جامعة المستقبل
كلية التقنيات الصحية والطبية
قسم تقنيات البصريات

Fourth Stage 2024-2025

X-ray and Ultrasound of The Eye

Lecture Title

Radiographic Changes with Orbital Pathology

Lecture Number: 4

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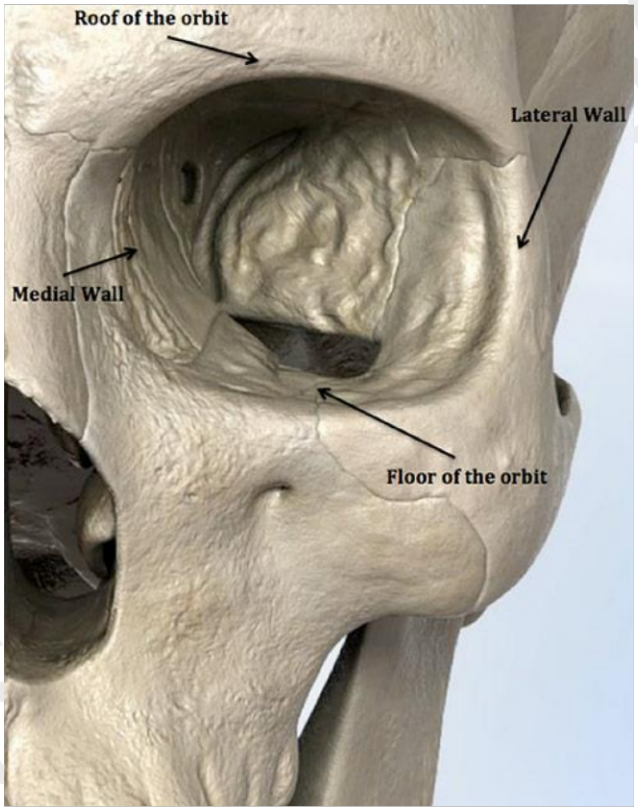
OPTOMETRIST

Radiographic Changes with Orbital Pathology

Radiographic changes with orbital pathology refer to the alterations in imaging characteristics of the orbital structures when there is a disease or abnormality affecting the eye socket (orbit). The orbit contains important structures such as the eye, extraocular muscles, optic nerve, blood vessels, and fat. Pathological conditions affecting these structures can manifest in distinctive ways on radiographic imaging, particularly on X-rays, CT (computed tomography), and MRI (magnetic resonance imaging).



1. Fractures and Trauma

- **Blowout Fractures**: These occur when trauma to the orbit causes a fracture of the orbital floor or medial wall. On CT, a herniation of the orbital fat or muscles through the fractured area can be seen, along with fluid accumulation in the maxillary sinus (air-fluid levels).

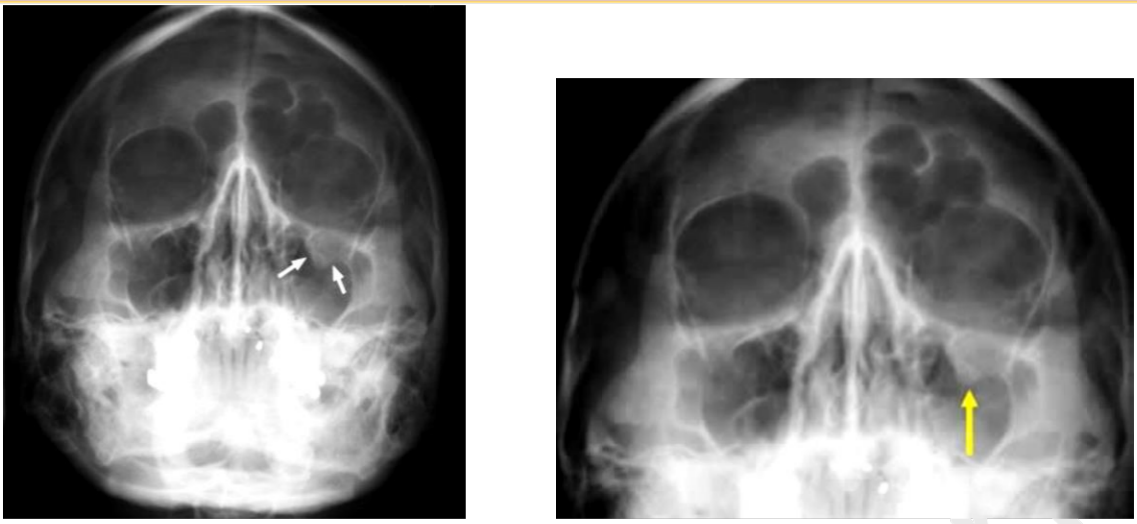


Figure 1 (a&b). Blowout fracture (a traumatic deformity of the orbital floor or medial wall). Muscles/fats herniate down into the maxillary sinus. Results in a 'teardrop' of soft tissue in the roof of the maxillary sinus

- **Orbital Hematoma**: Blood accumulation within the orbit can cause swelling and displacement of the ocular structures. On imaging, it appears as a hyperdense mass on CT or shows variable signal intensity on MRI, depending on the stage of the blood.

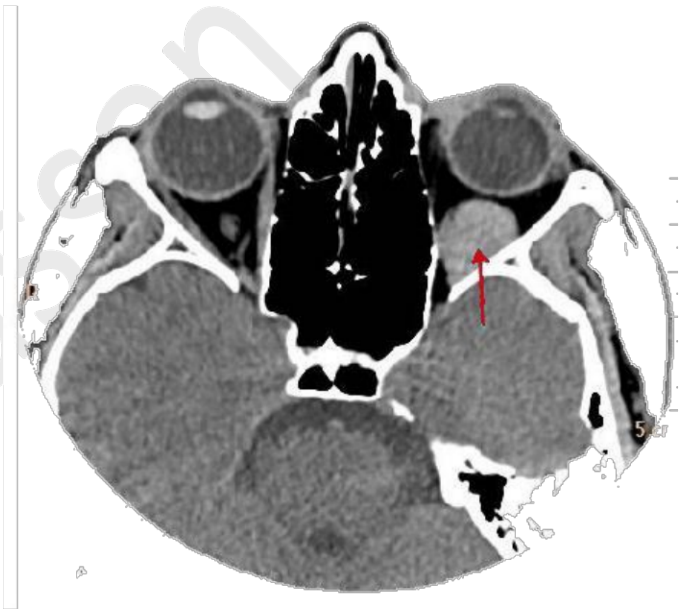
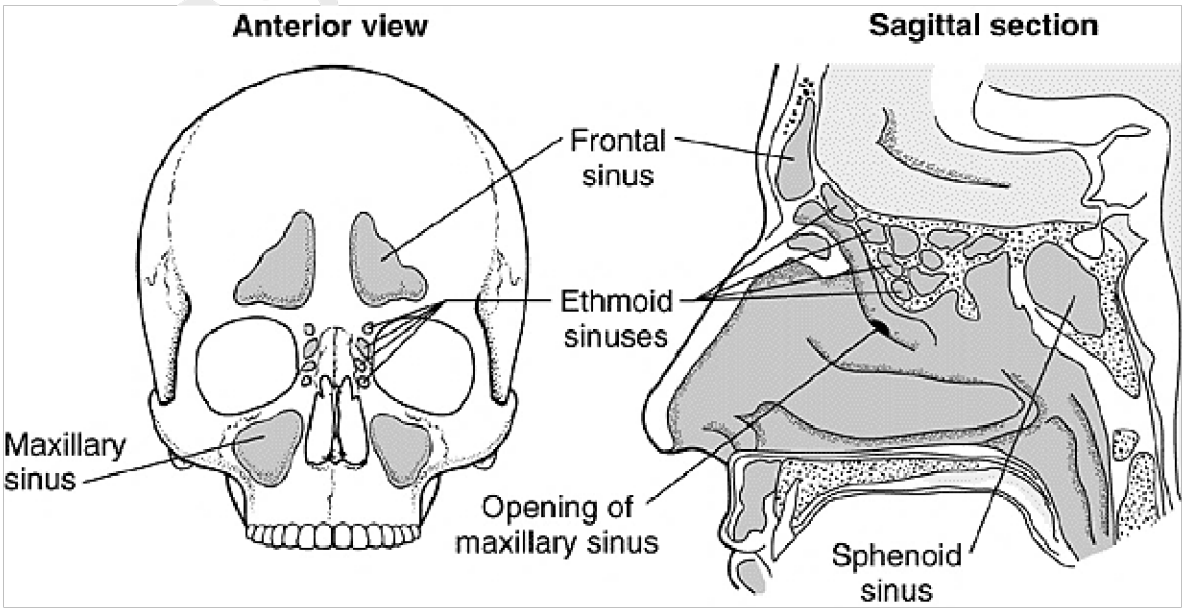


Figure 2. CT image showing a hyperdense retrobulbar mass in left orbit (arrow).

2. Infections

- **Orbital Cellulitis**: A bacterial infection of the soft tissues of the orbit often presents with swelling, proptosis (bulging of the eye), and inflammation. CT may show diffuse swelling of the orbital soft tissues, fat stranding, and fluid collections. MRI can further assess abscess formation.

- **Sinusitis with Orbital Extension**: Infections of the sinuses, especially ethmoid or maxillary sinuses, can extend into the orbit, leading to orbital cellulitis or abscess formation. This can be identified as fluid-filled sinuses and possible communication with the orbital space.



3. Tumors and Neoplasms

- **Orbital Masses**: Tumors such as optic nerve glioma, meningioma, or lacrimal gland tumors manifest as localized masses within the orbit. CT can show the location and extent of bone involvement, while MRI better defines soft tissue and neural involvement. Tumors often present as well-circumscribed masses that cause displacement or compression of adjacent structures.

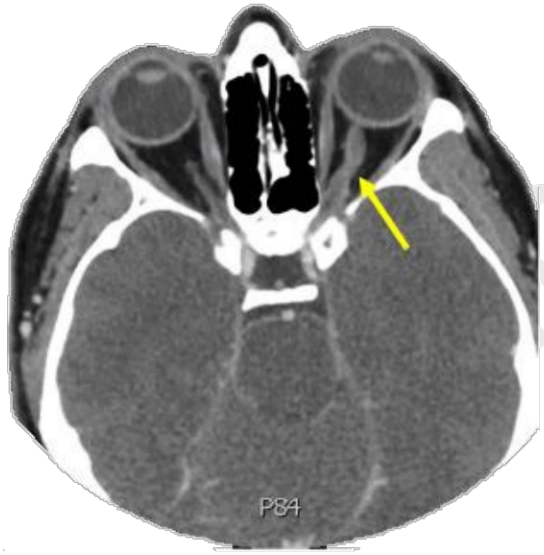


Figure. CT scan shows optic nerve sheath meningioma (yellow arrow).

- **Metastatic Lesions**: Cancer from other parts of the body (e.g., breast, lung, melanoma) can spread to the orbit. On imaging, these appear as irregular masses with variable enhancement on CT and MRI.

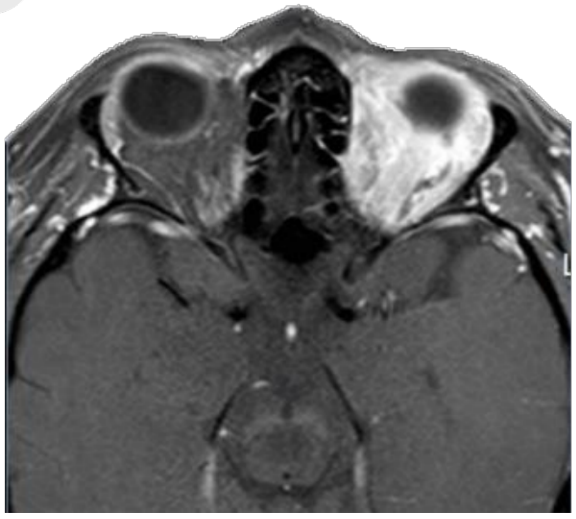


Figure. Orbital metastases from breast cancer.

4. Inflammatory Conditions

- **Thyroid Eye Disease (Graves' Ophthalmopathy)**: This autoimmune condition primarily affects the extraocular muscles, causing them to swell. CT and MRI show enlargement of the muscles, particularly the inferior and medial recti, with sparing of the tendons. This causes proptosis and sometimes compresses the optic nerve, leading to vision loss.

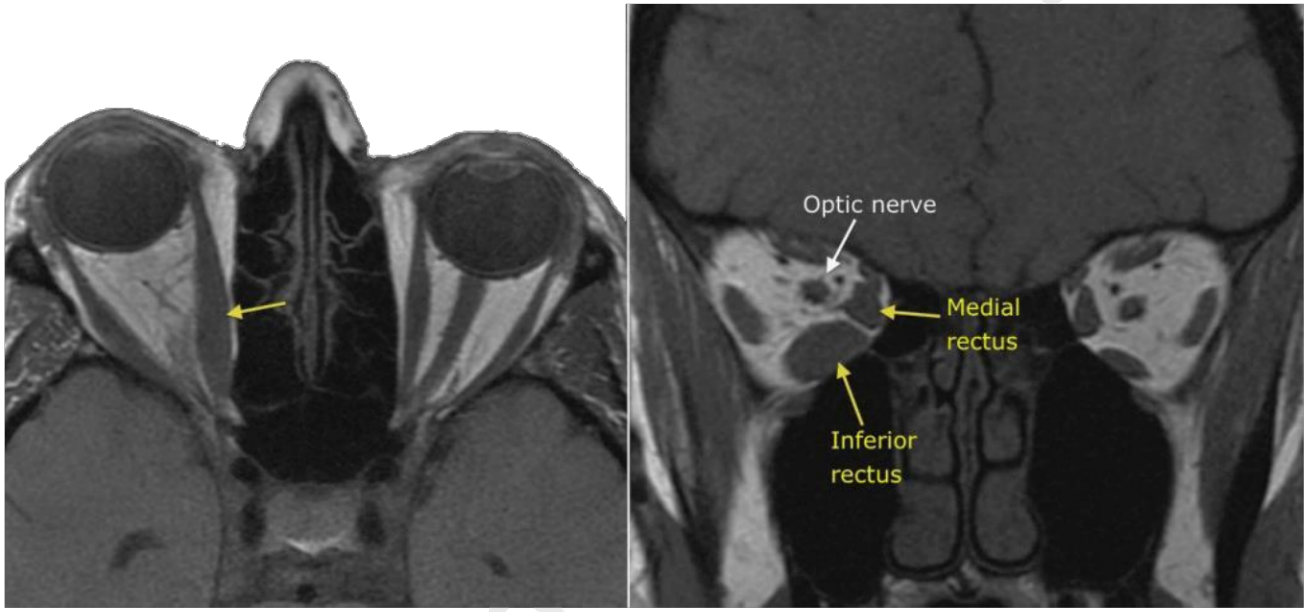


Figure. Thyroid eye disease.

5. Vascular Pathologies

- **Orbital Varices**: These are dilated veins within the orbit that can expand with Valsalva maneuvers. CT and MRI show engorged veins, which may increase in size with the patient holding their breath or straining.

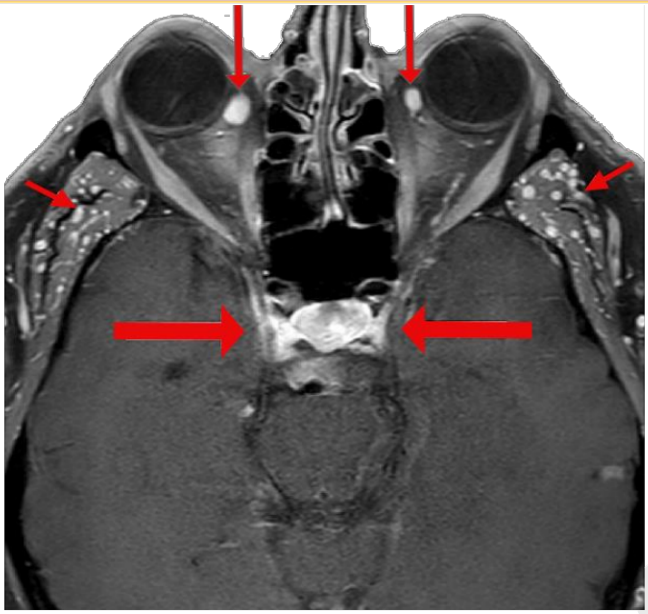
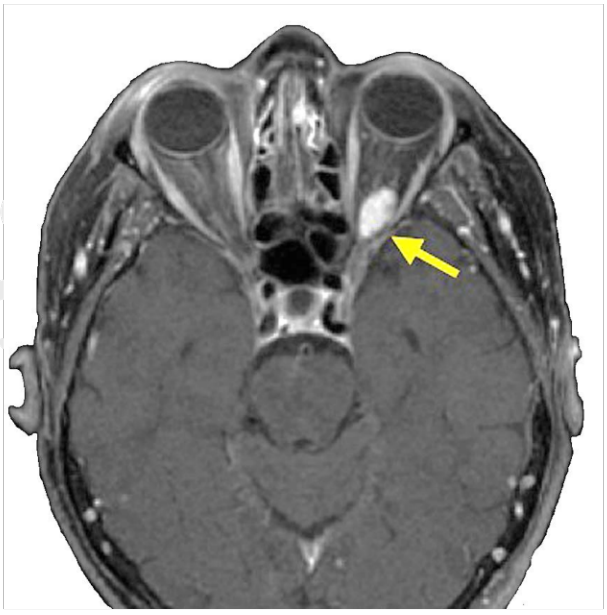


Figure. Magnetic resonance imaging of the brain demonstrating varices of inferior ophthalmic veins bilaterally (long arrows), infratemporal venous vessels (short arrows), and normal cavernous sinuses (thick arrows).

- **Cavernous Hemangioma**: A benign vascular tumor, cavernous hemangiomas present as well-circumscribed, homogeneously enhancing masses on imaging, most often located within the muscle cone near the optic nerve.



6. Congenital Conditions

- **Orbital Dermoid Cysts**: Congenital benign cysts typically found near the orbital rim, they appear as well-circumscribed, non-enhancing masses with fat and sometimes calcification on CT. MRI will show the cyst's contents more clearly.

- **Craniofacial Syndromes**: Syndromes like Crouzon or Apert syndrome, which involve premature fusion of skull bones, lead to orbital deformities. Imaging shows abnormalities in orbital shape and size, and MRI helps assess associated soft tissue anomalies.