

**Neuroradiology Radiology  
In-Training Test Questions  
for Diagnostic Radiology Residents**



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Sponsored by:  
*Commission on Education  
Committee on Residency Training in Diagnostic Radiology*

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1. Which of the following paragangliomas OCCURS RARELY in the neck?

- A. Carotid body tumor
- B. Glomus vagale tumor
- C. Laryngeal glomus tumor
- D. Glomus jugulare tumor

Rationales:

- A. *Incorrect.* This is the most common of the paragangliomas to occur in the neck.
- B. *Incorrect.* Though not as common as the carotid body tumor, this is one of the common locations for paragangliomas in the head and neck.
- C. **Correct.** These are exceptionally rare.
- D. *Incorrect.* Though not as common as the carotid body tumor, this is one of the more common locations of the paragangliomas in the head and neck.

Citations:

Som PM and Curtin HD Head and Neck Imaging Vol. 2, 3rd Edition page 808.

2. Which one of the following statements regarding orbital infections is CORRECT?
- A. Pre-septal cellulitis usually presents with pain and restriction of ocular motion.
  - B. Orbital cellulitis usually involves the intraconal space.
  - C. Opportunistic infection in AIDS patients usually involves the extraconal space.
  - D. Subperiosteal abscess usually involves the medial orbit.

Rationales:

- A. *Incorrect.* Preseptal cellulitis generally causes painless swelling and there is no restriction of ocular motion.
- B. *Incorrect.* Orbital cellulitis is usually confined to the extraconal space except in severe cases.
- C. *Incorrect.* Opportunistic infections in AIDS more commonly involve the globe.
- D. **Correct.** Orbital abscesses most commonly result from infection in the adjacent ethmoid sinus.

Citations:

Grossman R, Yousem D. *Neuroradiology: The Requisites*. St Louis, Mo: Mosby; 1994:313-330.

3. Which one of the following is MOST likely to cause a jugular foramen mass?

- A. Paranglioma
- B. Astrocytoma
- C. Schwannoma
- D. Meningioma

Rationales:

A. **Correct.** Paranglioma (glomus jugulare) is the most common primary tumor of the jugular foramen.

B. *Incorrect.* Astrocytoma is the most common primary brain parenchymal tumor, but would rarely involve the jugular foramen.

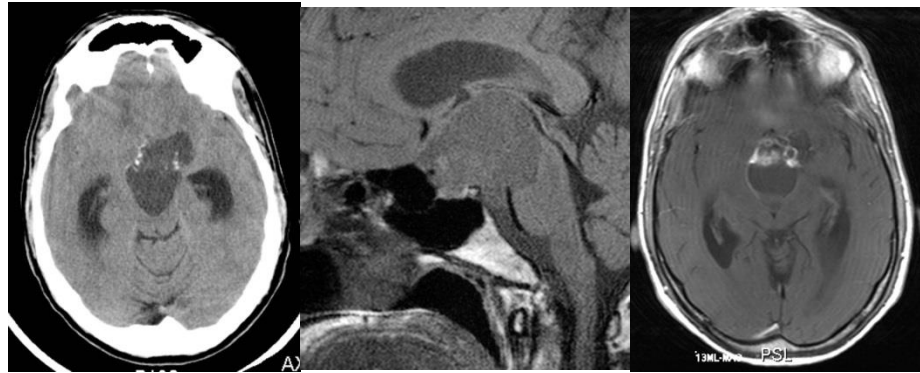
C. *Incorrect.* Cranial nerves 10 and 11 do accompany the jugular bulb though the skull base, but Schwannomas of these nerves are uncommon.

D. *Incorrect.* Meningiomas at the skull base are more common in the foramen magnum, parasellar region, and supraorbital region.

Citations:

Grossman R, Yousem D. *Neuroradiology: The Requisites*. St Louis, Mo: Mosby; 1994:332.

4. You are shown an axial unenhanced CT image (Figure 6A) and sagittal unenhanced T1-weighted (Figure 6B) and axial gadolinium-enhanced T1-weighted (Figure 6C) MR images of the brain on a 50-year-old man with headaches. What is the MOST LIKELY diagnosis?



- A. Craniopharyngioma
- B. Giant internal carotid artery aneurysm
- C. Rathke's cleft cyst
- D. Oligodendroglioma

Rationales:

- A. **Correct.** Craniopharyngioma is often intrasellar and suprasellar in location, as in this case. 90% of craniopharyngiomas show cyst formation, calcification, and peripheral enhancement, as in this case.
- B. *Incorrect.* Aneurysms may have peripheral calcification, but they do not have cystic components. Enhancement is uniform, with peripheral blood products usually seen in giant aneurysms.
- C. *Incorrect.* Rathke cleft cysts do not enhance. It would also be extremely rare for a Rathke cleft cyst to enlarge enough to produce hydrocephalus.
- D. *Incorrect.* This is an extra-axial mass. Oligodendroglioma may have cystic components and calcification, but it is a primary intra-axial tumor.

Citations:

Diagnostic Imaging: Brain. Osburn. Amerisys 2004. Part II :Section 2 - Craniopharyngiomas pages 32-35.

5. Which one of the following is NOT located in the cavernous sinus?

- A. Oculomotor nerve
- B. Third division of the trigeminal nerve
- C. Internal carotid artery
- D. Abducens nerve

Rationales:

A. *Incorrect.* The oculomotor nerve courses within the lateral wall of the cavernous sinus and is the most superiorly located of the cavernous sinus cranial nerves.

B. **Correct.** While both the first and second divisions of the trigeminal nerve are within the lateral wall of the cavernous sinus, the third division exits the skull base via foramen ovale.

C. *Incorrect.* The internal carotid artery courses through the cavernous sinus medial to cranial nerves III, IV, V1, V2, and VI.

D. *Incorrect.* The abducens nerve traverses the cavernous sinus and is the most medially located of the cranial nerves of the cavernous sinus, lying immediately lateral to the internal carotid artery.

Citations:

Harnsberger, Handbook of Neuroradiology, St. Louis, Mosby, 1996  
Grossman/Yousem, Neuroradiology Requisites, Philadelphia, Mosby, 2003.

6. Concerning carcinoma of the nasopharynx, which one is TRUE?
- A. Nasopharyngeal carcinoma commonly spreads to level IV and V nodes in the neck.
  - B. Intracranial spread is usually through the hematogenous route.
  - C. Epstein-Barr virus infection is a risk factor.
  - D. Nasopharyngeal squamous cell carcinoma presents on MRI is typically not enhancing, with hypo-intense signal on T2.

Rationales:

- A. *Incorrect.* Spread is to nodes more superiorly in the neck.
- B. *Incorrect.* Intracranial involvement is typically from retrograde perineural spread through the skull base foramina.
- C. **Correct.** Nasopharyngeal carcinoma is common in young adult men in Southeast Asia, and is thought to be caused by EBV in this group.
- D. *Incorrect.* Tumors mildly enhance and are hyper-intense on T2.

Citations:

Diagnostic Imaging: Head and Neck. Harnsberger. Amerisys 2004. Part III :Section 1 – Squamous cell carcinoma - Nasopharynx pages 16-19.

7. Which one of the following is NOT usually associated with a tethered cord?

- A. Spinal lipoma
- B. Chiari I malformation
- C. Thick filum terminale
- D. Diastematomyelia

Rationales:

A. *Incorrect.* Spinal lipomas are frequently associated with all forms of spinal dysraphism, especially those with a low conus and tethered cord.

B. **Correct.** The Chiari I malformation is associated with syringo-hydromyelia in 20-60% but not with meningo-myelocele or other forms of cord tethering.

C. *Incorrect.* A thick filum terminale is the rule with tethered cords.

D. *Incorrect.* Diastematomyelia is characterized by a sagittal clefting of the spinal cord or filum terminale. A low lying or tethered cord is present in about 40%.

Citations:

Osborn, AG: Diagnostic Neuroradiology, pp. 807-809, 815-816 Mosby, 1994.



8. Progressive intracranial occlusive arteriopathy (Moyamoya syndrome) is associated with ALL of the following conditions EXCEPT:
- A. Sickle cell disease.
  - B. Neurofibromatosis type 1.
  - C. Tuberous sclerosis.
  - D. Radiation therapy.

Rationales:

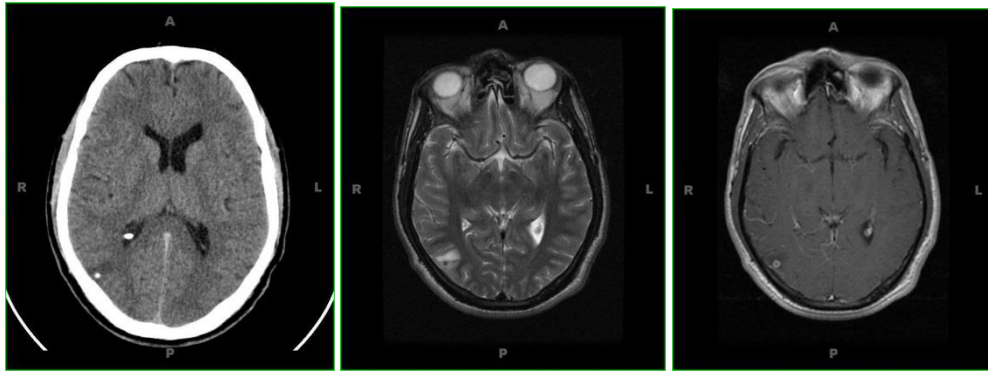
A. *Incorrect.* Moyamoya is seen in sickle cell disease secondary to stenosis/occlusion within the distal internal carotid artery and proximal aspects of the middle and anterior cerebral arteries. These findings are secondary to ischemia in the vasa vasorum with subsequent intimal and medial hyperplasia.

B. *Incorrect.* Vascular dysplasia sometimes occurs in neurofibromatosis type 1. This most commonly consists of intimal proliferation with resultant stenosis/occlusion involving the carotid, middle cerebral, and anterior cerebral arteries. Moyamoya pattern is seen in 60-70% of these patients.

C. **Correct.** Tuberous sclerosis is a neurocutaneous syndrome characterized by subependymal nodules, cortical hamartomas, giant cell astrocytomas, neuronal migration anomalies and many additional findings outside the central nervous system. There is no known association with moyamoya.

D. *Incorrect.* Radiation therapy can produce arterial injury including medial hyperplasia, intimal fibrosis, and endothelial degeneration. These can then produce vascular stenosis/occlusion resulting in a moyamoya pattern of collateral circulation.

9. You are shown an unenhanced CT scan (Figure 3A), an axial T2-weighted image (Figure 3B), and a post-contrast axial T1-weighted image (Figure 3C) from a 30-year-old Hispanic man who presents with seizures. Brain MRI performed six months prior to this study (not shown) was normal. What is the MOST LIKELY diagnosis?



- A. Ganglioglioma
- B. Contusion
- C. Bacterial abscess
- D. Cysticercosis

Rationales:

A. *Incorrect.* Ganglioglioma is a lesion which usually occurs in the temporal lobe and may cause seizures. It typically appears as a cystic lesion. Calcification is common with irregular enhancement on MRI. These are slow growing lesions. The fact that the patient had a normal MRI six months prior to the current study excludes a benign neoplasm such as ganglioglioma.

B. *Incorrect.* Contusions are more common in the anterior temporal lobe. Ring enhancement may occur with subacute contusions, and seizures are common. However, contusions do not have associated calcifications.

C. *Incorrect.* Bacterial abscess may be ring-enhancing and cause seizures. However, there are not associated calcifications. The central portion of an abscess usually has increased T2 signal with a lower T2 signal abscess wall. Abscesses will show increased signal on diffusion weighted imaging.

D. **Correct.** Cysticercosis is a parasitic infection caused by the pork tapeworm *Taenia solium*. Humans may become an unintentional intermediate host for this parasite, with infection occurring in the brain. This infection has an increased prevalence in Hispanic populations. Multiple punctuate calcifications may be seen in the subcortical white matter. As the parasite dies, the body forms an immune response. This results in ring enhancement and edema.

Citations:

Atlas, S. MRI of the Brain and Spine, 3rd edition. pp. 625, 1077, 1158-65 Lippincott, Williams & Wilkins 2002.

"Diffusion-weighted MR imaging in the preoperative assessment of brain abscesses."

Leuthardt EC, Wippold FJ 2nd, Oswood MC, Rich KM. Surg Neurol. 2002 Dec;58(6):395-402.

10. A young child presents with fever and periorbital swelling. You are shown a coronal reformatted image from a post contrast orbital CT. Which statement about the CT imaging findings is most accurate?



- A. In the orbit, the majority of the process involves the conal space.
- B. The process most likely started in the orbit and spread to the sinus.
- C. The lack of bony destruction of the orbital floor makes the pathology unlikely to be an infectious etiology.
- D. An extraconal phlegmon is present secondary to a sinusitis.

Rationales:

- A. *Incorrect.* Extensive abnormal soft tissue density is present in the extraconal space. Although the medial rectus muscle is mildly enlarged, the majority of the abnormality is in the extraconal space.
- B. *Incorrect.* Orbital infection usually is a complication of sinusitis, not vice versa.
- C. *Incorrect.* Infection readily passes through valveless veins through the orbital wall, allowing a sinus infection to spread to the orbit.
- D. **Correct.** An extraconal phlegmon is present in this case secondary to a sinusitis.

Citations:

Harnsberger HR. Diagnostic Imaging, Head and Neck. Amirsys 2004. II:1, 38-39.

11. Which statement about Le Fort Fractures is correct?

- A. Type I is also called the pyramidal fracture.
- B. Type II is also called the floating palate.
- C. Type III is complete cranial facial separation.
- D. Type I spares the pterygoid plates.

Rationales:

- A. *Incorrect.* Type I is floating palate.
- B. *Incorrect* Type II is the pyramidal fracture.
- C. **Correct.** Type III is complete cranial facial separation.
- D. *Incorrect* Pterygoid plates are involved in type 1.

Citations:

Mafee MF, Valvassori GE, Becker M. Thieme. Valvassori's Imaging of the Head and Neck. 2nd edition 2005. 467-469

12. Perineural spread of neoplasm involves which cranial nerves most commonly?

- A. III and IV.
- B. V and VII
- C. VI and VIII.
- D. IX and X.

Rationales:

- A. *Incorrect.* Though cavernous sinus involvement can lead to symptoms referable to cranial nerves III and IV, they are not the most common to be involved.
- B. **Correct.** Cranial nerves V and VII are the most common to be involved in perineural spread of tumor in the head and neck as they have the longest courses and most branches in the head and neck region.
- C. *Incorrect.* Though they may be involved, they are not the most common.
- D. *Incorrect.* Though they may be involved, they are not the most common.

Citations:

Caldemeyer K, et al. *Imaging features and clinical significance of perineural spread or extension of head and neck tumors* Radiographics. 1998; 18:97-110.

Chang P, et al. *Perineural spread of malignant melanoma of the head and neck: Clinical and imaging features.* Am J Neuroradiol. 2004; 25:5-11.

Gandhi D, et al. *Magnetic resonance imaging of perineural spread of head and neck malignancies.* Topics in Magnetic Resonance Imaging 2004; 15:79-85.