Introduction to Neuroradiology
Brain Imaging

The basic imaging tools

- Fluoroscopy/Radiography
- Computed Tomography
- Magnetic Resonance Imaging
- Digital Substraccion Angiography (DSA)
- Ultrasound
- Nuclear Medicine
Computerized Tomography (CT)
Computed Tomography (CT, CAT)
MRI Function

(A) No external field

Net magnetization vector:
\[ M = 0 \]

(B) External field applied

Net magnetization vector:

(C) Radio frequency pulse given

Net magnetization vector:
MRI in the Brain

Axial

Sagittal

Coronal
MAGNETIC RESONANCE IMAGING

T1WI

T2WI
MR Angiography
Without contrast medium
MR Angiography
With Gadolinium
Neuroangiography

Invasive procedure requiring insertion of a catheter through the femoral artery up to the carotid. Iodinated contrast material is injected into the carotid and vertebral arteries bilaterally and sequential images are obtained.
DIGITAL SUSTRACTION
ANGIOGRAPHY
DIGITAL SUBTRACTION ANGIOGRAPHY
MYELOGRAPHY

MYELO-TAC

MYELO-MRI
CEREBRAL VASCULAR EVENT

- ISCHEMIC
- HEMORRHAGIC
ACUTE INFARCT
EARLY SIGNS OF ISCHEMIC INFARCT

CT

• LOSS OF DEFINITION BETWEEN GRAY AND WHITE MATTER
• ILL DEFINITION OF INTERNAL CAPSULE
• HYPERDENSE MIDDLE CEREBRAL ARTERY
HYPERDENSE MCA
CHRONIC INFARCT
EARLY SIGNS OF ISCHEMIC INFARCT

MRI

- T1 HYPOINTENSITY
- T2, FLAIR HYPERINTENSITY
- DWI HYPERINTENSITY
- DECREASED SIGNAL IN PERFUSION IMAGES
T1

FLAIR

DIFFUSION
LUXURY PERFUSION
Ventricular hemorrhage and parenchymal infarct
CEREBRO VASCULAR EVENT

ISCHEMIC
THROMBO EMBOLIC
VASCULITIS
DISSECTION
FIBROMUSCULAR DISPLASIA
VENOUS THROMBOSIS
ANOXIA
ATHEROSCLEROTIC PLAQUE
COLOR AND PULSED DOPPLER ULTRASOUND
FIBROMUSCULAR DISPLASIA
DISSECTION
SUBACUTE INFARCT
VERTEBRAL ARTERY DISSECTION
SSS THROMBOSIS
VENOUS INFARCT
CEREBRO VASCULAR EVENT

• HEMORRHAGIC HYPERTENSION
ANEURYSM
VASCULAR MALFORMATION
TRAUMA
COAGULOPLATHY
AMYLOIDOSIS
HYPERTENSION

Intracerebral Hemorrhage
ANEURYSM

Subarachnoid Hemorrhage

[Images of a blood vessel and a brain CT scan]
Cerebral Arterio Venous Malformation (AVM)
CTA 3D RECONSTRUCTION
TRAUMA

• CONTUSION
• DIFFUSE AXONAL INJURY
• SUBDURAL HEMATOMA
• EPIDURAL HEMATOMA
• SUBARACHNOID HEMORRHAGE
EPIDURAL HEMATOMA
DIFFUSE AXONAL INJURY
SEIZURE

- CONGENITAL MALFORMATION
- MESIAL SCLEROSIS
- CVA
- POSTTRAUMATIC
MESIAL SCLEROSIS
INFLAMMATORY

- MENINGO ENCEPHALITIS
- ABCESS
- TOXOPLASMOSIS
MENINGITIS
NEOPLASIA

- GLIOMAS
- LYMPHOMA
- MEDULOBLASTOMA
- PINEAL TUMOR
- PITUITARY ADENOMA
- EXTRAAXIAL TUMORS
- MENINGIOMA
- SCHWANNOMA
MEDULLOBLASTOMA
LYMPHOMA

ASTROCYTOMA
HIGH GRADE GLIOMA
(GRADE III)
DEMYELINATING DISEASE

- MULTIPLE SCLEROSIS
- ADEM
MULTIPLE SCLEROSIS
MULTIPLE SCLEROSIS
MS
OPTIC NEURITIS
MULTIPLE SCLEROSIS
Differential Diagnosis for ring-enhancing lesions:

**MAGICAL DR**

M - Metastasis, MS
A - Abscess
G - Glioblastoma, Granuloma
I - Infarct (esp. Basal ganglia)
C - Contusion (rare)
A - AIDS (Toxo, etc.)
L - Lymphoma (in aids)

D - Demyelination (active)
R - Resolving hematoma, Radiation change (necrosis)
RESOLVING HEMATOMA