Cavernous Sinus Lesions For Beginners

The cavernous sinus is near the center of the image and the central skull base… in a “blindspot”
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No Disclosures
Anatomy Review

- The cavernous sinus is a venous space on either side of the sphenoid sinus and sella turcica.
- Contains the internal carotid artery, cranial nerves (CN) III, IV, V1, VI and V2.
  - CNVI travels more medially than the others and is more easily affected by cavernous sinus pathology.
- Cavernous sinus is also filled with venous blood, fat and fibrous tissue.
- Continuous with the epidural space of the spine and orbital space.
- Borders the sphenoid sinus superiorly and pituitary gland medially.

[Image of cavernous sinus diagram]

Case courtesy of Assoc Prof Frank Gaillard, Radiopaedia.org, rID: 54907
Cavernous Sinus Lesions

Most common:
- Meningioma
- Schwannoma

Rare lesions:
- Hemangiopericytoma
- Hemangioma

Nearby tumors that may invade the cavernous sinus:

Relatively common:
- Pituitary Macroadenoma

Less common:
- Adenoid cystic carcinoma
- Chondrosarcoma
- Nasopharyngeal carcinoma
Imaging Protocol for Suspected Cavernous Sinus Lesions

- MRI is the main modality for cavernous sinus imaging due to superior soft tissue contrast
- Thin-sections in coronal T2 and fat-suppressed T1 with contrast allows the best imaging of the cavernous sinus
Cavernous Sinus: Normal versus Abnormal

• **Usually**, symmetric enhancement and shape

• **However**, Asymmetry can be caused by normal variant tortuosity of one internal carotids

• **Generally**, the lateral cavernous sinus margin on axial images should not be convex. Concave or flat may be within normal limits.
  • If the lateral margin is convex, consider a space occupying lesion.
Schwannoma: Basics

- Benign nerve sheath tumors that arise from schwann cells
- Most schwannomas in the cavernous sinus originate from the trigeminal nerve
- Usually sporadic, solitary and occur in the 5th and 6th decades of life
- Exception is neurofibromatosis type 2 (Better named as Multiple Inherited Schwannomas, Meningiomas, Ependymomas; MISME) leading to earlier development
Schwannoma: Morphology and Features

- **On T2**
  - heterogeneously hyperintense
  - Thin-section coronal images can help depict origin of schwannoma
- **On T1**
  - hypointense
  - Exhibit heterogeneous enhancement with gadolinium contrast
- Often ovoid shaped when occurring in the cavernous sinus
Meningioma: Basics

- Constitute 41% of all cavernous sinus lesions
- Usually occur in the 5th to 7th decade of life
- More common in females
- In the cavernous sinus, typically arise from the dura of the lateral wall
- Meningiomas that invade the cavernous sinus can encase the cavernous segment of the internal carotid artery
Meningioma: Morphology and Features

- Usually isointense or hypointense to gray matter on T1 and T2 imaging
- Show intense homogeneous enhancement with gadolinium contrast
- Exhibit restricted diffusion
- Presence of calcification, vascularity or cystic areas can potentially lead to heterogeneous appearance on MRI
- Can also encase internal carotid artery, but more likely to narrow it
Hemangioma Morphology and Features

- Better described as a vascular malformation
- Typically in the brain parenchyma, but occurs extra-axially in the cavernous sinus or cerebellopontine angles
- High signal T2 and FLAIR
- Progressive intense homogeneous enhancement with gadolinium
- Tc-99m Tagged Red Blood Cell SPECT and Fluciclovine PET can help support diagnosis
Rare Tumors

Hemangiopericytoma:
- Mesenchymal neoplasms
- On imaging, closely mimic meningiomas
- Can have narrow dural attachment, bone erosion and flow voids
- Typically seen in younger patients compared to meningiomas

Lymphoma:
- Can be from direct extension from adjacent bone marrow or the nasopharynx or hematogenous dissemination
- T2 hypointense with diffusion restriction
- Intense enhancement with gadolinium

Neurofibroma:
- Almost always from neurofibromatosis type 1
- Seen in cranial nerve V1 & V2
- Peripheral T2 hyperintense and central hypointensity
- Variable gadolinium enhancement
Chondrosarcoma:
- Usually arise from skull base and extend into cavernous sinus
- Overall high T2 signal with region of lower signal due to calcifications in the tumor
- Typically show high enhancement with gadolinium

Nasopharyngeal Carcinoma:
- Cavernous sinus involvement through perineural spread
- Usually in 5th or 6th decade
- Nasopharyngeal mass or non-specific MR with bulky cervical lymphadenopathy
- Tumor in the cavernous sinus represents late stage disease

Rhabdomyosarcoma:
- Tumor seen in pediatric population
- Commonly in nasopharynx, masticator spaces, paranasal sinuses and orbits
- Bulky heterogeneous mass
- Invade cavernous sinus via bony destruction or perineural extension
References:


