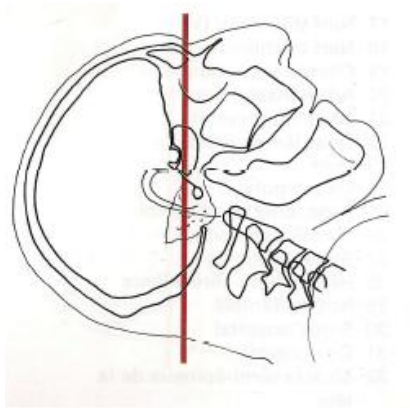
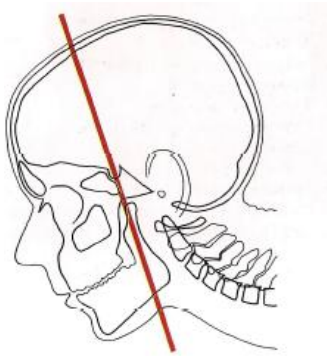
Brain Neuroanatomy and Imaging Planes



SPARK ACADEMY COURSES 2025



ND A BANKOLE, MD, MSc

PhD student

U1253 Ibrain, CIC 1415, INSERM,

CHRU Tours, University of Tours, France

19/04/2025

PLAN

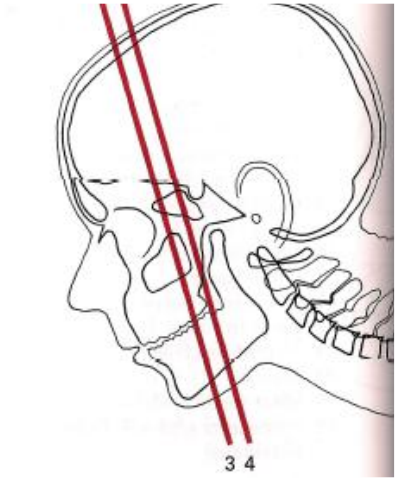
- Introduction
- Brain Anatomy
- Imaging Modalities for the Brain
- Brain Imaging Planes
- Clinical Applications of Brain Imaging
- Take home messages
- Conclusion and Q&A

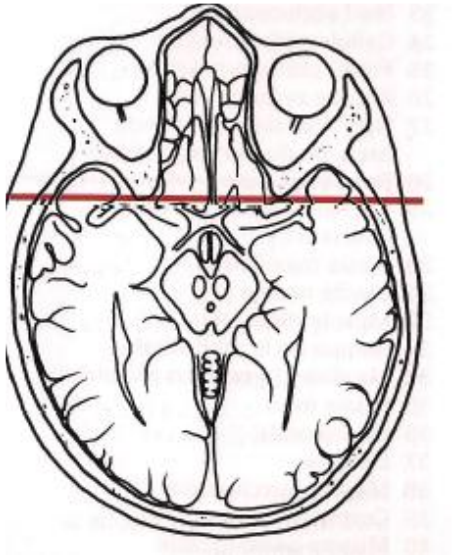
PLAN

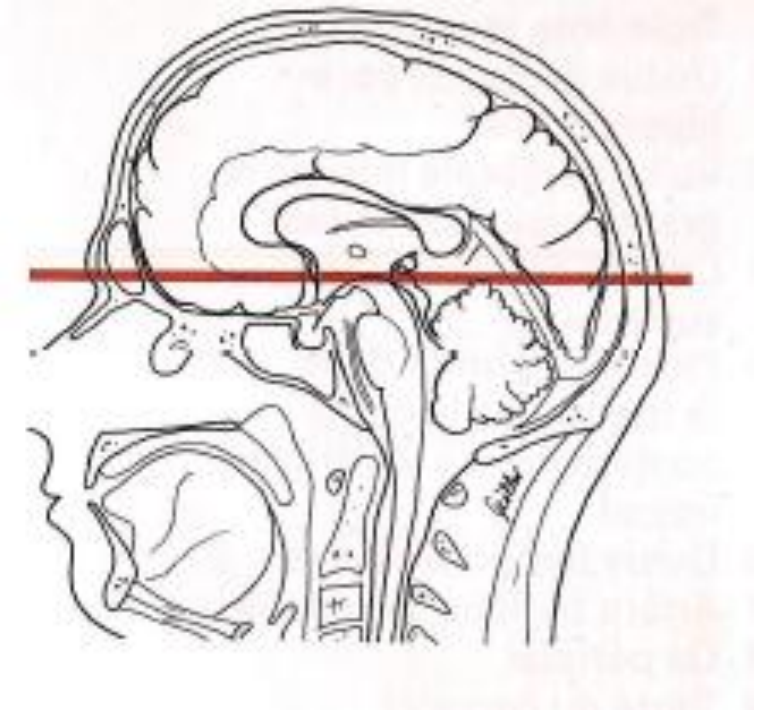
- **Introduction**
- Brain Anatomy
- Imaging Modalities for the Brain
- Brain Imaging Planes
- Clinical Applications of Brain Imaging
- Take home messages
- Conclusion and Q&A

INTRODUCTION

- **Knowledge of neuroanatomy is mandatory in clinical practice**
- **Imaging plays a key role in diagnosing neurological conditions**
- **Overview of brain imaging planes**



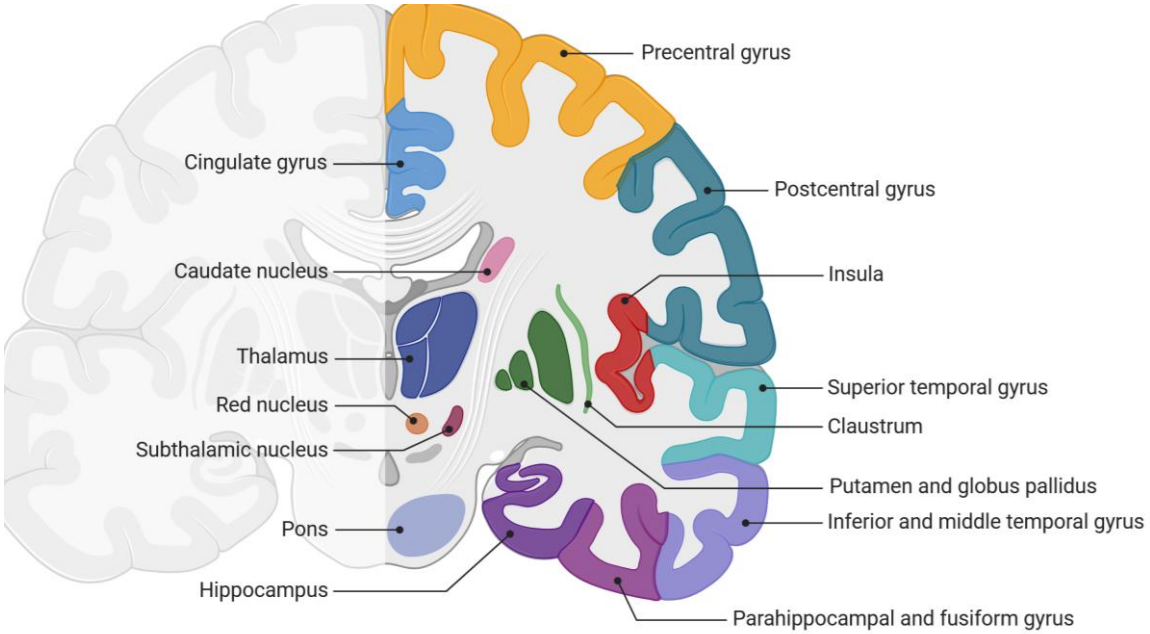


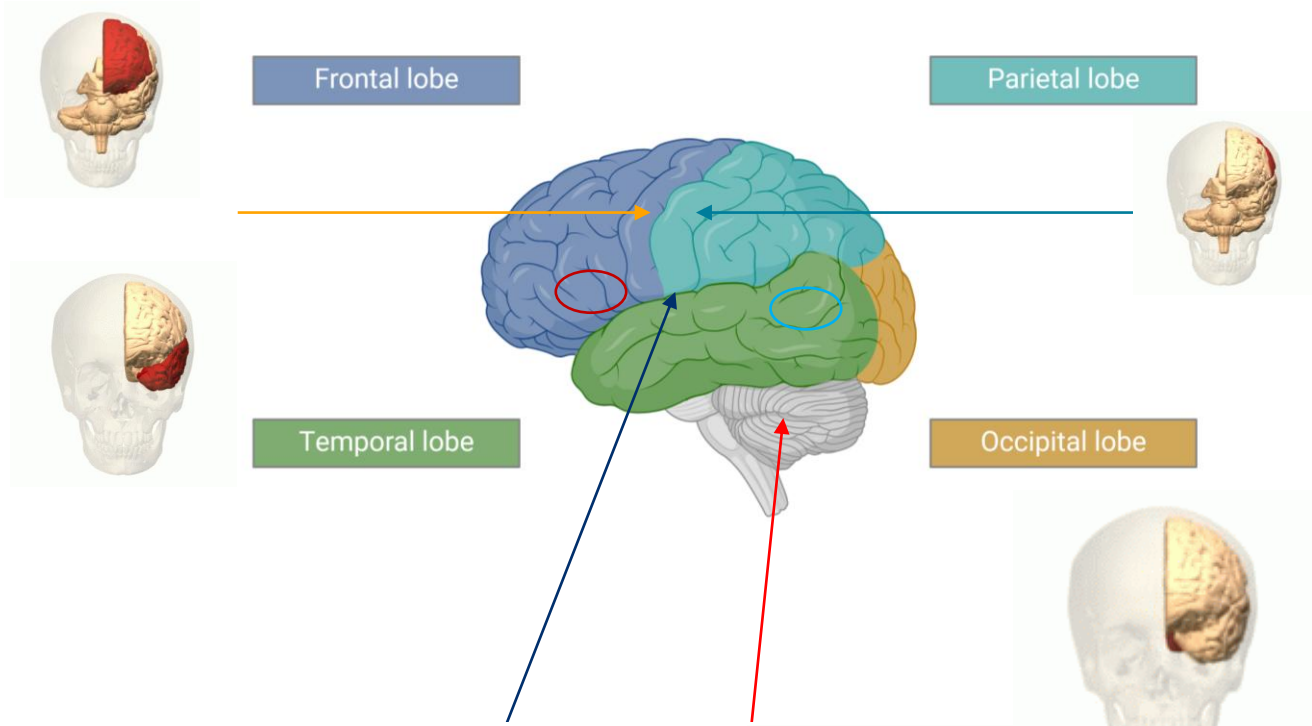


PLAN

- Introduction
- **Brain Anatomy**
- Imaging Modalities for the Brain
- Brain Imaging Planes
- Clinical Applications of Brain Imaging
- Take home messages
- Conclusion and Q&A

BRAIN ANATOMY





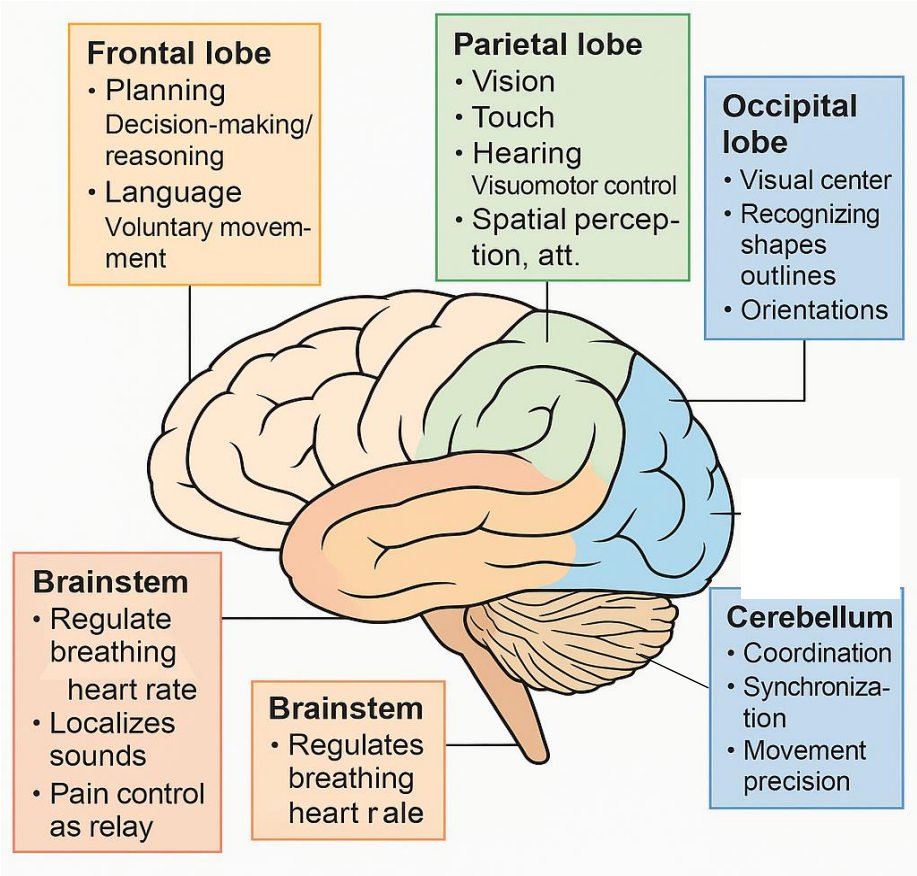
Major Brain region: **cerebral hemisphere with lobes, Brainstem, cerebellar hemisphere**

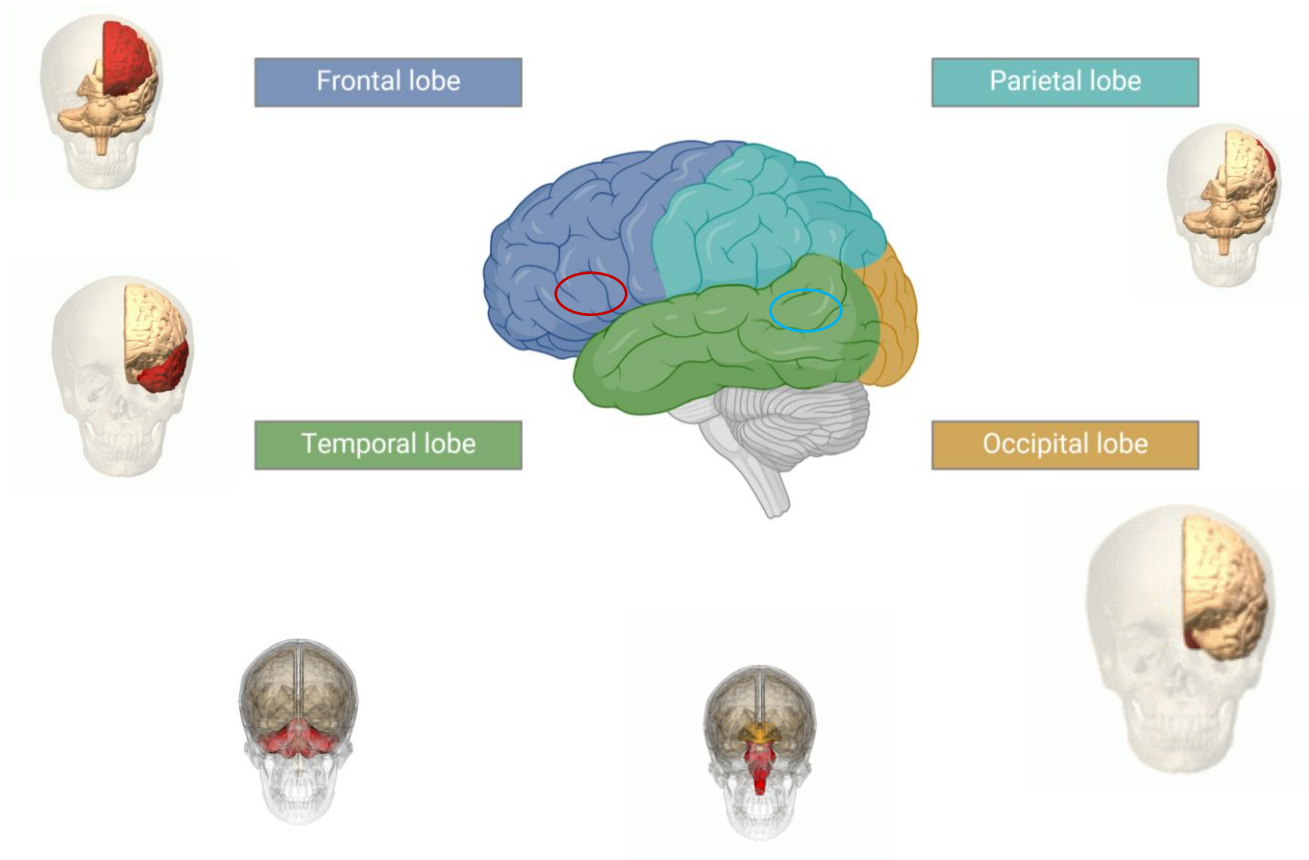
Basics Landmark : **Gyri, Sulcus (central and lateral++), Broca and Wernicke Areas, Ventricle (CSF), White and Gray matters (Connectivity)**

BRAIN ANATOMY

Functionnal Organization:

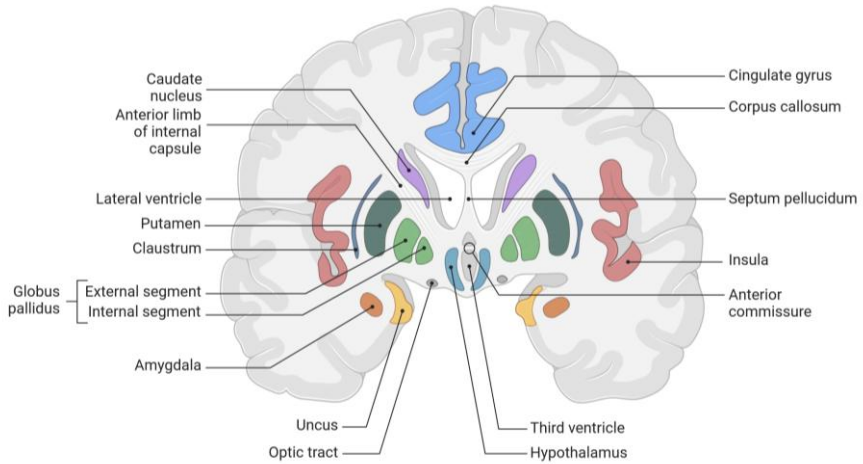
Essentials Functions

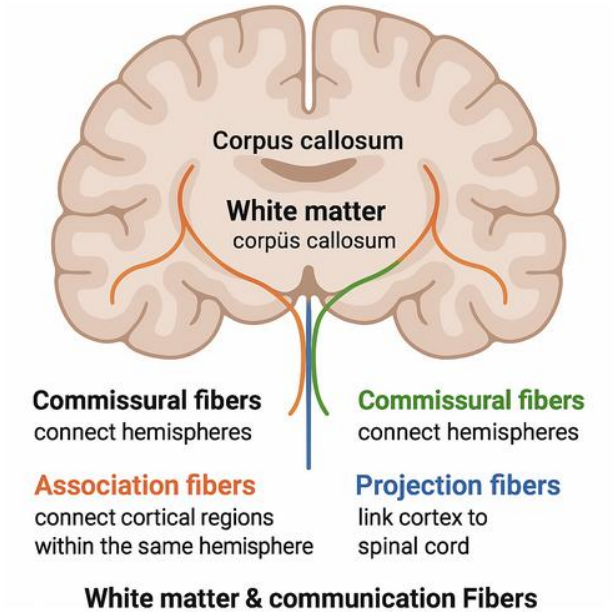




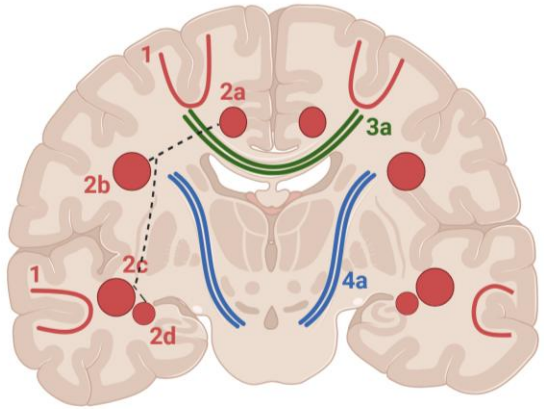
Wernicke's area: comprehension of written and spoken language,
Broca's area: the production of language

BRAIN ANATOMY

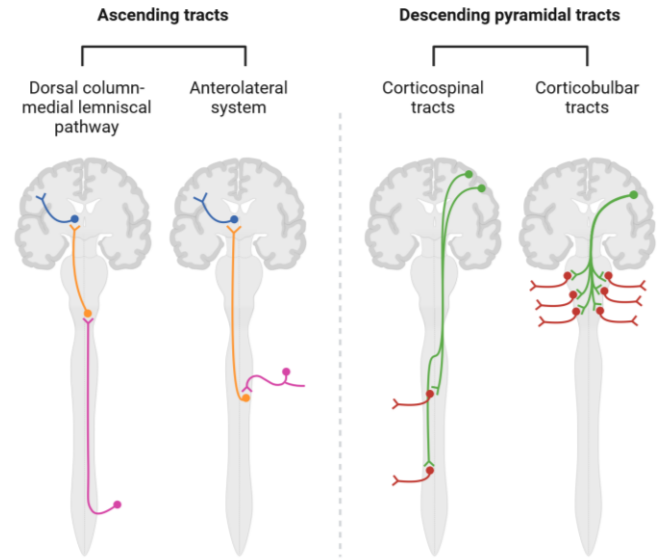




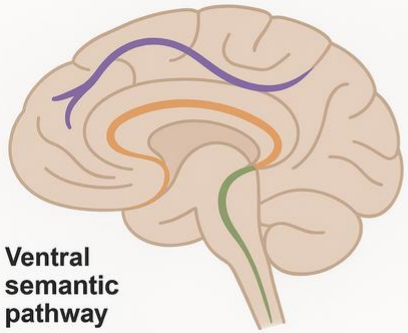
Brain Connectivity



1) Short association fibers
2) Long association fibers
   a) Cingulum
   b) Superior longitudinal fasciculus
   c) Inferior longitudinal fasciculus
   d) Uncinate fasciculus
3) Commissural fibers
   a) Corpus callosum
4) Projection fibers
   a) Internal capsule



Major Pathways

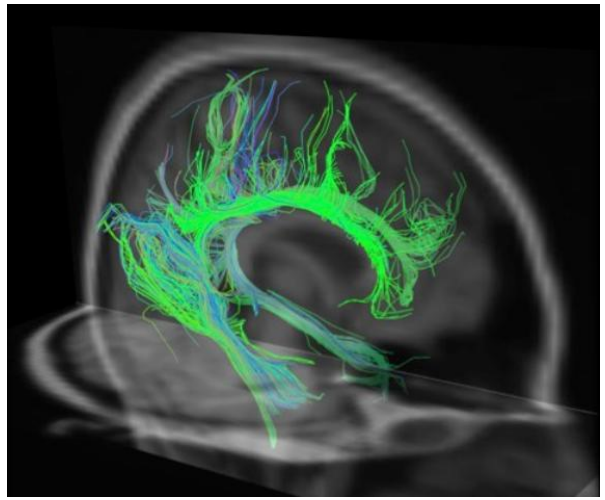


Dorsal phonological pathway
Reading, articulation phonology

Fornix
Memory, olfaction

Ventral semantic pathway
Word recognition

Cingulum
Executive functions semantics



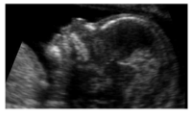
https://ibrain.univ-tours.fr/medias/fichier/ilyess-zemmoura-4831_1497430475682-pdf

PLAN

- Introduction
- Brain Anatomy
- **Imaging Modalities for the Brain**
- Brain Imaging Planes
- Clinical Applications of Brain Imaging
- Take home messages
- Conclusion and Q&A

IMAGING MODALITIES FOR THE BRAIN

Ultrasound

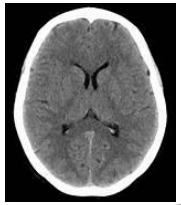


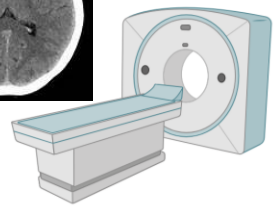
Ultrasound with high frequency reflects on soft and hard tissues

- Used to measure the direction and speed of movement
- Cannot see past bones

Mostly superficial tissues
- Pregnancy
- Cardiovascular imaging
- During surgery
- ...

Computed Tomography



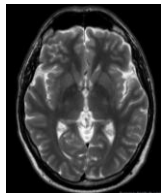


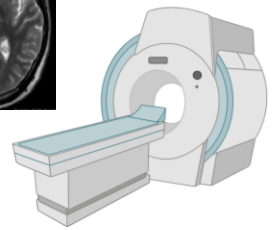
Source of X-rays and detectors rotate around patient

- Virtual slice through the patient for quick diagnosis
- Low dose of dangerous X-rays

Mostly hard tissues
- Broken bones
- Liquid build up in lungs
- Blood circulation
- ...

Magnetic Resonance Imaging

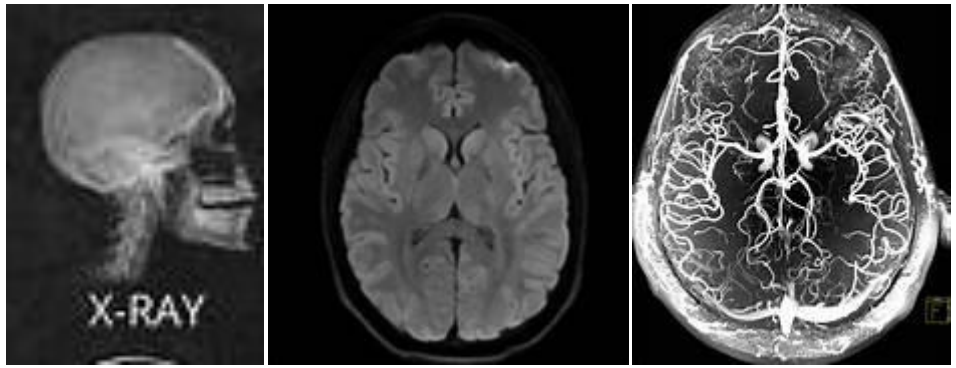


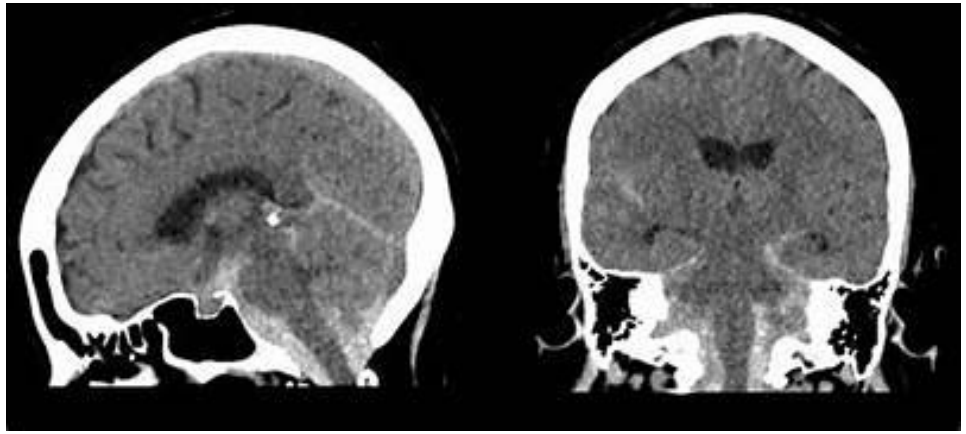


Large magnet and radio waves that influences water molecules to create an image

- Functional, structural and chemical information
- Long and loud scans

Mostly soft tissues
- Brain imaging
- Tendons and ligaments
- Cardiovascular imaging
- ...





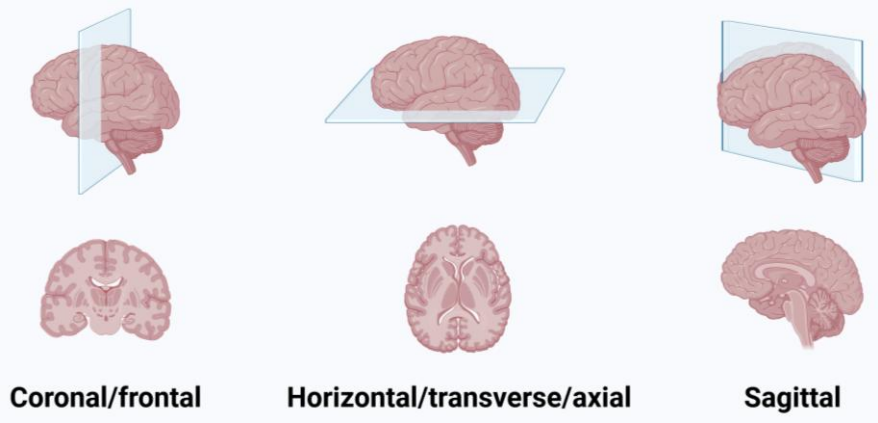
PLAN

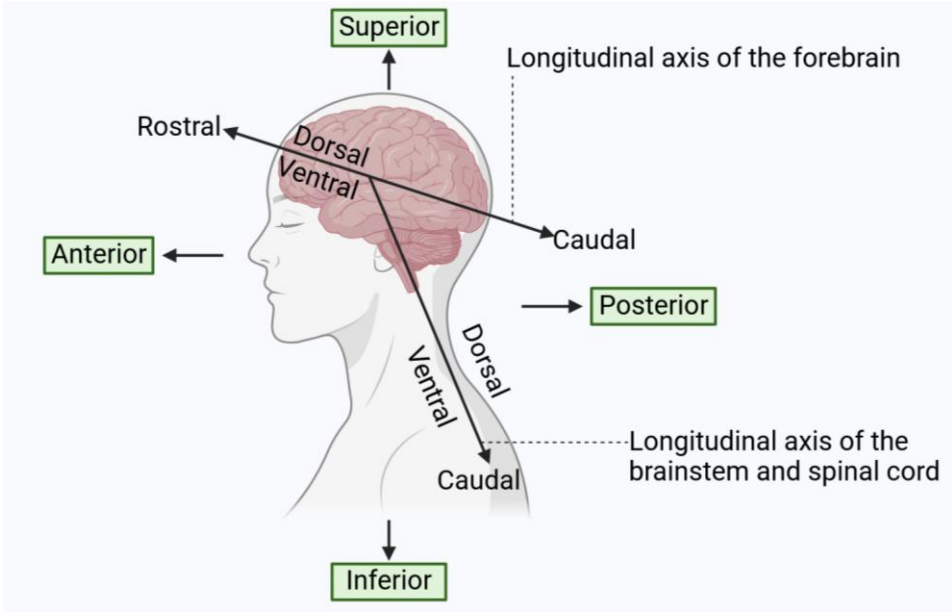
- Introduction
- Brain Anatomy
- Imaging Modalities for the Brain
- **Brain Imaging Planes**
- Clinical Applications of Brain Imaging
- Take home messages
- Conclusion and Q&A

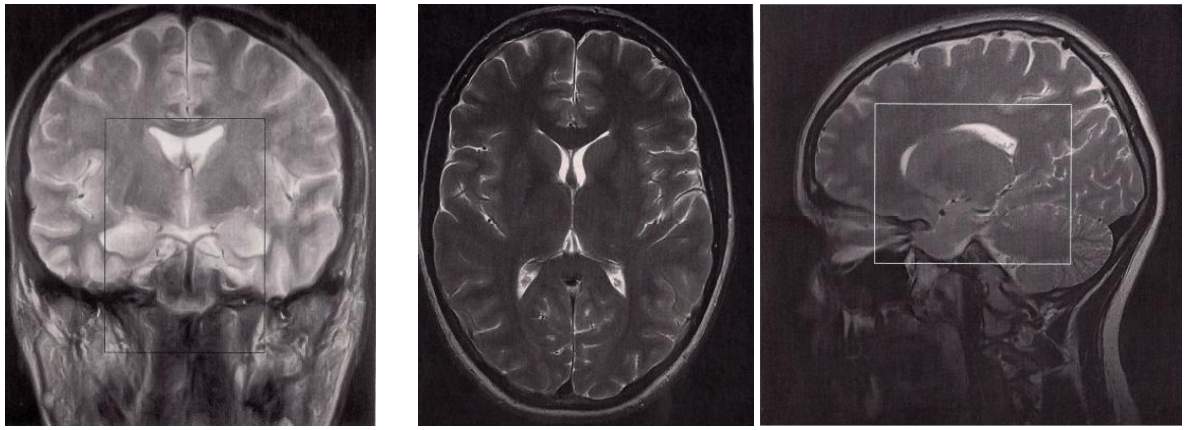
BRAIN IMAGING PLANES

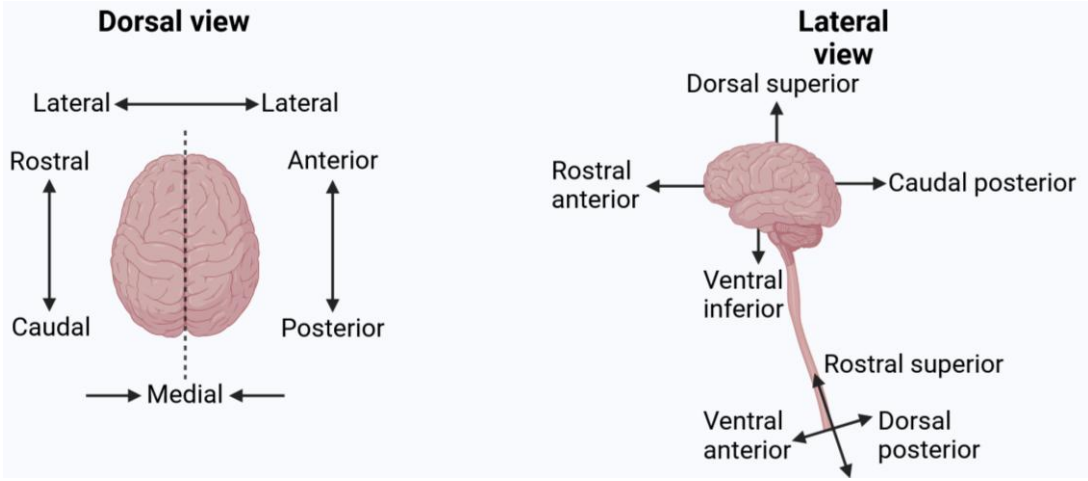
Why planes matter? : Standardized views for interpretation

- **Three primary planes: Axial, Coronal, Sagittal**









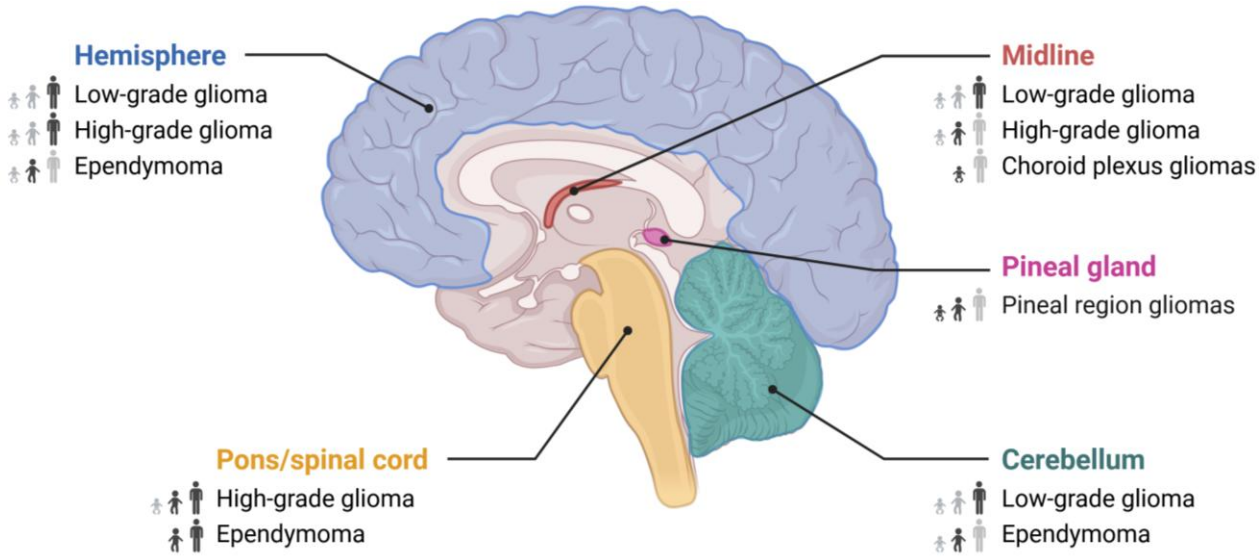
PLAN

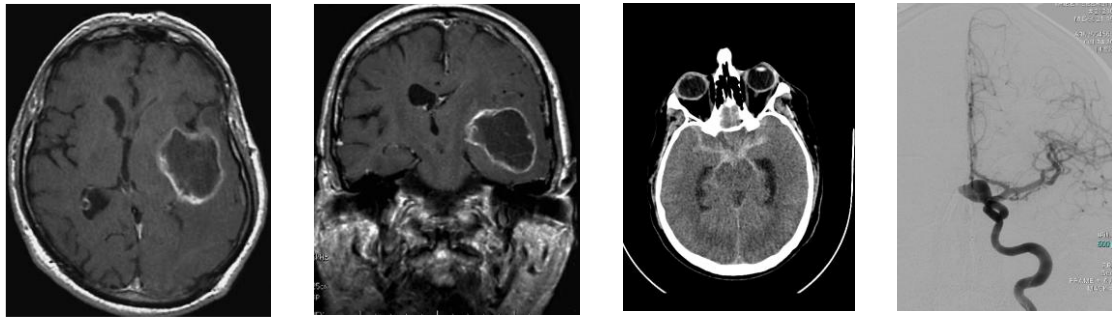
- Introduction
- Brain Anatomy
- Imaging Modalities for the Brain
- Brain Imaging Planes
- **Clinical Applications of Brain Imaging**
- Take home messages
- Conclusion and Q&A

CLINICAL APPLICATIONS OF BRAIN IMAGING

- **CT Scan: Quick, good for hemorrhage & fractures (Trauma)**
- **MRI: Superior for tumors & demyelination,neurodegenerative diseases (Atrophy patterns, Parkinson, Alzheimer…)**
- **Angiography: Visualizing blood vessels (Aneurysms, AVM, AVF…)**

Axial plane: Stroke, trauma, hydrocephalus
Coronal plane: Medial structures, ventricular system, pituitary gland
Sagittal plane: Midline structures (Corpus callosum, Brainstem, Pineal gland)





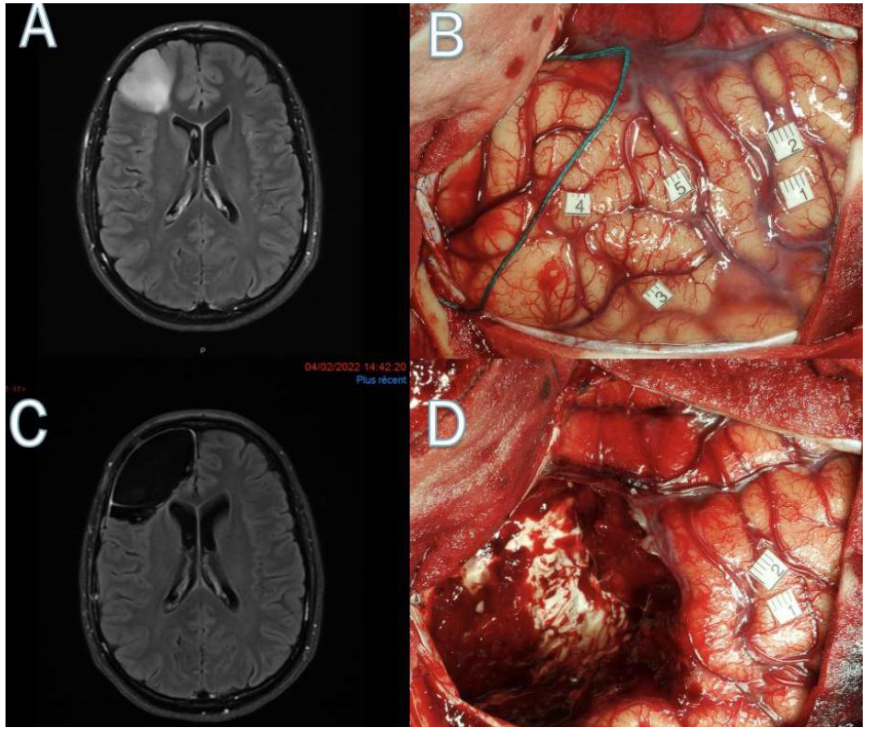
Correlation of clinic and paraclinic for Diagnosis
Follow-up: From diagnosis-Treatment-Outcomes

PLAN

- Introduction
- Brain Anatomy
- Imaging Modalities for the Brain
- Brain Imaging Planes
- Clinical Applications of Brain Imaging
- **Take home messages**
- Conclusion and Q&A

TAKE HOME MESSAGE

- Understanding brain anatomy enhances clinical practice
- Imaging planes provide standardized views for accurate diagnosis
- Choosing the right modality and plane is essential for optimal interpretation
- Establish good correlation between clinical and paraclinical for Diagnostics
- Follow-up from Diagnosis-treatment-Outcomes



PLAN

- **Introduction**
- Brain Anatomy
- Imaging Modalities for the Brain
- Brain Imaging Planes
- Clinical Applications of Brain Imaging
- Take home messages
- **Conclusion and Q&A**

CONCLUSION

- Understanding brain anatomy enhances clinical practice
- Imaging planes provide standardized views for accurate diagnosis
- Choosing the right modality and plane is essential for optimal interpretation
- Establish good correlation between clinical and paraclinical for Diagnosis
- Follow-up from Diagnosis-treatment-Outcomes

Thanks for your Kind Attention

Q&A ???

19/04/2025