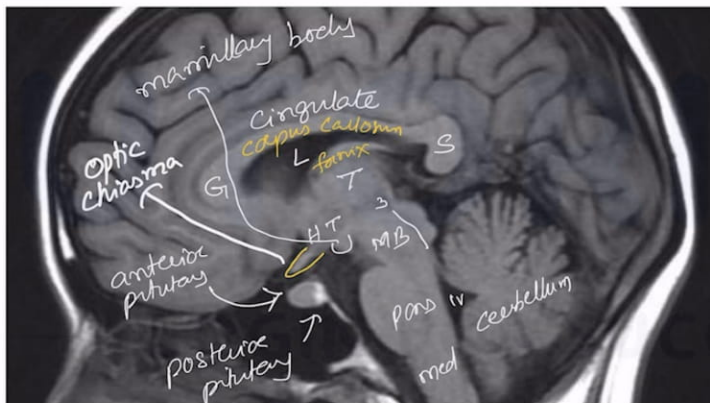
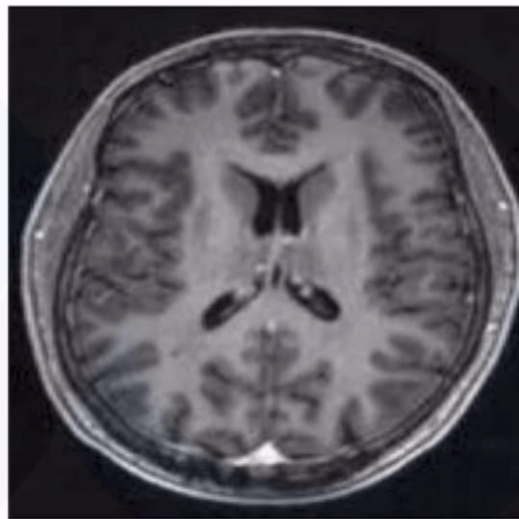


T1-Weighted MRI:

00:00:11

➤ T1-Weighted MRI

- In both **T1** and **T2** weighted imaging, bone appears black and fat appears white.
- Fluid is dark in **T1** imaging. This includes ventricles, sulci, and Sylvian fissures.
- Gray matter appears gray and white matter appears white.
- T1 relaxation is a spin lattice interaction that occurs on the z-axis.
- T1 uses short time to echo and short time to repeat.



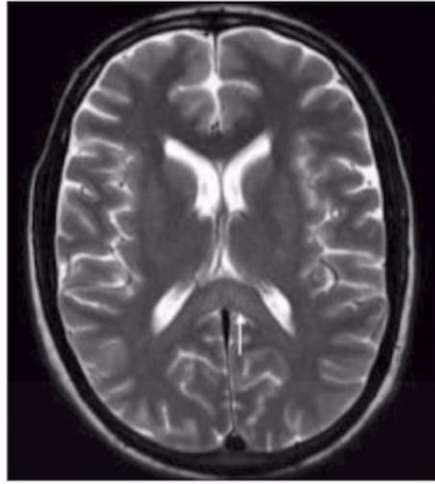
Sagittal T1 W

T2-Weighted MRI

00:02:15

➤ T2-weighted MRI:

- As in **T1**, bone is black and fat is white.
- Fluid appears white in **T2** imaging. This includes the vitreous of the eyeball, gallbladder, hepatic duct, CSF, urinary bladder, and fluid in follicles and cysts.
- Gray matter is white and white matter is black.
- **T2** is a spin-spin interaction, involving a loss of transverse magnetization in the x-y axis.
- **T2** uses long time to echo and long time to repeat.

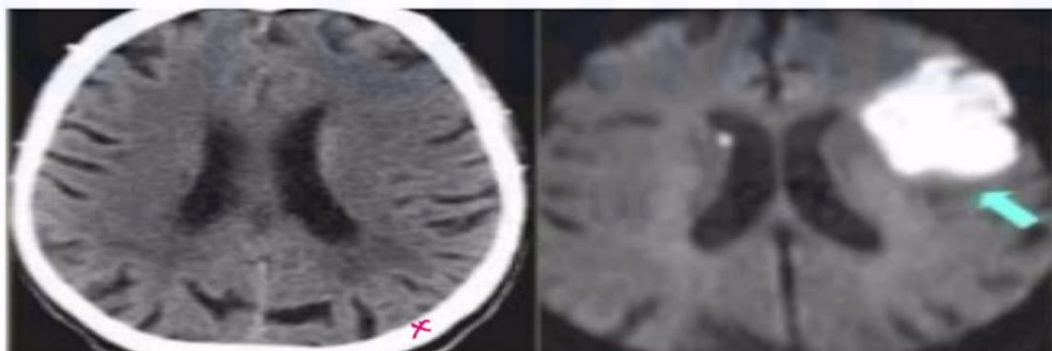


Diffusion Weighted Imaging (DWI)

00:07:25

➤ Diffusion Weighted Imaging (DWI):

- DWI is used to detect **cytotoxic edema** before vasogenic edema and is very sensitive for acute infarcts.
- Diffusion restriction will appear as a **bright signal** with a **low ADC (apparent diffusion coefficient) value**.
- Lesions that show diffusion restriction are:
 - Infarcts (wedge-shaped in a specific arterial territory)
 - Abscesses (ring-enhancing lesion)
 - Medulloblastomas (fourth ventricular mass in children)
 - Epidermoid cysts (in the cerebellopontine angle)
- DWI is based on Brownian movement, the random movement of molecules.



Rt sided hemiplegia

CT - normal

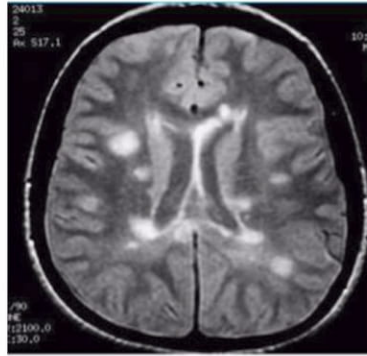
Diffusion Weighted MRI

FLAIR (Fluid Attenuated Inversion Recovery)

00:12:28

➤ FLAIR (Fluid Attenuated Inversion Recovery):

- FLAIR is similar to **T2**, but with **fluid signal suppressed**.
- It's the **best sequence for viewing plaques of multiple sclerosis**.
- It helps visualise periventricular hyperintensities like Dawson fingers by suppressing the fluid signal.

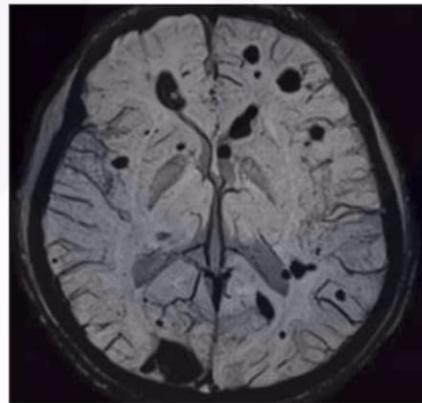


Susceptibility Weighted Imaging (SWI)

00:13:40

➤ Susceptibility Weighted Imaging (SWI):

- SWI is used to pick up microhemorrhages, hemosiderin, and calcifications.
- These areas appear as "blooming artifacts" which are larger and darker than in T1 or T2 imaging.
- Microhemorrhages are seen in conditions like diffuse axonal injury and cerebral amyloid angiopathy.

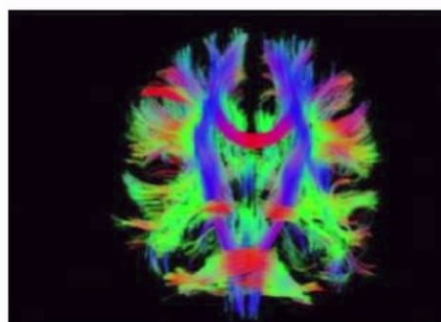


Diffusion Tensor Imaging(DTI)

00:14:56

➤ Diffusion Tensor Imaging (DTI):

- DTI, also called tractography, evaluates white matter tracts.
- DTI is based on anisotropic movement, which is movement in one direction.
- Different colours indicate different fiber directions, for example, superior to inferior fibres are blue and left to right fibers are red. anterior to posterior are green

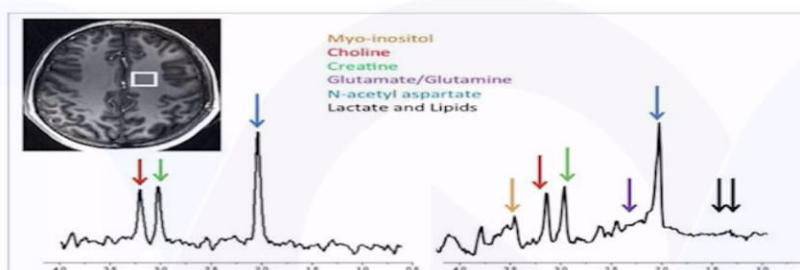


MRI Spectroscopy

00:16:58

➤ MRI Spectroscopy:

- MRI spectroscopy detects **chemical metabolites** of a lesion using frequencies measured in parts per million (ppm).
- Normal metabolites and their peaks include:
 - **Lipid lactate** at **1** ppm, increased in necrosis (e.g., tuberculoma).
 - **N-acetyl aspartate (NAA)** at **2** ppm, indicates neuronal integrity. Reduced in most pathologies but increased in Canavan disease.
 - **Creatinine** at **3** ppm
 - **Choline** at **3.2** ppm, increased in tumors.



Contrast Enhanced MRI

00:19:39

➤ Contrast Enhanced MRI:

- Contrast is used with **T1**-weighted imaging.
- **Gadolinium** is a paramagnetic substance that appears bright on T1.
- A **black turbinate sign** on contrast enhanced MRI suggests **mucormycosis**, an invasive fungal infection that prevents contrast from reaching the turbinate.



Black Turbinate Sign -

General Notes on Signal Intensity

00:23:24

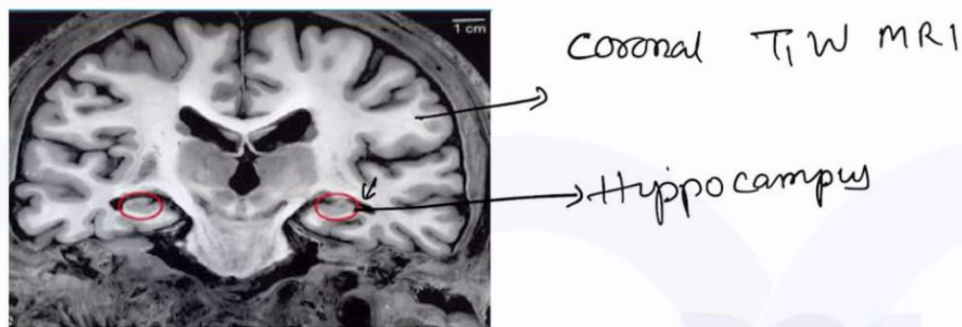
➤ General Notes on Signal Intensity:

- Most pathologies are **hypointense (dark)** on **T1** and **hyperintense (white)** on **T2**.
- Exceptions to this include:
 - **Signal voids**, which appear **dark on both T1 and T2**. These include bone, air, calcifications, dense fibrous tissues like ligaments and tendons, and flowing blood.

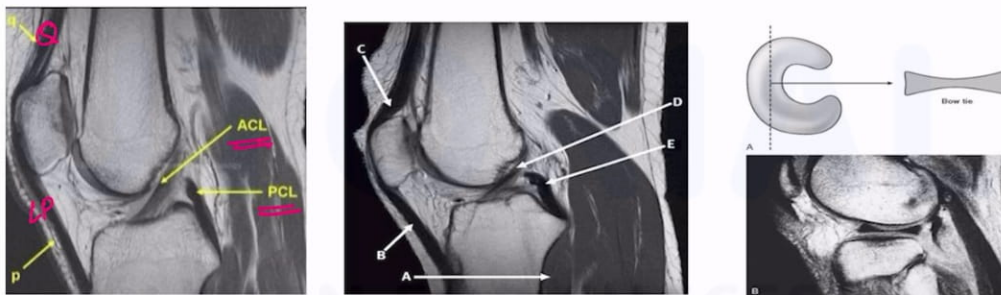
- Structures that appear bright on both T1 and T2 are fat(lipoma) , methemoglobin(subacute hge), melanin (choroidal melanoma), copper(wilsons), protein, and paramagnetic substances like gadolinium.
- Copper** appears **white** on MRI while **iron** appears **dark**.

➤ **Specific anatomical findings:**

- The hippocampus is best evaluated on oblique coronal non contrast t1wt MRI. Hippocampal atrophy is associated with mesial temporal sclerosis and Alzheimer's disease.



- The **posterior pituitary** appears as a **bright spot** due to vasopressin content. Absence of this bright spot suggests diabetes insipidus.
- On sagittal MRI of the knee, the normal **PCL (posterior cruciate ligament)** has a **question mark-like appearance**, while a **double PCL sign** indicates a bucket handle tear of the medial meniscus. The meniscus has a boat-like appearance on the sagittal section.



Mind Map

