



International
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Alder Hey Children's **NHS**
NHS Foundation Trust

Intraventricular Endoscopic Stents in Neonates

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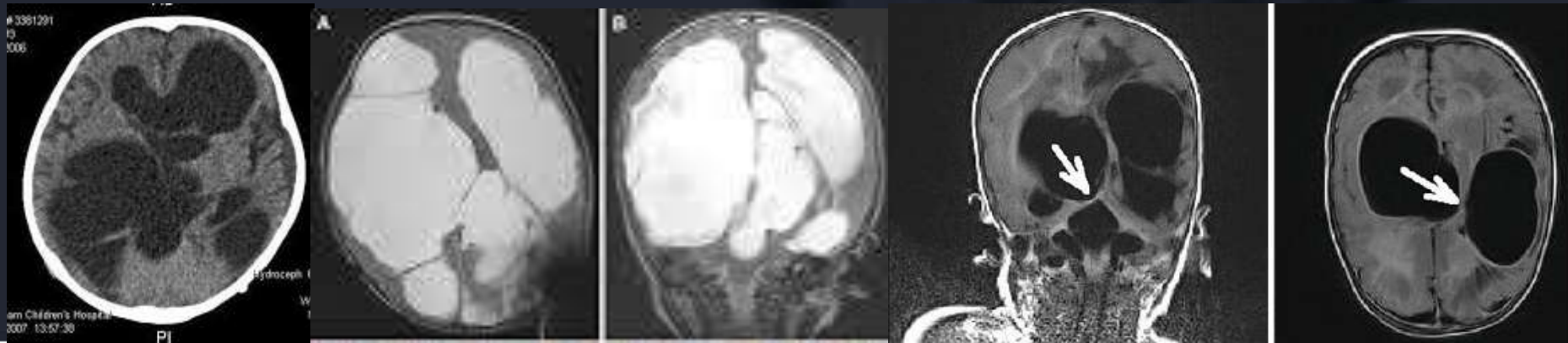
Alder Hey Children's Hospital

Liverpool, UK

Multiloculated hydrocephalus is a complicated form of hydrocephalus that is found mostly following an intracranial infection or haemorrhage (20%)

The primary pathology disrupts normal ventricular anatomy:

- an abnormal shape
- multiple chambers
- variable thickness webs



The rationale for treatment should be diminishing intracranial hypertension and decreasing the pressure inside the cavities that compress the adjacent brain

There is no standard treatment for this serious kind of hydrocephalus

Multiple shunting was a routine practice so far to normalize the intracranial pressure resulting in more shunt complications and more shunt revisions

Neuroendoscopy has changed the treatment options for complex multiloculated hydrocephalus with using fenestration in one or several stages to combine multiple cavities into the least number cavities

It's all in the planning



The accurate definition of the anatomy of the ventricles and the site of obstruction in multiloculated hydrocephalus can help to plan the most appropriate treatment and minimize the number of procedures

Preoperative neuroimaging and neuroendoscope is not enough for a successful operation:

- intraop CSF loss
- difficult anatomy
- lack of fixed anatomical landmarks

Magnetic resonance ventriculography: effective but should be limited to particularly complex cases, due to its invasiveness

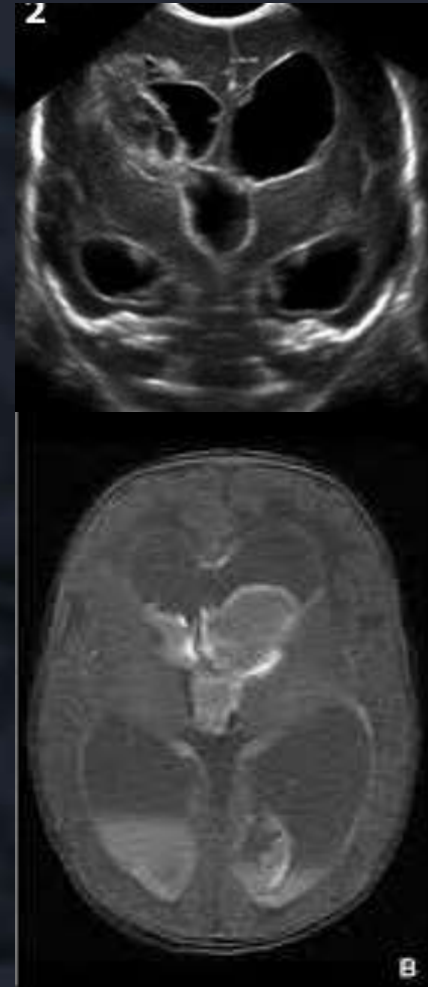
?USS bubbles

It's all in the planning

- Most convenient trajectory to be chosen: the more cavities in one time the better outcome
- BURR HOLE:
 - Big enough (endoscope + \- stent)
 - Shortest cortical passage through the largest cavity
- A pre-existing ventricular catheter to be used as anatomical landmark
- Effective navigation
- Burr hole big enough (endoscope + stent)

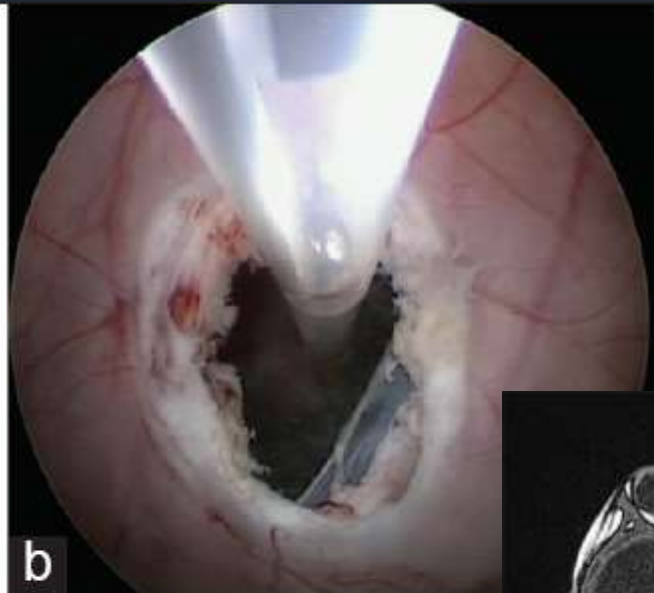
Neonates vs. Older

- ETV not usually a feasible option
- “dynamic” anatomy
- USS is a valid diagnostic test
- Endoscopes with big working channels not best options for infants
- Frameless magnetic navigation essential
- Limits in irrigation volume
- Role of endoscopic washout+/-subgaleal shunt: early removal of intraventricular blood degradation products and residual clot reduces risk of infection/loculations/shunt dependence





a



b



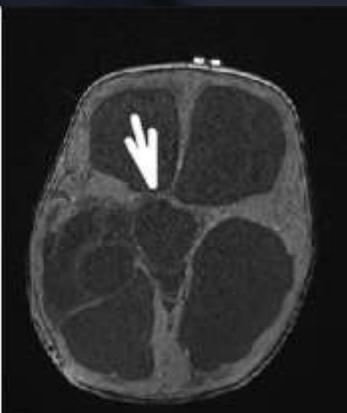
c



d



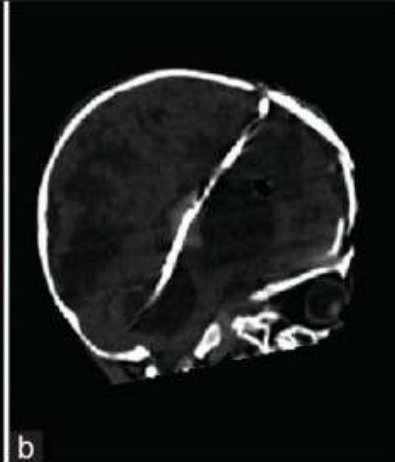
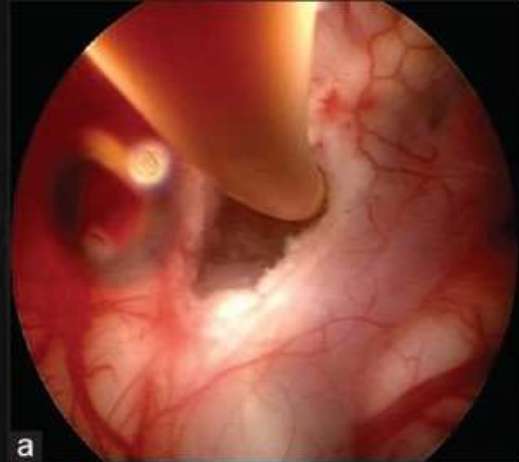
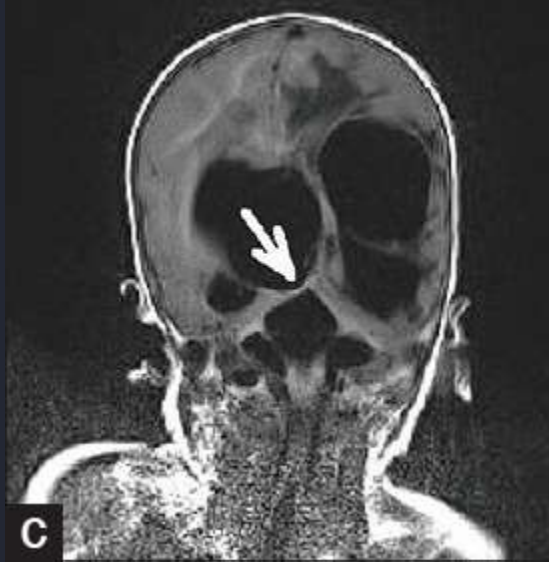
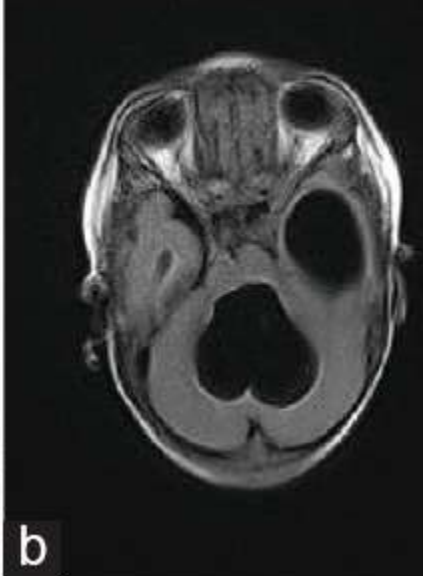
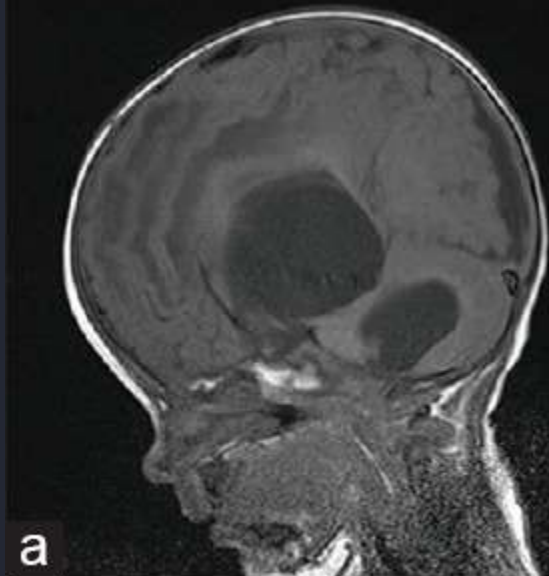
a



b



c



Personal Series



Prospective data collection

Equipment:

Pediscopes, Oi, Little Lotta

Single and Double balloon

ME2 monopolar

Frameless magnetic navigation

Digital Ultrasound

Intraop MRI

Personal Series



12 patients treated from 2012, 19 procedures

Median age: 26 weeks corrected

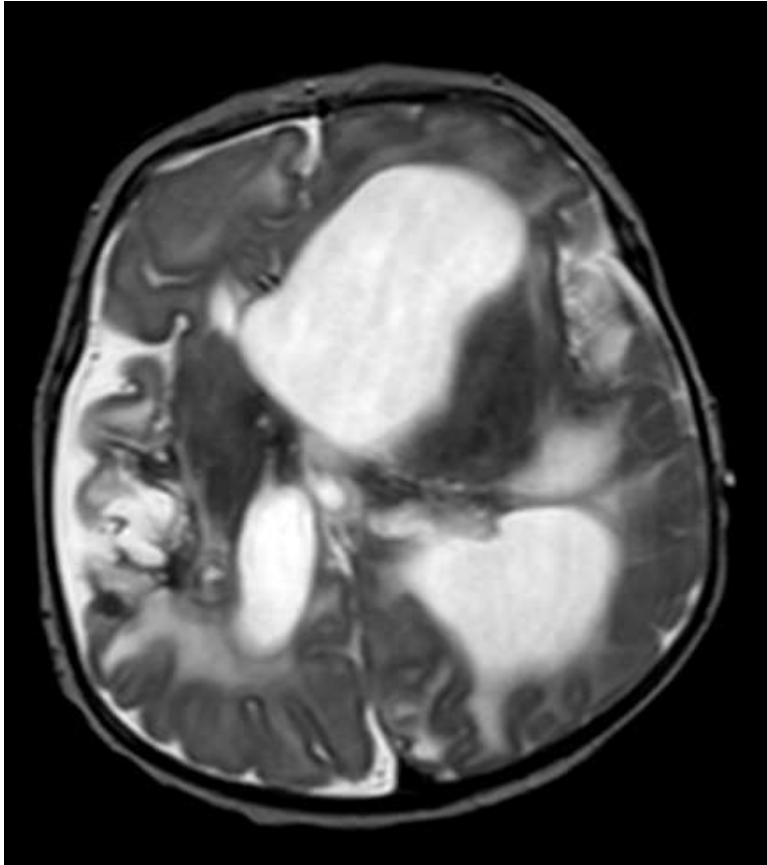
Primary cause of hydrocephalus:

- 10 Post-haemorrhagic
- 1 Post-infective
- 1 congenital

Indication for surgery:

- 6 Multi-loculations
- 4 Trapped Fourth Ventricle
- 2 combination

- 10 Stents
- 1 Fenestration only
- 1 Failure – multiple catheters insertion

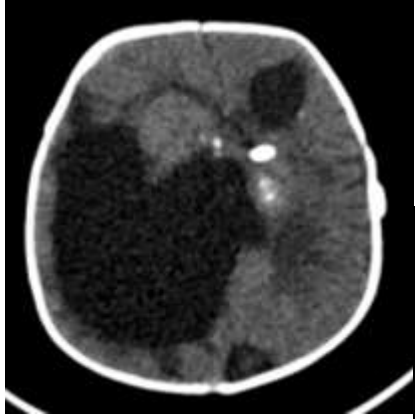
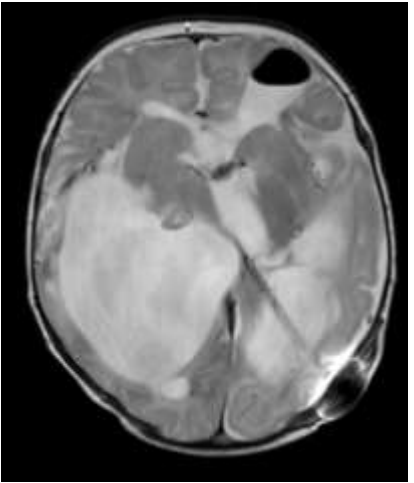
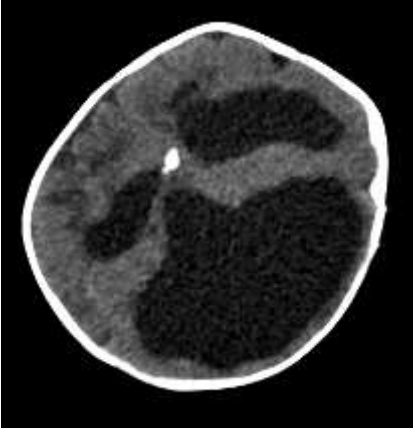


Baby born with
Candida sepsis

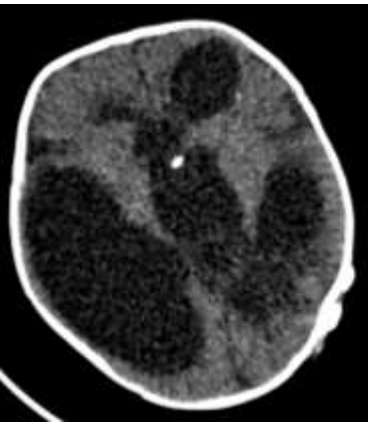
Then diagnosed with
Cystic Fibrosis and liver
failure

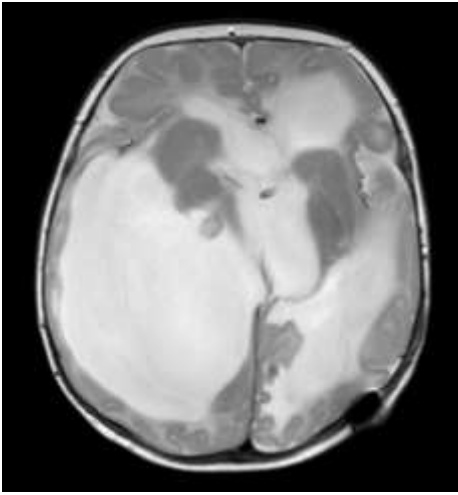
- Endoscopic washout , biopsy and subgaleal shunt
- Endoscopic septostomy, foraminoplasty and new subgaleal shunt

- Left frontal and occipital catheters (Y-connector) with EVD



- Right occipital fenestrated

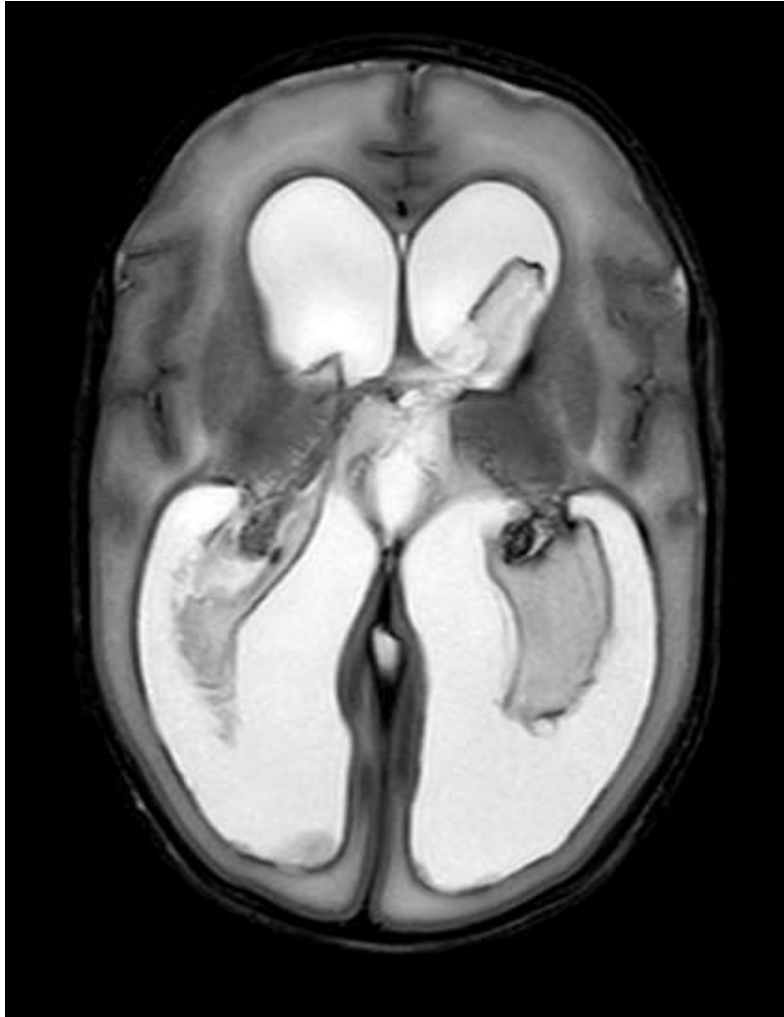




Insertion of stent

**What about the distal
end??????**

Ventriculo-pleural shunt in situ

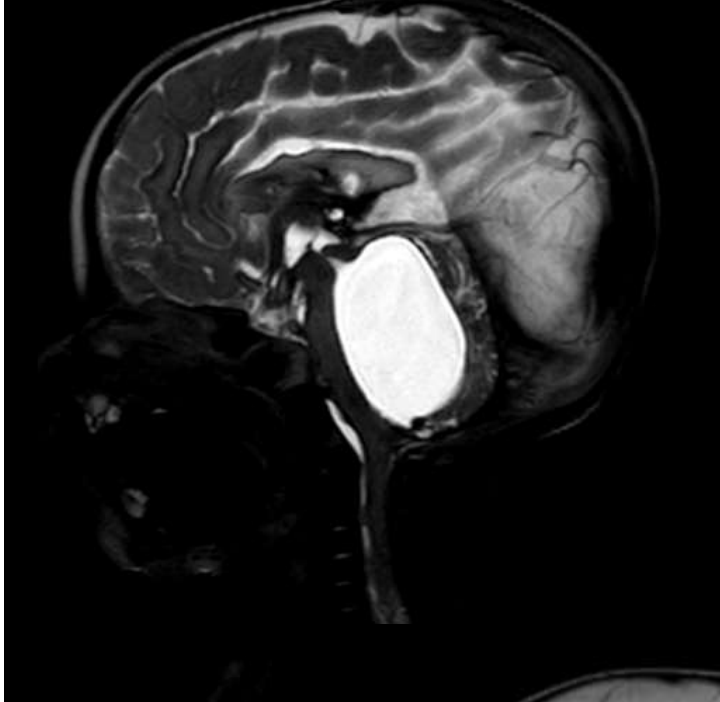


Premature baby 27wks
with IVH

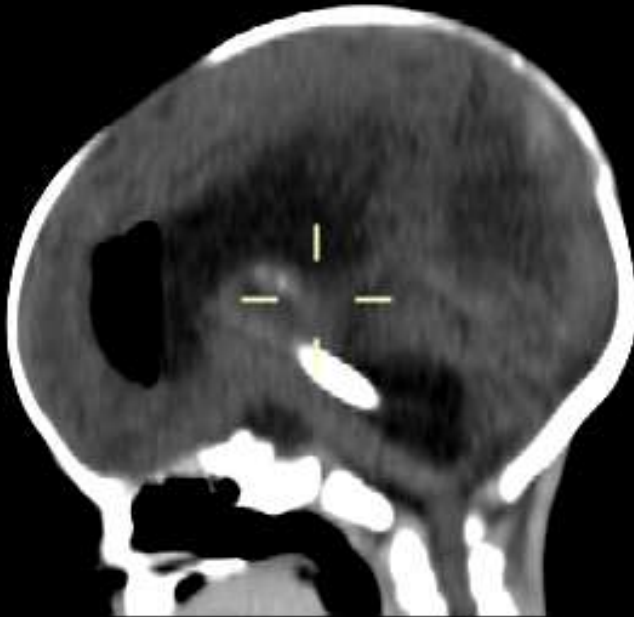
Washout and subgaleal
shunt

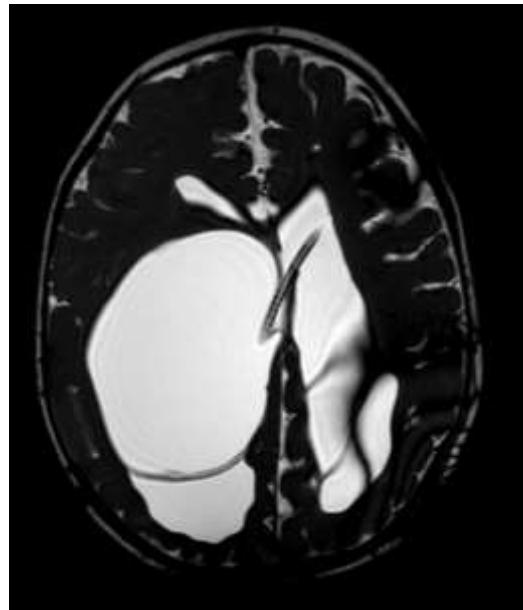
Insertion of VP shunt

4th trapped ventricle
Symptomatic and
progressive

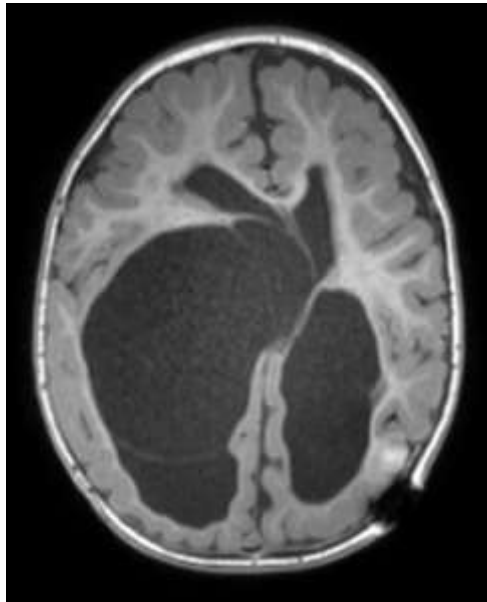


Acqueductoplasty and stent

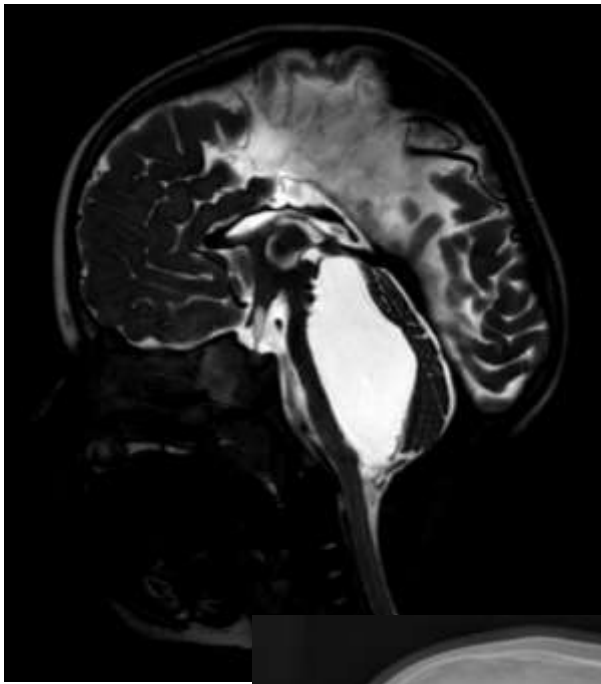




Distal end infection
Stent removed 4 months
after insertion
No recurrence of trapped
4th



Development of multiple
septi leading to isolated
ventricles



Premature baby with IVH

VA shunt in situ
Trapped 4th ventricle



Acute deterioration
requiring emergency
insertion of 4th ventricle
external catheter

Surgical Tips



- BFFE
- Navigate with the Stilet tip
- Pre-op planning
- Laser
- Multiple surgeries necessary for anatomy reappraisal
- Programmable valve preferable

Conclusion

Infants have a blend of specific issues

A combination of single/multiple fenestrations, washout, and CSF diversion can optimize outcome

Endoscopy and neuronavigation facilitates the preoperative planning and intraoperative orientation in distorted cerebral anatomy and lack of normal brain landmarks

The endoscopic stenting of formed connections ensures adequate catheter position and prevents the recurrence of occlusion

The aim of operation is the drainage of the maximum possible numbers of cavities using minimal amounts of the proximal catheter and shunts systems

Thanks

