



## **Neuroradiology Continuing Certification Exam Study Guide**

This exam content assesses the diplomate's knowledge and skills related to the clinical practice of neuroradiology. The domain encompasses the brain, skull base, orbit, face, neck, and spine. Common modalities and procedures covered include CT, MRI including diffusion imaging, CT or MRI angiography, CT or MRI perfusion, x-rays, and common neuroradiology procedures such as myelography, catheter angiography, and routine biopsies. Cases will be examples of common entities that can be expected to be seen in a typical neuroradiology practice.

### **Domain Critical Concepts**

1. Identify imaging features of stroke (hemorrhagic and non-hemorrhagic) and understand basics of imaging workup
2. Diagnose common white matter diseases in the brain and spinal cord including multiple sclerosis, acute demyelinating encephalomyelitis (ADEM) and other inflammatory diseases
3. Recognize fundamental imaging features of common tumors and vascular lesions in the brain, spine, and head and neck, and understand basics of their management
4. Identify normal anatomy and anatomic variants in the brain, spine, and head and neck
5. Diagnose common congenital abnormalities in the brain, spine, and head and neck
6. Diagnose common infections in the brain, spine, and head and neck

### **Domain Blueprint**

1. Brain:
  - a. Inflammatory/demyelinating
  - b. Vascular
  - c. Degenerative
  - d. Trauma
  - e. Tumor
  - f. Metabolic/toxic
  - g. Congenital/developmental
  - h. Anatomy
  - i. Cyst/hydrocephalus
  - j. Pineal region
  - k. Ventricles
  - l. Calvarium
2. Extracranial Head & Neck:
  - a. Sella/parasellar
  - b. Cerebellopontine Angle-Internal Auditory Canal (CPA-IAC) and Temporal bone
  - c. Skull base

- d. Orbit/ocular
  - e. Nose and sinus
  - f. Facial bones including maxilla and mandible
  - g. Suprahyoid and infrahyoid neck and oral cavity
3. Spine:
- a. Inflammatory/demyelinating
  - b. Vascular
  - c. Degenerative
  - d. Trauma
  - e. Tumor
  - f. Congenital/developmental
  - g. Anatomy

### **Domain Overview**

1. Brain
  1. Normal Anatomy & Variants
    1. Brain And CSF Spaces
    2. Vascular
    3. Skull And Dura
  2. Congenital/Genetic
    1. Lipoma
    2. Chiari malformations (1,2,3)
    3. Corpus Callosum: Dysgenesis/Agenesis
    4. Hindbrain Malformations
    5. Holoprosencephaly & Variants Including Syntelencephaly
    6. Septo-optic Dysplasia
    7. Megalencephaly/ Hemimegalencephaly
    8. Microcephaly
    9. Focal Transmantle Cortical Dysplasia (Focal Cortical Dysplasia with or without Balloon Cells)
    10. Neuronal Migration
    11. Cortical Organization and Late Migration
    12. Congenital Calvarial Defects
    13. Neurocutaneous syndromes
    14. Inherited Metabolic
  3. Infection/Inflammation
    1. Congenital/Neonatal
    2. Pyogenic
    3. Granulomatous
    4. Viral
    5. Immunocompromised
    6. Parasitic
    7. Prion Disease
    8. Lyme Disease
    9. Rasmussen Encephalitis
  4. Spontaneous Hemorrhage
    1. Intracerebral

- 2. Subarachnoid (aneurysmal and non-aneurysmal)
- 3. Epidural/ Subdural
- 4. Germinal matrix hemorrhage/pediatric intraventricular hemorrhage
- 5. Superficial siderosis
- 5. Vascular Disease/ Structural Lesions
  - 1. Atherosclerosis
  - 2. Nonatheromatous
  - 3. Aneurysms (all types including pseudoaneurysm and dolichoectasia)
  - 4. Arteriovenous Malformations
  - 5. AV Fistula (including carotid cavernous)
  - 6. Vein of Galen Malformation
  - 7. Cavernoma/Cavernous malformation
  - 8. Developmental venous anomaly (DVA)
  - 9. Capillary telangiectasia
  - 10. Hemangioma, calvarial (venous malformation)
- 6. Ischemia/infarction
  - 1. Thrombo-embolic infarction
  - 2. Hypoxic Ischemic/Anoxic Injury
  - 3. Venous Thrombosis
  - 4. Lacunar infarction
  - 5. Borderzone/ watershed infarction
  - 6. Posterior reversible encephalopathy syndrome (PRES)
  - 7. Transient Global Amnesia
  - 8. Fat Emboli
  - 9. Periventricular leukomalacia (PVL)
  - 10. Hydranencephaly
  - 11. Porencephalic Cyst
- 7. Neoplasm, Supratentorial, Intra-Axial
  - 1. Astrocytoma including glioblastoma
  - 2. Oligodendroglioma including mixed
  - 3. Multifocal glioma
  - 4. DNET
  - 5. Ganglioglioma
  - 6. Desmoplastic Infantile Ganglioglioma (DIG)
  - 7. Metastases
  - 8. Lymphoma any type including PTLD
  - 9. Neoplasm, Supratentorial, Intra-Axial: Rare and Miscellaneous
- 8. Neoplasm, Extra-Axial
  - 1. Dural/leptomeningeal
  - 2. Pineal Region
  - 3. Osseous
- 9. Neoplasm, Supratentorial, Intraventricular
  - 1. Choroid Plexus Papilloma or Carcinoma
  - 2. Meningioma
  - 3. Metastasis
  - 4. Ependymoma/subependymoma
  - 5. Neurocytoma, Central
  - 6. Subependymal giant cell astrocytoma

10. Neoplasm, Posterior Fossa
  1. Diffuse infiltrating pontine glioma/diffuse midline glioma
  2. Ependymoma/Subependymoma
  3. Medulloblastoma
  4. Pilocytic Astrocytoma
  5. Hemangioblastoma
  6. Metastases
  7. Lymphoma any type including PTLD
  8. Rare and Miscellaneous
11. Cysts
  1. Epidermoid or Dermoid Cyst
  2. Arachnoid Cyst
  3. Colloid Cyst
  4. Leptomeningeal Cyst
  5. Rare and Miscellaneous
12. Hydrocephalus
  1. Benign Extracerebral Collections of Childhood (External Hydrocephalus)
  2. Obstructive Hydrocephalus, Intraventricular or Extraventricular
  3. Normal Pressure Hydrocephalus
  4. CSF Shunts and Complications including Slit Ventricle Syndrome (Shunt Dependence)
13. Demyelinating Disease
  1. Multiple Sclerosis
  2. Neuromyelitis Optica (Devic) including spectrum disorder
  3. Acute Disseminated Encephalomyelitis (ADEM)
  4. Tumefactive Demyelination
  5. Demyelinating Disease: Rare and Miscellaneous
14. Acquired Metabolic/Toxic
  1. Carbon Monoxide Poisoning
  2. Osmotic Demyelination Syndrome
  3. Hypoglycemia/Hyperglycemia
  4. Hepatic Failure
  5. Parathyroid Disorders, CNS Manifestations
  6. Methanol/Ethanol Poisoning
  7. Medication toxicity
  8. Wernicke Encephalopathy
  9. Rare and Miscellaneous
15. Neurodegenerative
  1. Alzheimer Disease
  2. Frontotemporal Lobal Degeneration (Pick Disease)
  3. Neurodegeneration with Brain Iron Accumulation (NBIA), (PKAN)
  4. Parkinson Disease and Parkinson's plus (MSA, PSP, OPCA)
  5. Amyotrophic Lateral Sclerosis (ALS)
  6. Hypertrophic Olivary Degeneration
  7. Rare and Miscellaneous
16. Trauma
  1. Calvarial and skull base fractures
  2. Traumatic hemorrhage including Duret

- 3. Traumatic axonal injury/Diffuse axonal injury
- 4. Encephalomalacia, Post-Traumatic
- 5. Non-accidental trauma (abuse)
- 6. Herniation syndromes
- 17. Treatment/Post Surgery Effects
  - 1. Skull
  - 2. Devices and Complications including Sinking Skin Flap Syndrome
  - 3. Radiation and Chemotherapy Including Pseudoprogression
  - 4. Avastin (Bevacizumab) and Pseudo-Response
  - 5. Stroke Like Migraines After Radiation Therapy (SMART) Syndrome
  - 6. Cerebral Hyperperfusion Syndrome
  - 7. Thrombolysis & Anticoagulation Complications
  - 8. Immune reconstitution inflammatory syndrome (IRIS)
- 18. Miscellaneous
  - 1. Intracranial Hypotension (Craniospinal Hypotension Syndrome)
  - 2. Idiopathic Intracranial Hypertension (Pseudotumor Cerebri), including venous stenosis
  - 3. Mesial Temporal Sclerosis & Status Epilepticus
  - 4. Paraneoplastic Syndromes/Limbic Encephalitis
  - 5. Hypertrophic Pachymeningitis
  - 6. Fibrous Dysplasia
  - 7. Paget Disease
- 2. Extracranial Head & Neck
  - 1. Sella/Parasellar
    - 1. Normal Anatomy and Variants
    - 2. Congenital/Genetic
    - 3. Infection/Inflammation
    - 4. Pituitary Infarction, Hemorrhage or Sheehan syndrome
    - 5. Neoplasm, Sellar
    - 6. Neoplasm, Supra/Juxtellar
    - 7. Cysts and Tumor-like Lesions
    - 8. Treatment/Post Surgery Effects
  - 2. Cerebellopontine Angle-Internal Auditory Canal (CPA-IAC) and Temporal Bone
    - 1. Normal Anatomy and Variants including carotid artery and jugular vein variants
    - 2. Congenital/Genetic
    - 3. Infection/Inflammation
    - 4. Vascular
    - 5. Neoplasm
    - 6. Cysts and Tumor-like lesions
    - 7. Trauma (including ossicles)
    - 8. Treatment/Post Surgery Effects
  - 3. Skull Base
    - 1. Normal Anatomy and Variants (including foramina and arachnoid granulation)
    - 2. Infection and Inflammation
    - 3. Neoplasm
    - 4. Cysts and Tumor-Like Lesions
    - 5. Trauma
    - 6. Treatment/Post Surgery Effects

4. Orbit/Ocular
  1. Normal Anatomy and Variants
  2. Congenital/Genetic
  3. Infection/Inflammation
  4. Vascular
  5. Neoplasm, Benign
  6. Neoplasm, Malignant/Metastatic
  7. Cysts and Tumor-Like Lesions
  8. Trauma
  9. Treatment/Post Surgery Effects
5. Nose and Sinus
  1. Normal Anatomy and Variants
  2. Congenital/Genetic
  3. Infectious/Inflammatory
  4. Neoplasm, Benign
  5. Neoplasm, Malignant
  6. Treatment/Post Surgery Effects
  7. Miscellaneous including CSF Leak
6. Facial Bones including maxilla and mandible
  1. Normal Anatomy and Variants
  2. Congenital/Genetic
  3. Infectious/Inflammatory including dental
  4. Neoplasm, Benign
  5. Neoplasm, Malignant
  6. Cysts and Tumor-Like Lesions
  7. Trauma
  8. Treatment/Post Surgery Effects
7. Suprahyoid & Infrahyoid Neck and Oral Cavity
  1. Normal Anatomy and Variants
  2. Congenital/Genetic
  3. Infection/Inflammation
  4. Vascular
  5. Neoplasm, Benign
  6. Neoplasm, Malignant
  7. Cysts and Tumor-Like Lesions
  8. Trauma
3. Spine
  1. Normal Anatomy and Variants
  2. Congenital/Genetic
  3. Infection/Inflammation
  4. Vascular
  5. Neoplasm
  6. Cysts and Tumor-Like Lesions
  7. Systemic/Metabolic
  8. Inflammatory and other arthritides
  9. Degenerative/Arthropathic
  10. Trauma
  11. Postoperative/Post-Procedural