BRAIN IMAGING
CT & MRI

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Patient Preparation
Patient position

Technique
Scanogram [frontal, lateral]
Scan intervals

Orbito-meatal line:
From External Canthus
To Ext. Auditory meatus
Patient Preparation

Fasting 4-6 hours

• Contrast material
  [Urographin, Telebrix, Isovist...] 1-2 ml/kg

• Anesthesia
  Children, Uncooperative patients
Contrast material administration

NO
Traumatic cases, CVS

YES
Cold cases [headache, epilepsy, signs of increased ICT, ...]
Ventricular anatomy

- Quadrigeminal Cistern
- Occipital horn, Calc. pineal body

Ventricular anatomy
Quadrigeminal Cistern
Corona Radiata
CT Vascular Anatomy

- ICA
- ACA (a1)
- ACA (a2)
- MCA
- A. Communicating A.
- PCA
- P. Comm. A.
- Basilar A.
Strong magnetic field and
Radiofrequency (RF) coils

- Imaging are created by the motion of hydrogen protons in response to the applied radiofrequency
- Multiplanar imaging [axial, sagittal, coronal]
- Any MR examination should include T1 and T2 Weighted images
Subarachnoid Cisterns

- Cisterna Magna
- Prepontine Cistern
- Interpeduncular Cistern
- Quadrigeminal Cistern
- Cavum velum interpositum
- Suprasellar Cistern
- Cisterna Magna
- Suprasellar Cistern
OPEN MAGNET
MR advantages

- Multiplanar imaging
- Tissue characterization
- No bone artifacts
- Shows blood vessels without contrast
• T1 WIs (TR< 800 msec  TE  20 msec)
• T2 WIs (TR> 1000 msec  TE> 80 msec)
• PD WIs (TR> 1000 msec  TE= 20 msec)

• T1 WIs  [CSF BLACK ]
• T2 WIs  [CSF BRIGHT ]
• FLAIR WIs [ CSF BLACK ]
Aneurysm Clips

Yasargil clip positioned with Yasargil applicator on anterior communicating aneurysm. Perforating branches avoided (mandatory in all cases)

Heifetz applicator

Heifetz angled clip used for less accessible aneurysm
- Low signal lesion = hypointense = dark
- High signal lesion = hyperintense = bright
- Intermediate signal = isointense = Gray
How to interpret MR Images ?!

- Identify T1 weighted images (CSF low signal) and T2 Weighted images (CSF high signal)
- Assess the signal intensity of the structure or lesion in both T1 and T2 weighted images
- Follow the well known common signal behavior
**T1 [low signal] T2 [low signal]**

[Non mobile protons]

- Cortical bone
- Mature fibrous tissue (ligaments and tendons)
- Calcifications (physiological, pathological)
- Flowing blood in the vessels (fast moving protons) (signal void)
- Air in the sinuses, lungs... (minimal hydrogen protons)
- Others...
**T1 High signal**  **T2 High signal**
- Subacute blood [met Hb]
- Others....

**T1 High signal**  **T2 Low signal**
- Fat (subcutaneous fat, dermoid cyst,...)
- Others....
**T1[Low signal] T2[High signal]**

Any structure or lesion not listed before
- Fluids (CSF, urine, pleural effusion, ascites, …)
- Edema and infarctions
- Most of tumors
- Contrast injection [Gd-DTPA] +
Gadolinium – DTPA
0.1 – 0.2 mmol/kg body weight

Only T1 weighted images are obtained after Gd- DTPA injection

- Differentiate SOLs
- Assess activity of some lesions like MS
- Assess post operative tumour recurrence
Trigeminal n.
Optic tract, mamillary body, cerebral peduncle, substantia negra

Gyrus rectus
Amegdala, hippocampus, superior vermis

Temporal Horn

Quadrigeminal Cistern

Interpeduncular Cistern

Amegdala, hippocampus, superior vermis

Hippocampal Formation

(epilepsy)
Hippocampal region
Mesial temporal sclerosis
Choroidal fissure, Hippocampal tail, Vein of Galen

(Retrothalamic Cistern)
Verchaw – Robben’s spaces (dilated perivascular spaces)

- Seen in T1WIs
- Not seen in FLAIR
- No clinical correlation
- Anatomic sites
Grey matter : Whitish
White matter: Greyish
Value of sagittal images

- Anatomic localization [Lobes]
- Corpus callosum delineation
- Cranio cervical junction
- Evaluation of the venous sinuses
- Pituitary gland
Value of coronal images

- Pituitary gland, chiasm, hypothalamus
- Hippocampal region
- Skull base and posterior fossa
- Trigeminal nerve
- Vascular anatomy
Superficial veins of cortical regions and their sinuses:
1 Superior (superficial) cerebral veins
2 Superior sagittal sinus
3 Superficial middle cerebral vein (of Sylvius)
4 Cavernous sinus
5 Inferior petrosal sinus

Deep veins of central and nuclear regions and their sinuses:
6 Anterior vein of septum
7 Superior thalamostriate
8 Venous angle
9 Internal cerebral vein
10 Great cerebral vein (of Galen)
11 Inferior sagittal sinus
12 Basal vein (of Rosenthal)
13 Straight sinus
14 Confluence of sinuses
15 Transverse sinus
16 Sigmoid sinus
17 Internal jugular vein
1 Sphenoparietal sinus
2 Anterior intercavernous sinus
3 Cavernous sinus
4 Posterior intercavernous sinus
5 Basilar plexus
6 Venous plexus of foramen ovale
7 Superior petrosal sinus
8 Inferior petrosal sinus
9 Internal jugular vein (running caudally)
10 Sigmoid sinus
11 Transverse sinus
12 Occipital sinus
13 Superior sagittal sinus
14 Confluence of sinuses
سبحانك اللهم و بحمدك نشهد ان لا اله الا انت نستغفرك و نتوب اليك

Thank you
Fig. 2-33 PCA distribution. Axial diagrams arranged in sequence from base to vertex outline supply from the PCA, the thalamic and midbrain perforators (medium shading), callosal (dark shading), and hemispheric branches (light shading). (From Latchaw RE: MR and CT imaging of the head, neck, and spine, ed 2, St. Louis, Mosby, 1991.)

A

Superficial veins of cortical regions and their sinuses:
1. Superior (superficial) cerebral veins
2. Superior sagittal sinus
3. Sphenoid middle cerebral vein (of Sylvius)
4. Cavernous sinus
5. Inferior petrosal sinus

Deep veins of central and nuclear regions and their sinuses:
6. Anterior vein of septum
7. Superior thalamic vein
8. Venous angle
9. Inferior cerebral vein
10. Great cerebral vein (of Galen)
11. Inferior sagittal sinus
12. Basal vein (of Rosenthal)
13. Straight sinus
14. Confluence of sinuses
15. Transverse sinus
16. Sigmoid sinus
17. Internal jugular vein

Fig. 2-34 Venous anatomy. A. Lateral view of the head illustrating the cerebral veins and sinuses. The sequence of the numbers takes into account both the areas drained by the veins and the direction of blood flow.