**EDUCATIONAL OBJECTIVE**

Exhibit the anatomy of the orbital apex, and illustrate key CT and MRI imaging findings of some common pathological processes manifesting in this region.

**INTRODUCTION**

The unique, complex anatomy of the orbital apex results in a high concentration of important neurovascular structures in a small, confined space. As a result, cranial nerve palsies, vision loss, and a relative afferent pupil defect can result from a wide range of infections, inflammatory, neoplastic, and vascular processes. The orbital apex is an important route of spread of intracranial and orbital pathology. Infections and neoplastic diseases frequently spread along the complex pathways at the orbital apex. Familiarity with this complex anatomy and potential routes of disease spread that can lead to life-threatening complications.

**DISCUSSION**

The normal orbit arguably contains some of the most complex anatomy of the human body. The bony orbit is essentially a pyramid with four walls: a roof, lateral wall, medial wall, and floor, which is housed in the LWS, and contains the optic nerve and ophthalmic artery. The superior fissure is the most important route of spread of infection from the face and orbit posteriorly to the intracranial cavity (SOV thrombosis). The entire orbit is divided into two compartments. Given the potential for significant resultant morbidity and mortality, imaging is crucial to understand the complex anatomy and potential pathways of spread.

**VASCULAR DISEASE**

- **Cavernous-Carotid Fistula**
  - Axial T2 (A) and T1+C (B) show findings of congestive orthoptosis of the left eye in this patient with new HA, blurred vision, and left eye pain. Propiomorph of the left globe, intracranial fat stranding, and contrast enhancement of the SOF (red arrow). The SOF provides communication between the orbit and middle cranial fossa, on which the CCF is dependent.
  - The SOF is considered a potential intracranial and extracranial components by the auralis of 2mm (blue dot), a high-resolution imaging technique which can be helpful in identifying the CCF. The CCF is located within the SOF, and is the most common site for CCFs.

**ORBITAL ANATOMY**

- The superior ophthalmic vein (SOV) drains via the lateral aspect of the superior orbital fissure into the cavernous sinus. This vein provides a route for spread of infection from the face and orbit posteriorly to the intracranial cavity (SOV thrombosis).

**NEOPLASM**

- **Orbital Lymphoma**
  - Axial T1 (A) and T2 (B) show proptosis with a left orbital mass with significant mass effect on the left globe (red arrow).
  - Differential Diagnosis
    - Based on imaging alone, it may be impossible to distinguish lymphoma from IOID (Graves orbitopathy, primary orbital tumors, or even cavities).

**INFECTION**

- **Pressepal vs Postsepal Cellulitis**
  - Pressepal: Typically limited to the soft tissues anterior to the orbital apex (TO). Complications: - Superficial ophthalmic vein thrombosis - Meningitis/vasculitis - Treatment: oral antibiotic therapy
  - Postsepal: Typically limited to the soft tissues posterior to the orbital apex. Complications: - Deep ophthalmic vein thrombosis - Meningoencephalitis - Treatment: IV antibiotics, surgical drainage may be necessary

- **S Subtypes of Fungal Sinusitis**
  - Fungal sinusitis is defined by the presence of fungal hyphae within the submucous, bone or vessels of the paranasal sinuses.
  - Most common: Aspergillus
  - **Acute Invasive Fungal Sinusitis**
    - Most lethal form of fungal sinusitis, 50-80% mortality
    - Rapidly progressing infection seen in 2 distinct populations: - Immunocompromised (severe neutropenia) - Severe neutropenia

- **Invasive Fungal Sinusitis**
  - 5 fungal sinusitis accompanied by a chronic sinusitis: - Polymicrobial (as with rhinosinusitis). - Aspergillus
  - Imaging Features of Fungal Sinusitis
    - Edema/Cyst
    - Intracranial extension, pachymeningeal enhancement (red arrows)
    - Intraorbital fluid collection
    - **Differential Diagnoses**
      - Polyangiitis
      - Wegener's Granulomatosis
      - Sarcoidosis

**SUMMARY**

Complete radiologic evaluation of orbital apex pathology requires an understanding of the complex anatomy of this region, broad categories of pathology which can manifest, and potential routes of disease spread that can lead to life-threatening complications.