Current Approach to Cranial and Spinal Imaging

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CSF LEAK
Monro-Kellie Hypothesis

- 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
Hypotension or Hypovolemia?

Decreased CSF pressure

Pressure can be normal

CSF hypovolemia (CSF volume depletion)

Headache can be absent

Clinical Manifestations

MRI abnormalities

MRI maybe normal

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
Coma
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

<table>
<thead>
<tr>
<th>Modality</th>
<th>Initial</th>
<th>High Flow</th>
<th>Low Flow</th>
<th>Radiation</th>
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</thead>
<tbody>
<tr>
<td>CTM</td>
<td>+++</td>
<td>+</td>
<td>++</td>
<td>10-30 mSv</td>
</tr>
<tr>
<td>Dynamic CTM</td>
<td>-</td>
<td>++</td>
<td>+</td>
<td>20-200</td>
</tr>
<tr>
<td>DSM</td>
<td>?</td>
<td>+++</td>
<td>+</td>
<td>2-35</td>
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<tr>
<td>MR/MYEOLO</td>
<td>+++</td>
<td>-</td>
<td>+</td>
<td>0</td>
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<tr>
<td>MR IT Gado</td>
<td>-</td>
<td>-</td>
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<td>0</td>
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Kranz et al AJR