



جامعة المستقبل
كلية التقنيات الصحية والطبية
قسم تقنيات البصريات



Fourth Stage 2024-2025

X-ray and Ultrasound of The Eye
Lecture Title
Introduction to Radiological

Lecture Number: 1

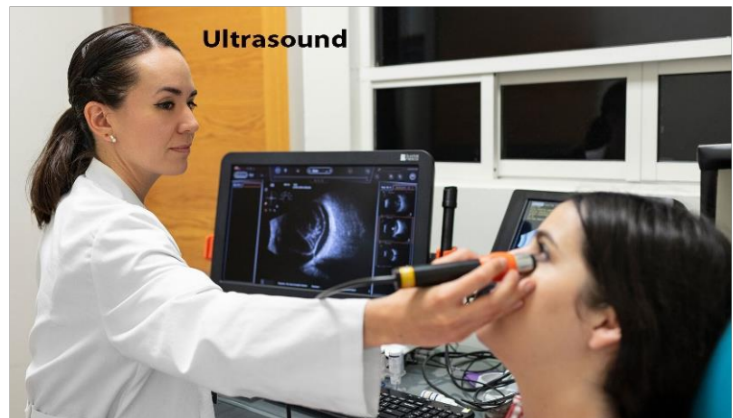
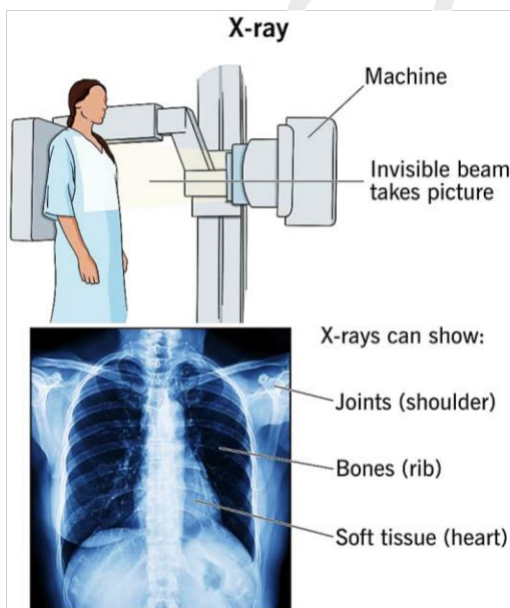
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Radiological Imaging التصوير الإشعاعي

Radiology: is the use of radiation in various imaging technologies to diagnose and treat diseases. It involves creating images of the internal structure of dense objects, such as parts of the human body, using radiant energy.

Types of Radiological Techniques

- **X-ray:** Basic concept of X-ray imaging, including its use for bony structures and detecting foreign objects.
- **Ultrasound (Sonography):** How it uses sound waves to create images, particularly relevant for soft tissues and eye conditions.
- **CT Scan (Computed Tomography):** Cross-sectional images for detailed internal views of body structures.
- **MRI (Magnetic Resonance Imaging):** Detailed images using magnetic fields, useful for soft tissues, including optic nerves.
- **MRA (Magnetic Resonance Angiography):** It uses magnetic fields and radio waves, similar to MRI, but with an emphasis on blood flow and the condition of blood vessels without using ionizing radiation (like X-rays or CT scans).



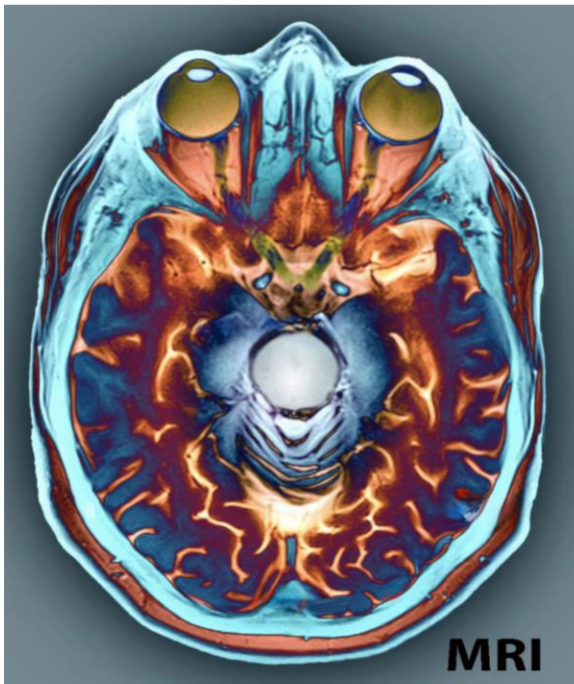
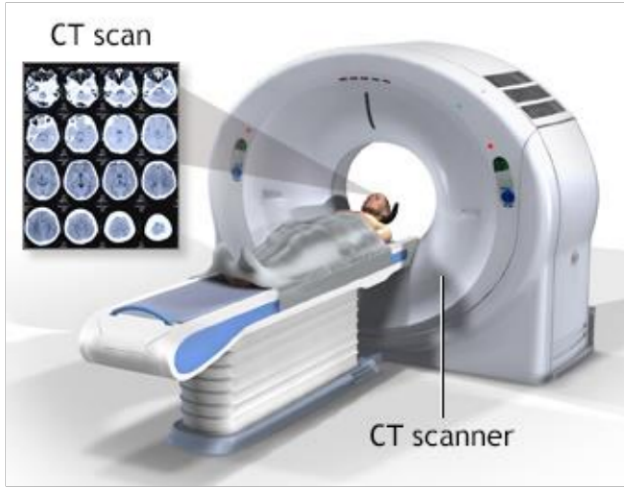


Table 1: Comparison of Radiological Techniques

Technique	Radiation	Best for	Advantages	Limitations
X-ray	Yes	bones, lungs	fast, inexpensive	limited soft tissue detail
Ultrasound	No	soft tissues, pregnancy	portable, real-time	poor for bones
CT	Yes	bones, soft tissues, trauma	fast, detailed cross-sections	high radiation dose
MRI	No	soft tissues, brain, joints	high soft tissue contrast	expensive, long scan time
MRA	No	Blood vessels, blood flow	Detailed images of blood vessels, non-invasive	Expensive, not ideal for all patients (e.g., metal implants)

Relevance of Radiology in Eye Care

- **Diagnosis of Ocular Diseases:** How radiological imaging helps in diagnosing conditions like:
 - Orbital fractures (X-ray/CT)
 - Tumors or lesions in and around the eye (MRI/CT)
 - Blood flow in retinal conditions (Ultrasound Doppler)
- **Non-invasive Imaging:** Discuss the importance of non-invasive techniques like ultrasound in examining ocular structures.

Radiological Equipment for Optometrists

Devices Used:

- **B-scan Ultrasound:** For imaging the posterior segment of the eye when the view is obscured.
- **X-rays and CT Scans:** For examining the bony structure of the orbit and sinus issues that may affect the eyes.
- **MRI:** For detailed analysis of the optic nerve, especially in cases of nerve damage, inflammation, or tumors.

Table 2: Comparison of Radiological Techniques for Eye Imaging

Technique	Radiation	Best for	Advantages	Limitations
OCT	No	retina, cornea	high-resolution, non-invasive	does not image deeper tissues
Ultrasound Biomicroscopy	No	anterior, posterior segment	real-time, useful for anterior eye	requires contact, lower resolution
Fundus Photography	No	retina, optic nerve	simple, fast, high-resolution	no depth information
Fluorescein Angiography	Yes	retinal blood vessels	visualizes blood flow, detects vascular issues	invasive, allergic reactions possible
MRI	No	orbital structures, optic nerve	high soft tissue contrast, non-invasive	expensive, less suited for small structures
CT	Yes	trauma, calcifications, tumors	good for bone and calcifications	ionizing radiation, limited soft tissue detail