Current Approach to Cranial and Spinal Imaging

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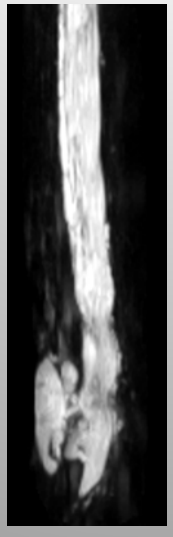
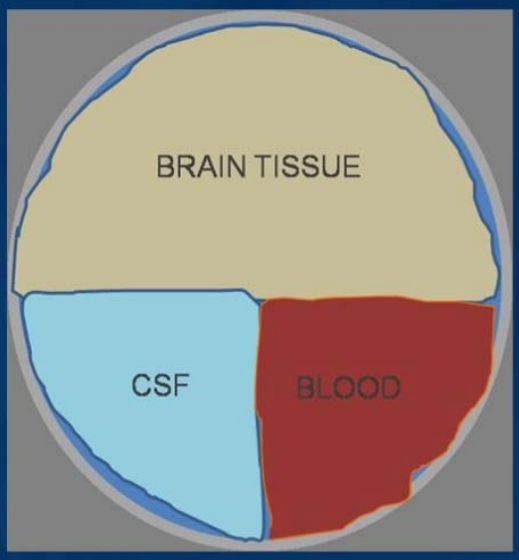
Cedars Sinai

CSF LEAK

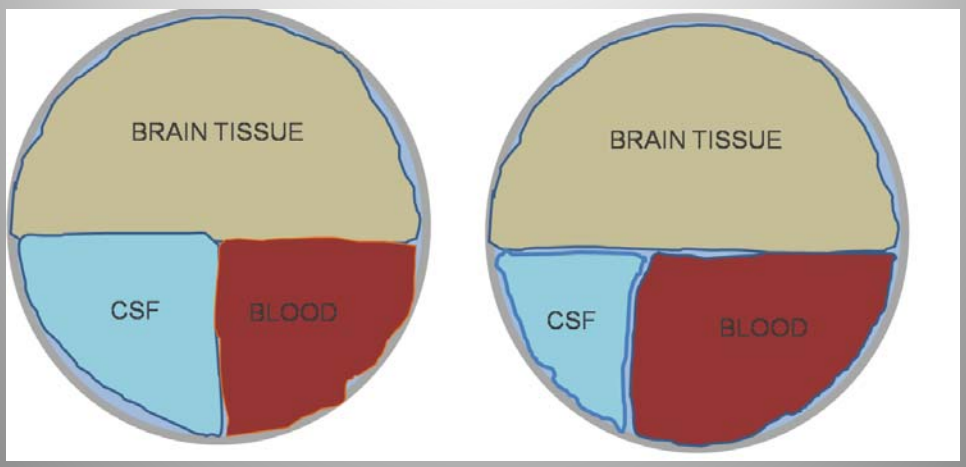


Normal Brain

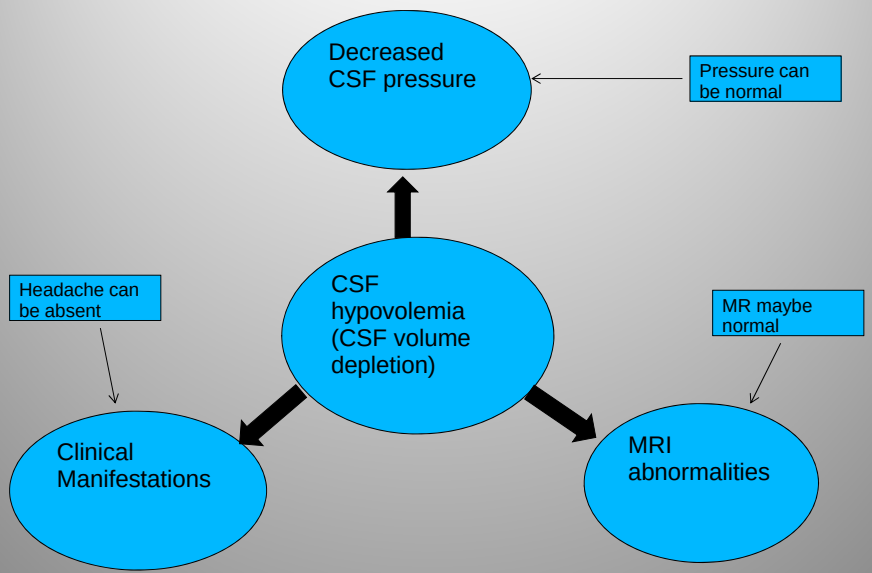
- Monro-Kellie hypothesis
  - Blood
  - Brain
  - CSF
- In adults the intracranial compartment is protected by the skull
- There is a fixed internal volume of 1400-1700mL



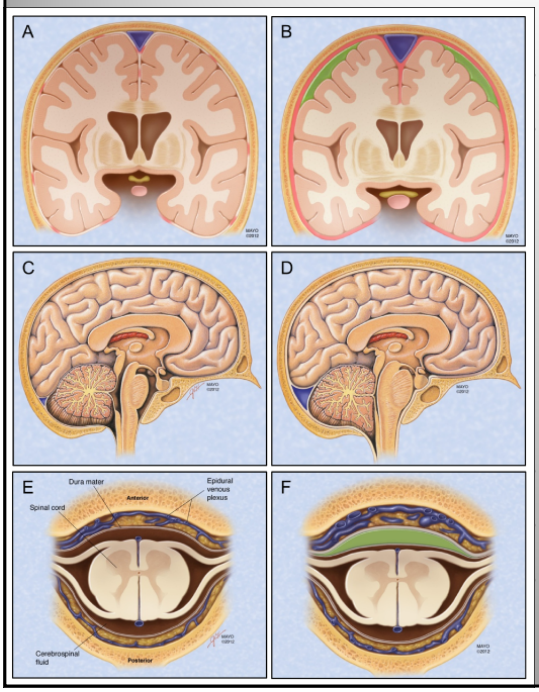
Monro-Kellie Hypothesis



Hypotension or Hypovolemia?



Intracranial Hypotension/Hypovolemia



Pachymeningeal enhancement

Brain “sagging” or “sinking”

- cerebellar tonsils low
- brainstem distortion
- Pontine enlargement
- crowding of the posterior fossa
- flattening of the optic chiasm

Subdural hygromas/hematomas

Engorged venous sinuses

Pituitary hyperemia

Cranial MRI

S Subdural hygroma/hematoma
E Enhancement of pachymeninges
E Enlargement of veins
P Pituitary hyperemia
S Sagging of brain

Imaging

- Radionuclide Cisternography
- MRI Brain
- MRI Spine
- MR Myelogram
- Intrathecal Gado MR Spine
- Conventional CT Myelogram
- Dynamic CT guided Myelogram
- Digital Subtraction Myelogram

Radionuclide Cisternography

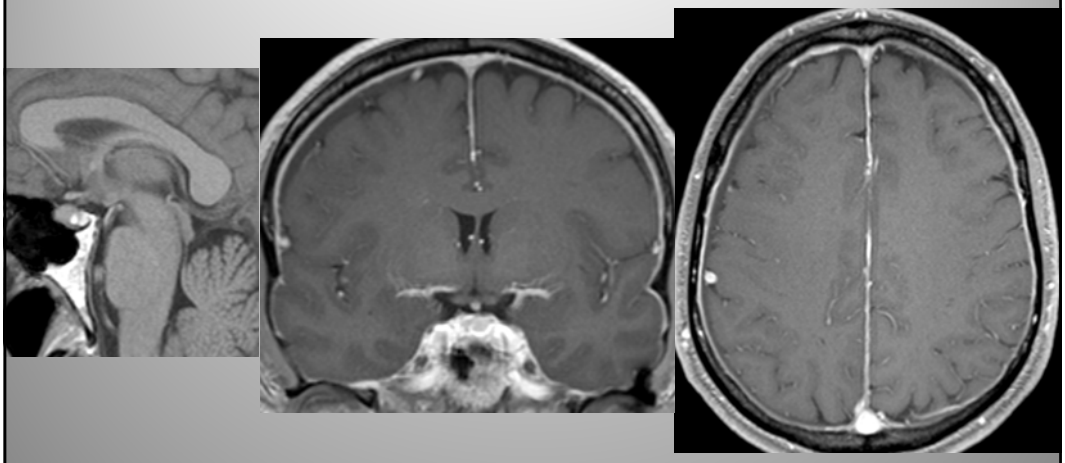
Paucity of activity over the convexities

Parathecal activity

Not good for localizing site of leak

Helpful when all else is unconvincing

Cranial MRI



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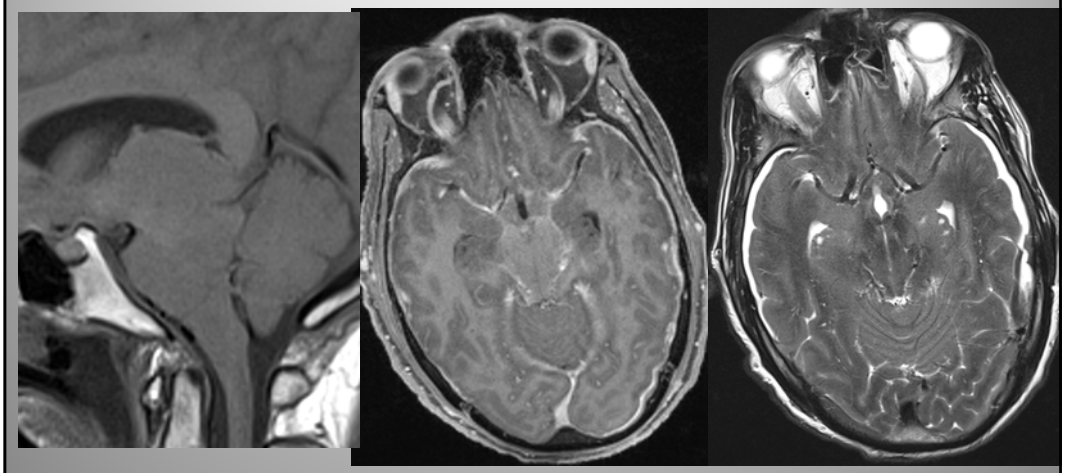
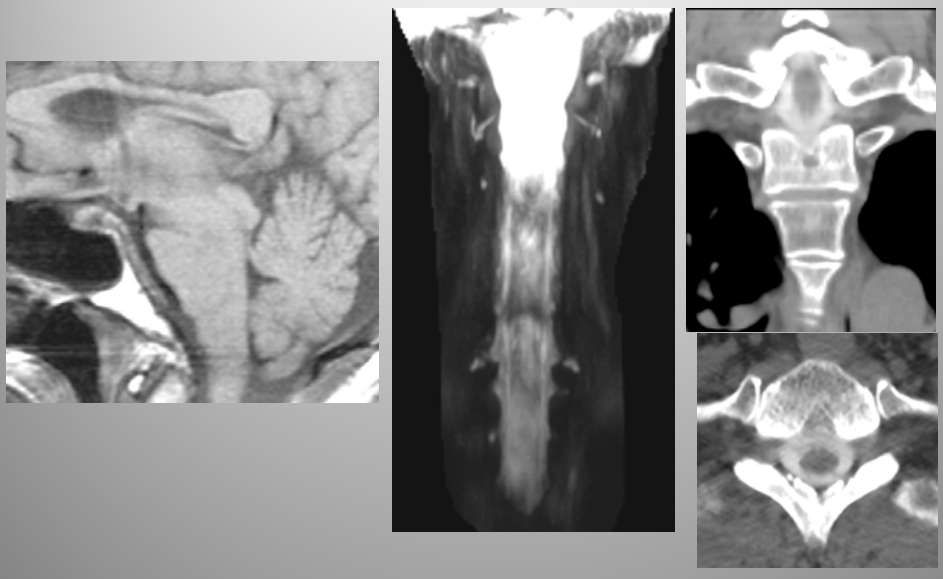
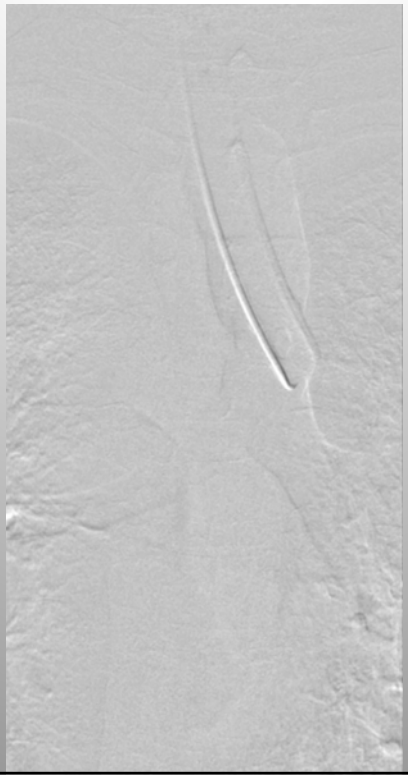
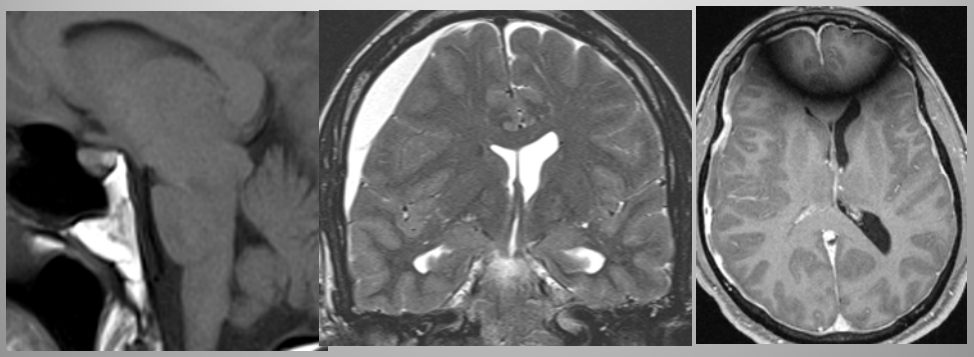
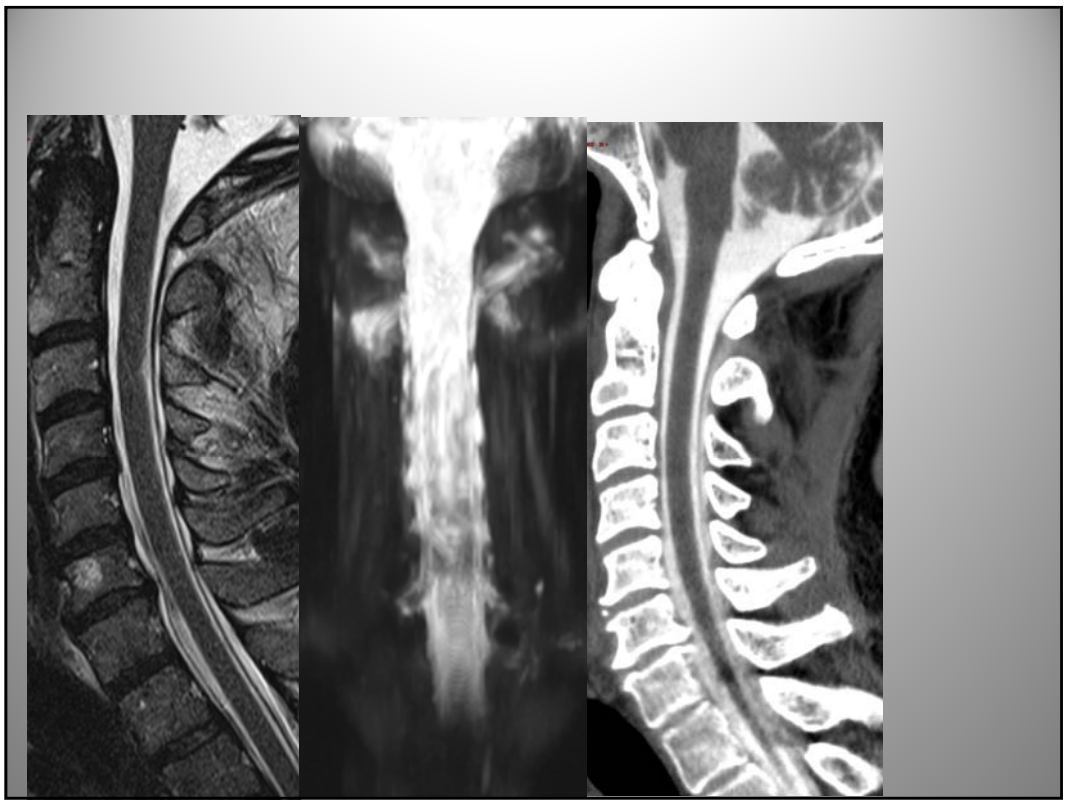
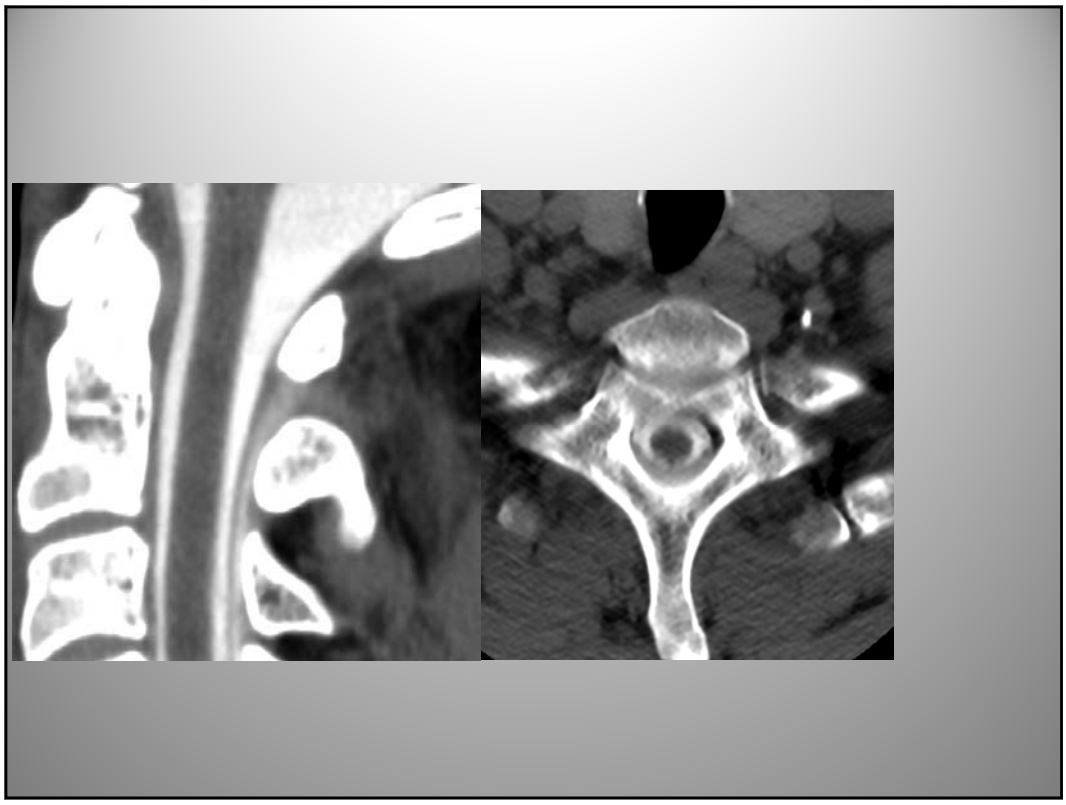




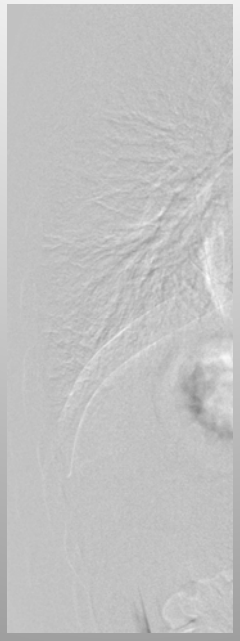




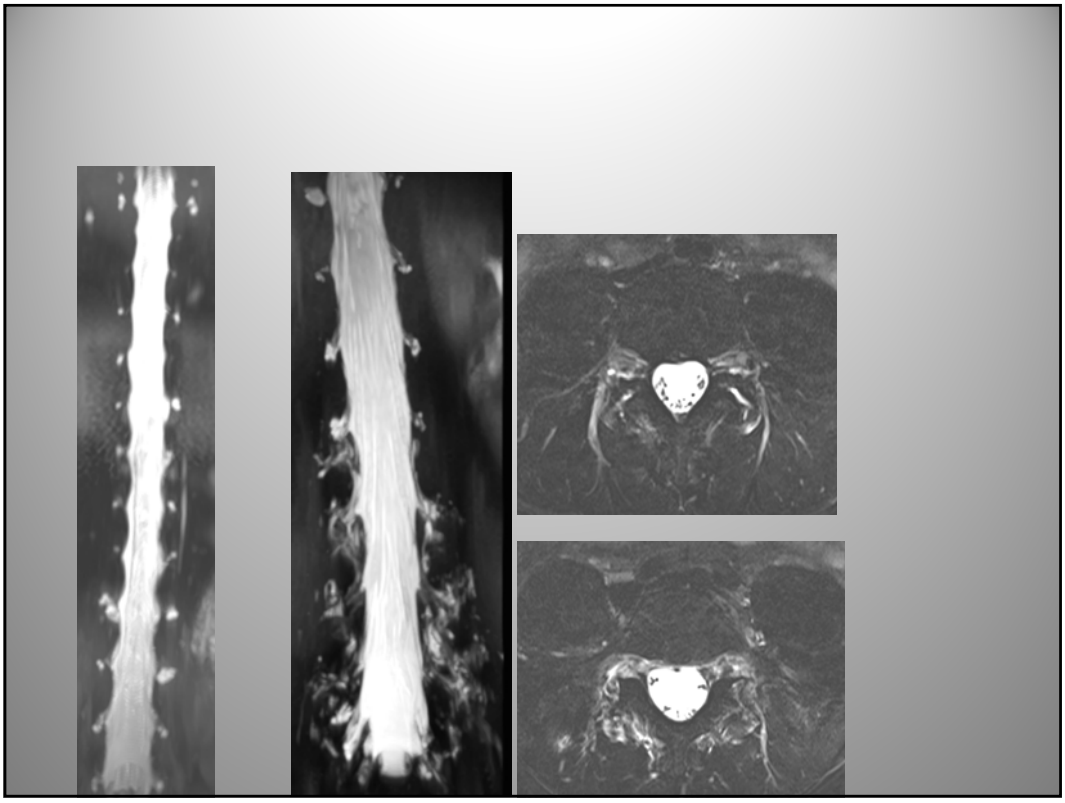




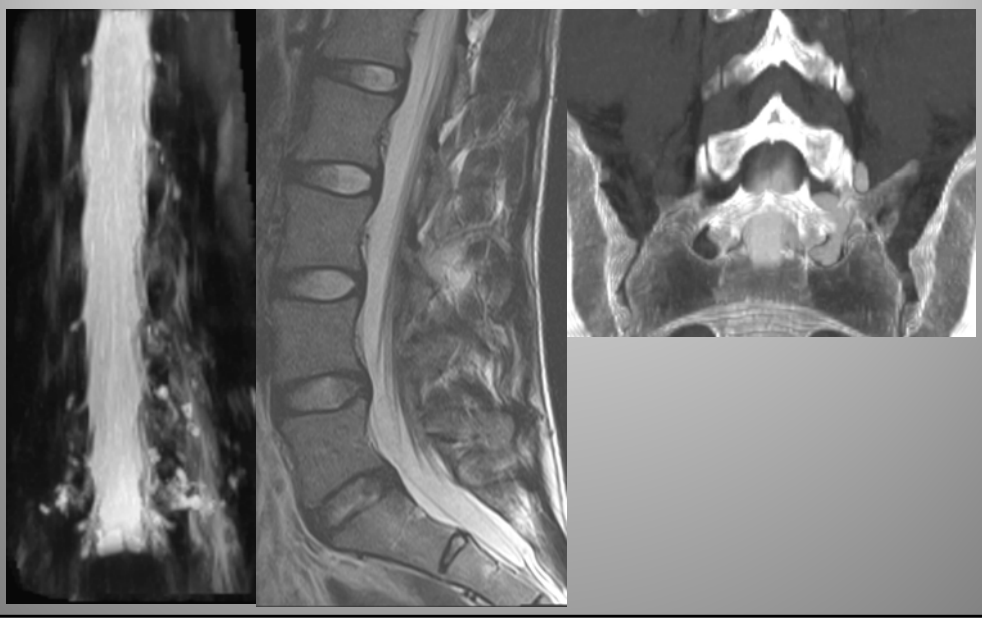
Ventral Leak DSM



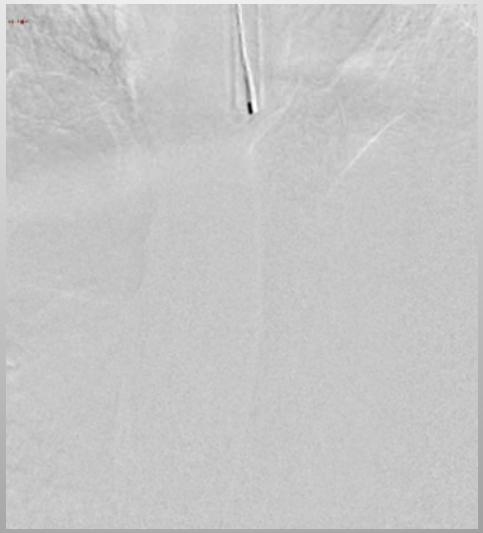
Ventral Leak Dynamic CT guided Myelogram



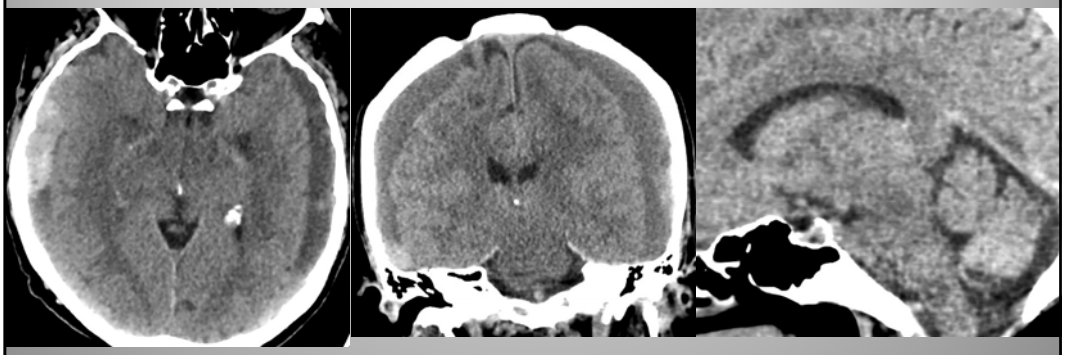
Meningeal diverticulum



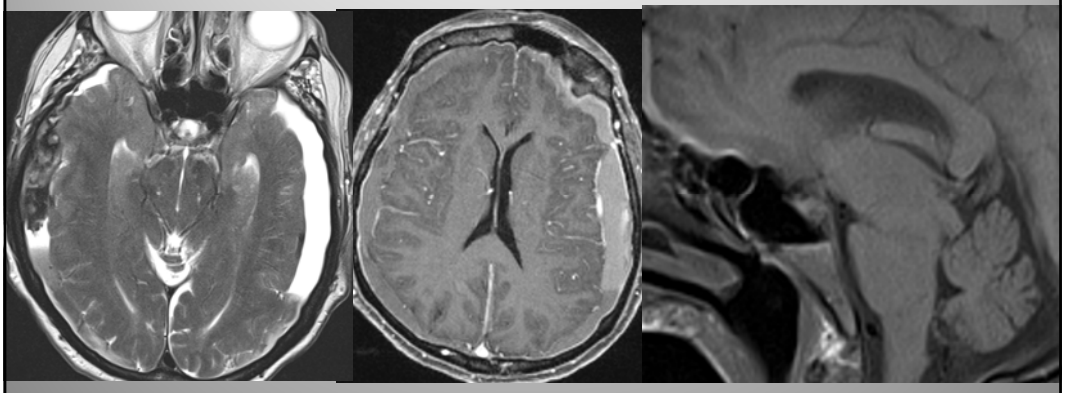
CSF-venous fistula



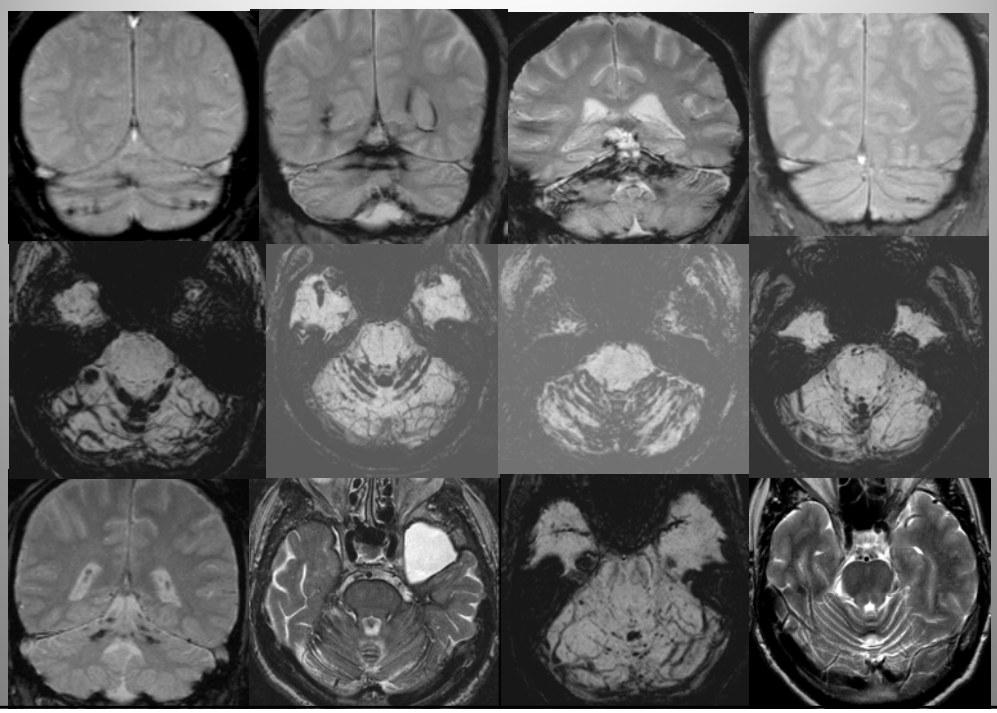
SDH



SDH due to CSF leak



Siderosis



Spinal Leak Detection and Localization

Modality	Initial	High Flow	Low Flow	Radiation
CTM	+++	+	++	10-30 mSv
Dynamic CTM	-	++	+	20-200
DSM	?	+++	+	2-35
MR/MYELO	+++	-	+	0
MR IT Gado	-	-	++	0
Radionuclide		-	++	2-6

Kranz et al AJR