 2.10.2.8 seisures
- 2.10.2.9 neck stiffness or pain
- 2.10.2.10 photophobia

2.11 Multiple Sclerosis, Suspected

2.11.1 Altered level of consciousness, cognitive ability or personality

2.11.2 Ataxia

2.11.3 Diplopia

2.11.4 Lhermitte's sign

2.11.5 Ophthalmoplegia

2.11.6 Optic neuritis

2.11.7 Pain with movement of the eye

2.11.8 Parestesias

2.11.9 Scotoma

2.11.10 Spasticity

2.11.11 Uhthoff's phenomenon

2.11.12 Visual disturbances,

2.11.13 Weakness

References:

1. Nueurology in Clinical Practice 3d Ed. Bradley et al Eds. Butterworth Heinman Pub, pp 1638-1642
2. Kremenchutzky, M, Lee, D, Rice, G P A, Ebers, G C Diagnostic brain MRI findings in primary progressive multiple sclerosis Multiple Sclerosis 2000 6: 81-85
3. Harrison's Internal Medicine > Part 15. Neurologic Disorders Chapter 359. Multiple Sclerosis and Other Demyelinating Diseases Stephen L. Hauser, Douglas S. Goodin
4. Poser, CM, Paty, DW, Scheinberg, L, et al. New diagnostic criteria for multiple sclerosis: guidelines for research protocols. Ann Neurol 1983; 13:227.
5. Diagnosis of multiple sclerosis in adults Michael J Olek, DO in UpToDate 17.1
6. Polman, CH, Reingold, SC, Edan, G, et al. Diagnostic criteria for multiple sclerosis: 2005 revisions to the "McDonald Criteria". Ann Neurol 2005; 58:840.

2.12 Optic neuritis

2.12.1 Marcus Gunn pupil Asymmetric pupillary response to light

2.12.2 Ophthalmoplegia paralysis of some or all of the muscles of the eye

2.12.3 Pain with movement of the eye

2.12.4 Scotoma

References

1. Balcer, LJ. Clinical practice. Optic neuritis. N Engl J Med 2006; 354:1273. Riordan-Eva P. Chapter 7. Disorders of the Eyes & Lids. In: McPhee SJ, Papadakis MA, Rabow MW, eds. CURRENT Medical Diagnosis & Treatment 2012. New York: McGraw-Hill; 2012. Hickman SJ, Toosy AT, Miszkiel KA, Jones SJ, Altmann DR, MacManus DG, Plant GT, Thompson AJ, Miller DH Visual recovery following acute optic neuritis–a clinical, electrophysiological and magnetic resonance imaging study. J Neurol. 2004;251(8):996. Rizzo JF 3rd, Andreoli CM, Rabinov JD Use of magnetic resonance imaging to differentiate optic neuritis and nonarteritic anterior ischemic optic neuropathy. Ophthalmology. 2002;109(9):1679.
2. Kupersmith MJ, Alban T, Zeiffer B, Lefton D Contrast-enhanced MRI in acute optic neuritis: relationship to visual performance. Brain. 2002;125(Pt 4):812.
3. R. Bonhomme, A. T. Waldman, L. J. Balcer, A. B. Daniels, G. I. Tennekoon, S. Forman, S. L. Galetta, and G. T. Liu Pediatric optic neuritis: Brain MRI abnormalities and risk of multiple sclerosis Neurology, Mar 2009; 72: 881 – 885.

2.13 Parkinson Disease

2.13.1 Generally ordered to rule our other causes of tremor

2.13.2 Advanced MRI techniques may be approved if conventional imaging leaves doubt.

2.13.3 Prior to Deep Brain stimulation

References:

1. MRI directed bilateral stimulation of the subthalamic nucleus in patients with Parkinson’s disease N K Patel, P Plaha, K O’Sullivan, R McCarter, P Heywood, S S Gill J Neurol Neurosurg Psychiatry 2003;74:1631-1637
2. Patrice Péran, et al Magnetic resonance imaging markers of Parkinson’s disease nigrostriatal signature Brain (2010) 133(11): 3423-3433

2.14 Pituitary pathology (Normal values given below)

2.14.1 Follicular Stimulating Hormone (FSH), abnormal level

2.14.1.1 Male: 1–10 mIU/mL

2.14.1.2 Female: (mIU/mL)

2.14.1.2.1 Follicular 4–13

2.14.1.2.2 Luteal 2–13

2.14.1.2.3 Midcycle 5–22

2.14.1.2.4 Postmenopausal 20–138 (laboratory-specific)

2.14.2 Growth Hormone (GH), abnormal level

2.14.2.1 0–5 ng/mL [mcg/L]

2.14.3 Luteinizing Hormone (LH), abnormal level

2.14.3.1 Male: 1–10 mIU/mL

2.14.3.2 Female: (mIU/mL)

2.14.3.2.1 Follicular 1–18

2.14.3.2.2 Luteal 0.4–20

2.14.3.2.3 Midcycle peak 24–105

2.14.3.2.4 Postmenopausal 15–62 (laboratory-specific)

2.14.4 Prolactin (PRL), abnormal level

2.14.4.1 >20 ng/mL [mcg/L]

2.14.5 Thyroid Stimulating Hormone (TSH), abnormal level

2.14.5.1 0.4–6 mcU/mL [mU/L]

References:

1. Nicoll Diana, McPhee Stephen J, Pignone Michael, Lu Chuanyi Mark, Pocket Guide to Diagnostic Tests, 5e
2. Harrison's Online the complete contents of Harrison's Principles of Internal Medicine, 16th Edition Dennis L. Kasper, Eugene Braunwald, Anthony S. Fauci, Stephen L. Hauser, Dan L. Longo, J. Larry Jameson, and Kurt J. Isselbacher, Eds. Chapter 318. Disorders of the Anterior Pituitary and Hypothalamus Shlomo Melmed, J. Larry Jameson

2.15 Pituitiary Apoplexy

2.15.1 Acute headache with vomiting

2.15.2 Bitemporal hemianopsia

2.15.3 Depressed level of consciousness

References:

1. Frederick Shane, Danzl Daniel F, “Chapter 41. Metabolic & Endocrine Emergencies” (Chapter). Stone CK, Humphries RL: CURRENT Diagnosis & Treatment: Emergency Medicine, 6th Edition:
2. Rita N., AbdelMannan, Dima, Selman, Warren R., Arafah, Baha M. Analytic Review: Pituitary Tumor Apoplexy: A Review J Intensive Care Med 2008 23: 75-90
3. Robert L. Reid; Malachi E. Quigley; Samuel S. C. Yen Pituitary Apoplexy: A Review Arch Neurol. 1985;42(7):712-719.

2.16 Pseudotumor Cerebri

2.16.1 Abducens palsy (inability to deviate the eye laterally)

2.16.2 Altered level of consciousness, cognitive ability or personality

2.16.3 Diplopia

2.16.4 Enlargement of the blind spots

2.16.5 Headache, worse on straining

2.16.6 Papilledema

2.16.7 Visual disturbance

References:

1. Michael J. Aminoff, DSc, MD, FRCP Chapter 24. Nervous System Disorders Current Medical Diagnosis & Treatment 2009, Forty-Eighth Edition Copyright © 2009 by The McGraw-Hill Companies > Chapter 24. Nervous System Disorders
2. Thapa, Rajoo, Mukherjee, Swapan Transient Bilateral Oculomotor Palsy in Pseudotumor Cerebri J Child Neurol 2008 23: 580-581

2.17 Stroke or TIA Suspected

2.17.1 Ataxia (unsteady and clumsy motion of the limbs or trunk)

2.17.2 Cognitive dysfunction

2.17.2.1 Memory loss

2.17.2.2 Confusion

2.17.2.3 Disorientation or

2.17.2.4 Behavioral changes

2.17.3 Decreased sensation on one side

2.17.4 Difficulty Speaking

2.17.5 Dysphagia

2.17.6 Impaired vision

2.17.6.1 Amaurosis fugax

2.17.6.2 Visual field loss

2.17.6.3 Diplopia

2.17.7 Syncope

2.17.8 Vertigo

2.17.9 weakness on one side

References:

1. Wintermark, Max, et al Acute Stroke Imaging Research Roadmap Stroke 39: 1621-1628;
2. American Heart Association Council on Cardiovascular Radiology and Intervention, Stroke Council, and the Interdisciplinary Council on Peripheral Vascular Disease Recommendations for Imaging of Acute Ischemic Stroke: A Scientific Statement From the American Heart Association Stroke 40: 3646-3678;
3. Tic Doloreux See Trigeminal Neuralgia

2.19 Trigeminal Neuralgia

2.19.1 Recurrent severe pain involving the face.

2.19.1.1 Trigeminal reflex tests abnormal or not feasible

2.19.1.2 Failure to respond to medical therapy (e.g. carbamazepine or another anticonvulsant)

References:

1. G. Gronseth, G. Cruccu, J. Alksne, C. Argoff, M. Brainin, K. Burchiel, T. Nurmikko, and J. M. Zakrzewska, MD, FDSRCS, FFDRCSI Practice Parameter: The diagnostic evaluation and treatment of trigeminal neuralgia (an evidence-based review): Report of the Quality Standards Subcommittee of the American Academy of Neurology and the European Federation of Neurological Societies Neurology October 7, 2008 71:1183-1190; published ahead of print August 20, 2008,
2. A. Pichiecchio, Bilateral trigeminal enhancement on magnetic resonance imaging in a patient with multiple sclerosis and trigeminal neuralgia Mult Scler July 2007 13: 814-816
3. Mills, R J, Young, C A, Smith, E T Central trigeminal involvement in multiple sclerosis using high-resolution MRI at 3 T Br J Radiol 2010 83: 493-498 NOTE: This study found no correlation between MRI findings and symptomatorlogy.
4. Roshan Koul, Amna Alfutaisi, Rajeev Jain, and Faisal Alzri Trigeminal Neuralgia Due to Anterior Inferior Cerebellar Artery Loop: A Case Report J Child Neurol August 2009 24: 989-990
5. Cruccu G, Biasiotta A, Galeotti F, Iannetti GD, Truini A, Gronseth G. Diagnostic accuracy of trigeminal reflex testing in trigeminal neuralgia. Neurology. 2006 Jan 10;66(1):139-41.
6. Goh BT, Poon CY, Peck RH. The importance of routine magnetic resonance imaging in trigeminal neuralgia diagnosis. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2001;92:424–429.
7. Dandy Walker cyst
8. Encephalocele

2.22 Microcephaly

2.22.1 Head circumference less than 2 standard deviations below average for age

2.23 Macrocephaly

2.23.1 Head circumference greater than 2 standard deviations above average for age

2.24 Developmental delay

2.25 Other congenital anomalies

2.25.1 Send to physician review

2.26 Intracranial hemorrhage suspected

2.26.1 Head trauma

2.26.1.1 Amnesia

- 2.26.1.2.Altered level of consciousness
- 2.26.1.3.Vomiting

2.26.1.4 Seizure

2.26.1.5 Coagulopathy or current treatment with heparin or Coumadin

2.26.1.6 Skull fracture

2.26.1.7 Ataxia

2.26.1.8 Aphasia

2.26.1.9 Decreased sensation in a limb

2.26.1.10 Visual field loss

2.26.1.11 Double vision

2.26.1.12 Memory loss

2.26.2 Subarachnoid hemorrhage

2.26.2.1. Vomiting

2.26.2.2 Sudden severe hypertension

2.26.2.3. Decreased level of consciousness

2.26.2.4 Thunderclap headache

2.26.2.5. Worst headache of life

2.26.2.6 Known aneurysm

2.26.2.7 Treated aneurysm and/or AVM with new headache or neurologic findings

2.26.2.8 Stiff neck

2.26.2.9 Seizures

2.26.2.10 Third nerve palsy

2.26.3 Intracerebral hemorrhage

2.26.3.1 Hypertension with new onset headache

2.26.3.2 Known brain tumor with new neurologic findings

2.26.3.4 New onset of neurologic symptoms

2.27 Brain tumor, mass, structural lesion suspected

- 2.27.1 Motor weakness affecting a limb, face, or body
- 2.27.2 Decreased sensation affecting a limb, face or body
- 2.27.3 Ataxia
- 2.27.4 Confusion, memory loss, or disorientation
- 2.27.5 Visual disturbance
- 2.27.6 Aphasia
- 2.27.7 Dysarthria
- 2.27.8 Dysphagia
- 2.27.9. Vertigo with headache or nystagmus
- 2.27.10 Numbness, tingling, paresthesias
- 2.27.11 Papilledema
- 2.27.12 Stiff neck
- 2.27.13 New onset of severe headache
- 2.27.14 Drowsiness
- 2.27.15 Vomiting
- 2.27.16 Nystagmus
- 2.27.17 Cranial nerve palsy
- 2.27.18 Gait disturbance
- 2.27.19 Personality or behavioral changes
- 2.27.20 New seizures
- 2.27.21 Hearing loss or tinnitus
- 2.27.22 Sudden falls

2.28 Suspected tumor of cranial nerves

2.28.1 Anosmia

2.28.2 Weakness of muscles of mastication

2.28.3 Sensory loss in the head and neck

2.28.4 Weakness or paralysis of facial expression

2.28.5 Weakness of the palate

2.28.6 Vocal cord paralysis

2.28.7 Weakness of the sternocleidomastoid muscle

2.28.8 Weakness or paralysis of the trapezius

2.28.9 Weakness or paralysis of the tongue

2.29 Neurofibromatosis

2.29.1 First-degree relative with neurofibromatosis 1 or 2

2.29.2 Scoliosis

2.29.3 Seizure disorder

2.29.4 Peripheral neurofibromas

2.29.5 Hearing loss

- 2.29.6.Brain tumor suspected

2.29.7 Spinal cord tumor

2.29.8 Lisch nodules in the iris of the eye

2.29.9 Bone dysplasia

2.29.10 Headache

3 Abnormal Physical Exam Finding presented as primary indication

3.1 Abducens palsy (inability to deviate the eye laterally)

References:

1. Current Consult: Medicine, 2006 by Maxine A. Papadakis, Stephen J. McPhee Copyright © 2006 by The McGraw-Hill Companies, Inc.
2. Friedman DI: Pseudotumor cerebri. Neurol Clin 2004;22:99
3. Adams and Victor's Principles of Neurology,8th Edition Allan H. Ropper, Robert H. Brown Eds. Copyright © 2005,> Chapter 10. Headache and Other Craniofacial Pains > Principal Varieties of Headache
4. Simon, J.E., Morgan, S.C., Pexman, J.H.W., Hill, M.D., Buchan, A.M. CT assessment of conjugate eye deviation in acute stroke Neurology 2003 60: 135-137
5. Hauser Stephen L, Goodin Douglas S, "Chapter 375. Multiple Sclerosis and Other Demyelinating Diseases" (Chapter). Fauci AS, Braunwald E, Kasper DL, Hauser SL, Longo DL, Jameson JL, Loscalzo J: Harrison's Principles of Internal Medicine, 17th Edition:

3.2 Alternating focal neurologic deficits,

3.2.1 Cerebral Venous Thrombosis

3.3 Amnesia

3.3.1 Suspect Stroke or TIA 3.3.2 Trauma

3.4 Aphasia

3.4.1 Suspect Stroke or TIA

3.5 Apraxia

3.5.1 Normal Pressure Hydrocephalus (NPH suspected)

3.6 Ataxia

3.6.1 Hydocephalus

3.6.2 Multiple Sclerosis

3.6.3 Suspect Stroke or TIA

3.7 Bitemporal hemianopsia

3.8 Change in clinical status after stroke

3.9 Cognitive dysfunction

3.9.1 Suspect Stroke or TIA

3.10 Decreased sensation, Unilateral

3.10.1 Suspect Stroke or TIA

3.11 Enlargement of the blind spots

3.12 Focal neurologic finding

3.12.1 Fever

3.12.2 Trauma

3.12.3 Suspect Stroke or TIA

3.13 Mental status changes

3.13.1 Cerebral Venous Thrombosis

3.13.2 Hydrocephalus, Suspected obstructive

3.13.3 Suspect Stroke or TIA

3.14 Motor perseveration

3.14.1 Normal Pressure Hydrocephalus (NPH), Suspected

3.15 Ophthalmoplegia

3.15.1 Pituitiary Apoplexy

3.15.1.1 Acute headache with vomiting

3.15.1.2 Bitemporal hemianopsia

3.15.1.3 Depressed level of consciousness

References:

1. Frederick Shane, Danzl Daniel F, “Chapter 41. Metabolic & Endocrine Emergencies” (Chapter). Stone CK, Humphries RL: CURRENT Diagnosis & Treatment: Emergency Medicine, 6th Edition: 3.15.1.4.2 Rita N., AbdelMannan, Dima, Selman, Warren R., Arafah, Baha M. Analytic Review: Pituitary Tumor Apoplexy: A Review J Intensive Care Med 2008 23: 75-90 3.15.1.4.3 Robert L. Reid; Malachi E. Quigley; Samuel S. C. Yen Pituitary Apoplexy: A Review Arch Neurol. 1985;42(7):712-719.
2. Suspected Multiple Sclerosis

References

1. Simon, J.E., Morgan, S.C., Pexman, J.H.W., Hill, M.D., Buchan, A.M. CT assessment of conjugate eye deviation in acute stroke Neurology 2003 60: 135-137
2. Hauser Stephen L, Goodin Douglas S, “Chapter 375. Multiple Sclerosis and Other Demyelinating Diseases” (Chapter). Fauci AS, Braunwald E, Kasper DL, Hauser SL, Longo DL, Jameson JL, Loscalzo J: Harrison’s Principles of Internal Medicine, 17th Edition:
3. Papilledema

3.17 Ptosis

3.17.1 Suspected tumor affecting Cranial Nerve

3.18 Visual field loss

4 Abnormal Lab or Imaging presented as primary indication

4.1 Follicular Stimulating Hormone (FSH), abnormal level

4.2 Growth Hormone (GH), abnormal level

4.3 Luteinizing Hormone (LH), abnormal level

4.4 Prolactin (PRL), abnormal level

4.5 Thyroid Stimulating Hormone (TSH), abnormal level

5 Significant Prior Medical History presented as primary indication

5.1 Alzheimer's Disease

5.1.1 Imaging required while on treatment (monoclonal antibody therapy)

5.2 Cushing Disease or Syndrome, Known

5.2.1 Neurosarcoid, known

5.2.1.1 Cranial nerve palsy

5.2.1.2 Headache

5.2.1.3. Seizure

5.2.1.4 Sensory deficit

5.2.1.5. Pituitary dysfunction

5.2.1.6. Vision loss

5.2.1.7 Cognitive changes

5.2.1.8 Psychiatric symptoms

5.3 HIV infection

5.4 Lyme Disease

> **NOTE:**
>
> Between 3 and 32 days following the tick bite, which the patient may not notice, a gradually expanding area of redness with clearing (erythema migrans) occurs at the bite site. The involved skin is warm but not particularly tender to touch. About half of affected patients will develop smaller lesions of similar morphology at areas remote from the bite site over ensuing days to weeks. In stage-1 disease (erythema migrans), often there are fever, chills, malaise, and regional lymphadenopathy. In stage 2 (days to weeks after infection), symptoms related to the multisystemic nature of Lyme borreliosis often appear, such as meningitis, hepatitis, sore throat, dry cough, heart block and other cardiac abnormalities, musculoskeletal pain, and neuropathy. Fatigue and lethargy are prominent and may persist for months after the skin lesions have disappeared. Jaffe Jon, Morris James E, “Chapter 40. Infectious Disease Emergencies” (Chapter). Stone CK, Humphries RL: CURRENT Diagnosis & Treatment: Emergency Medicine, 6th Edition:

5.4.2 Focal neurologic finding And ONE

5.4.2.1 Clinical Diagnosis of Lyme Disease

5.4.2.1.1 Characteristic rash

5.4.2.1.2 Erythema Migrans

5.4.2.1.3 Joint pain

5.4.2.2 Fever

5.4.2.3 Positive Lyme titers

5.4.3 Meningitis TWO

5.4.3.1 CSF findings

5.4.3.2 Fever

5.4.3.3 Headache

5.4.3.4 Mental status change

5.4.3.5 Nuchal rigidity

5.4.3.6 Photophobia

References:

1. J. Oksi , H. Kalimo , R. J. Marttila , M. Marjamaki , P. Sonninen , J. Nikoskelainen , and M. K. Viljanen Inflammatory brain changes in Lyme borreliosis: A report on three patients and review of literature Brain 119: 2143-2154.
2. P Oschmann, W Dorndorf, C Hornig, C Schäfer, HJ Stages and syndromes of neuroborreliosis Journal of neurology, Volume 245, Number 5 247-255 May, 1998

5.5 Mass or tumor, known intracranial

5.5.1 Changing clinical condition

5.5.2 Interval reevaluation

References:

1. Zimmerman, RD, Fleming, CA, Saint-Louis, LA, Lee, BC, Manning, JJ, Deck, MD Magnetic resonance imaging of meningiomas AJNR Am J Neuroradiol 1985 6: 149-157
2. Melanoma, Initial Staging of Disease

5.7 Metastatic, any primary, Suspected

5.7.1 Changing clinical condition

5.8 Multiple Sclerosis, Known

5.8.1 Altered clinical picture

5.8.2 Annual follow up

5.8.3 If under treatment 6 month follow ups are permitted

References:

1. Filippi M, Rocca MA, Arnold DL, et al, ESFN guidelines of the use of neuroimaging in the management of multiple sclerosis, Eur J Neuro, 2006; 13:313-325.
2. Sarcoma, Initial Staging of Disease
3. Small cell lung cancer, Initial Staging of Disease

5.11 Trauma CT Preferred, especially early

5.11.1 Amnesia

5.11.2 Altered consciousness

5.11.3 Vomiting

5.11.4 Focal neurologic finding

5.11.5 Headache

5.11.6 Seizure

5.11.7 Coagulopathy

References:

1. Kirsch Thomas D, Lipinski Christopher A, “Chapter 255. Head Injury” (Chapter). Tintinalli JE, Kelen GD, Stapczynski JS, Ma OJ, Cline DM: Tintinalli’s Emergency Medicine: A Comprehensive Study Guide, 6e: