



UNIVERSITÄTS**medizin.**

Neurochirurgische Klinik und Poliklinik  
Sektion Pädiatrische Neurochirurgie

MAINZ

# Endoscopic aqueducto- plasty/stenting

Wolfgang Wagner

with contributions by Sonja Vulcu (Bern), Joachim Oertel (Homburg), Christoph Tschan and Alexandra Huthmann (Meppen)

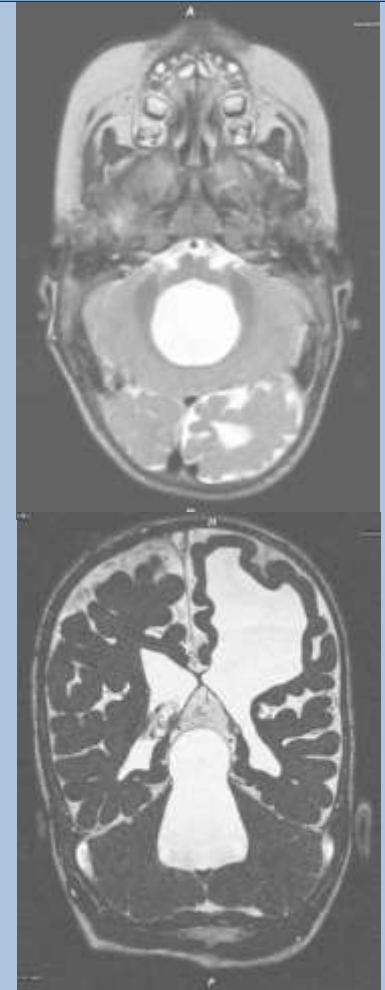


## Indication

Indication for endoscopic aqueductoplasty or aqueductal stenting:

### Trapped 4th ventricle

- obstruction of aqueduct and outlet foramina + continuous production of CSF by choroid plexus
- most often in the context of posthemorrhagic hydrocephalus and VP-shunt overdrainage





# Characteristics of trapped 4th ventricle

## Incidence

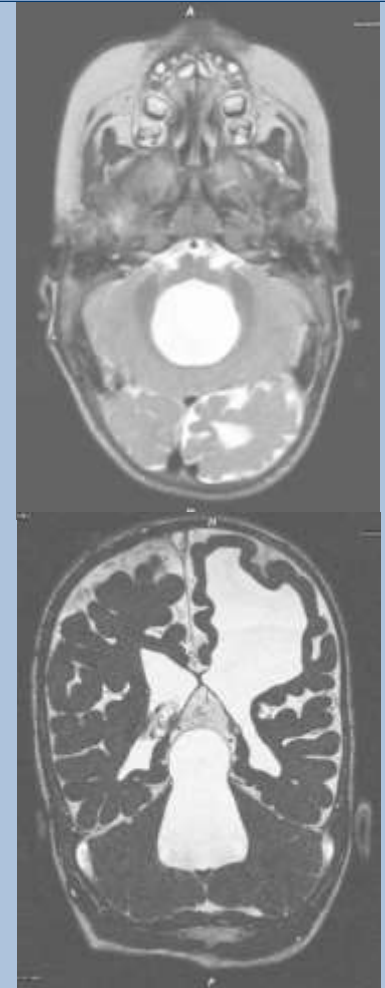
- rare

## Clinical symptomatology

- ambiguous, variable
- often non-specific

## Treatment

- difficult

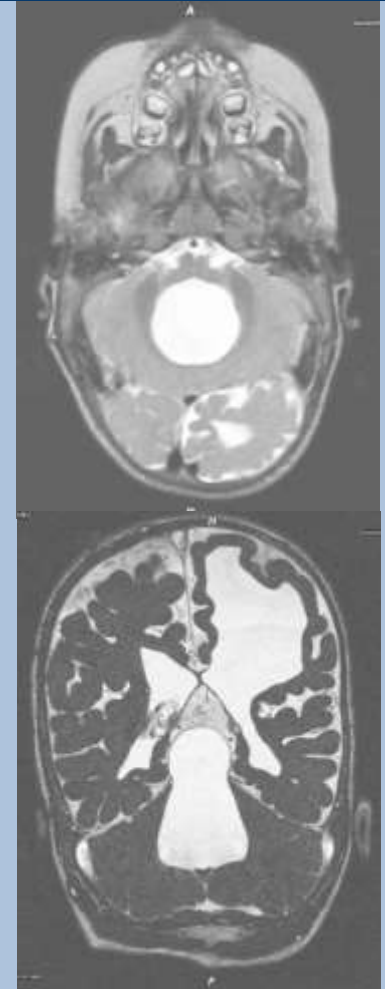




# Treatment

## Treatment options

- shunting (Y-connector to existing VP-shunt)
- microsurgical fenestration
- endoscopy:
  - aqueductoplasty
  - aqueductal stenting

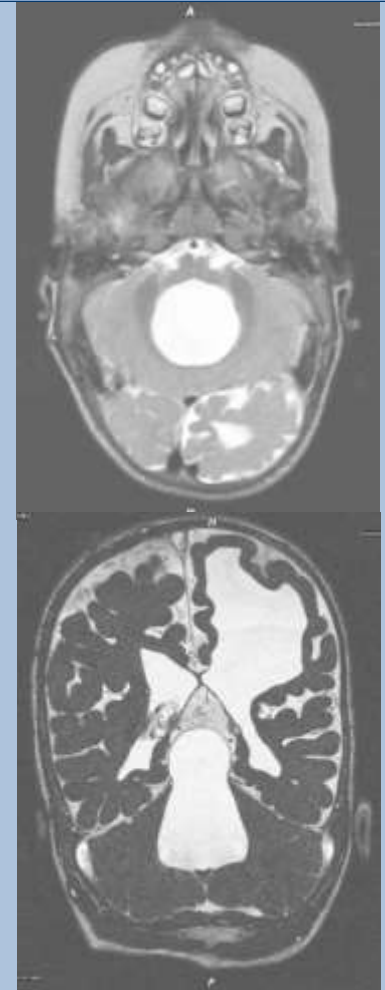




# Treatment

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- microsurgical fenestration
- **endoscopy:**
  - **aqueductoplasty**
  - **aqueductal stenting**

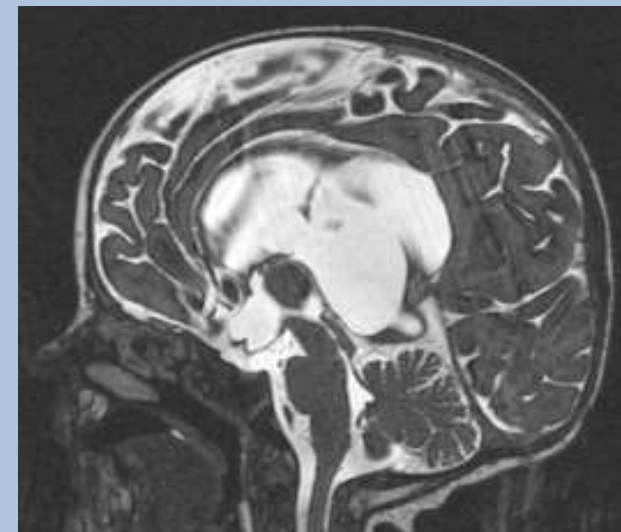
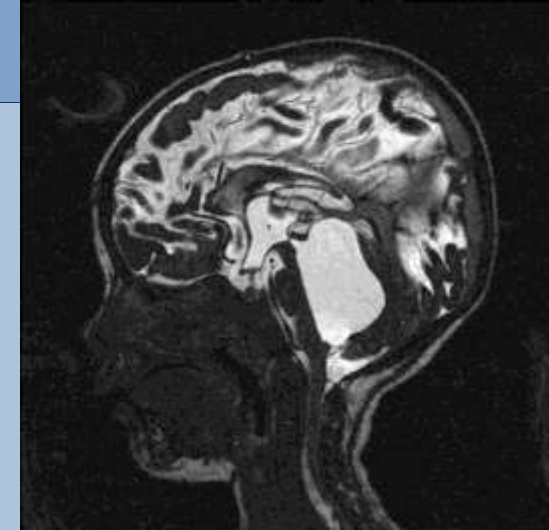




# Treatment

## Prerequisites for endoscopy

- short segment (or ideally membranous) aqueductal stenosis
- anatomical constellation allowing a straight approach to the aqueduct





## Mainz Series

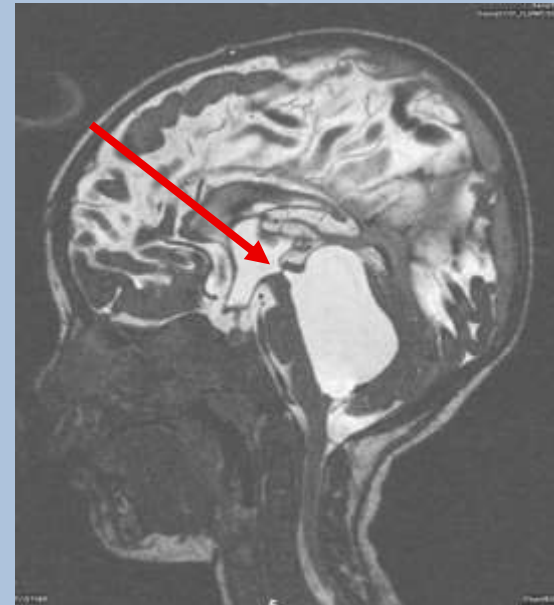
- 11 children with isolated fourth ventricle, VP-shunt after posthemorrhagic hydrocephalus (9 pts.) or after hemispherectomy/CPR (2 pts.)
- 8 males, 3 females, mean age at first surgery 3 (0 - 17) years
- Clinical and/or electrophysiological signs (often subtle) of brainstem compression (headache, vomiting, impaired vision...)
- 17 endoscopic procedures between 2005 and 2016, using rigid rod lens endoscopes



# Surgical approaches

## Frontal approach

- Supine position
- Frontal entry point in line with the trajectory foramen of Monroe – entrance of aqueduct



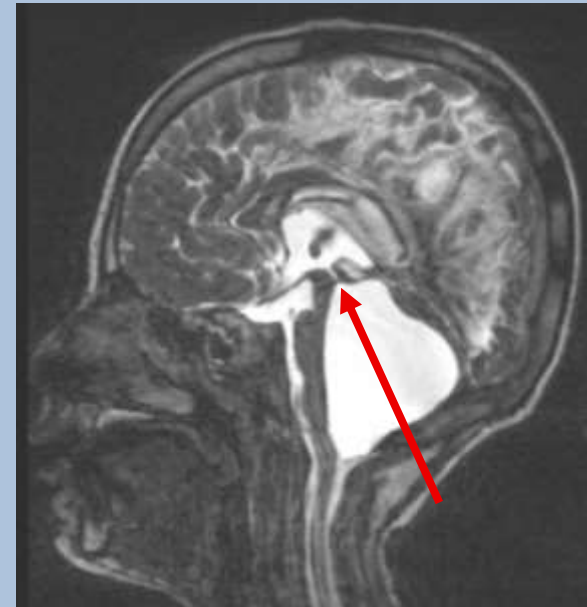




# Surgical approaches

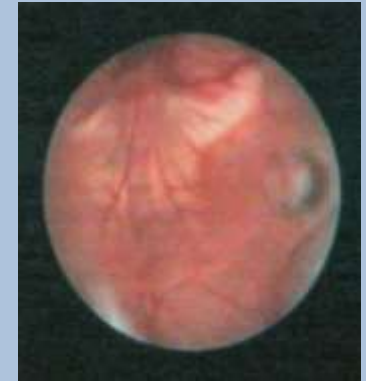
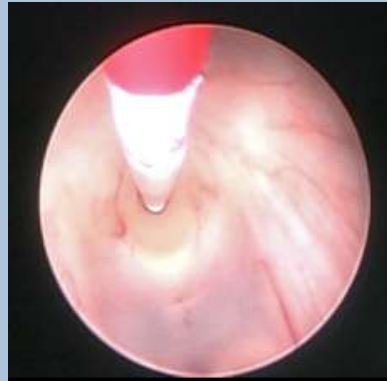
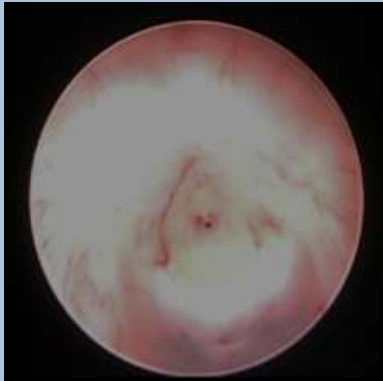
## Suboccipital approach

- Prone position
- Suboccipital entry point in the line with the trajectory lower end of 4th ventricle – exit of aqueduct





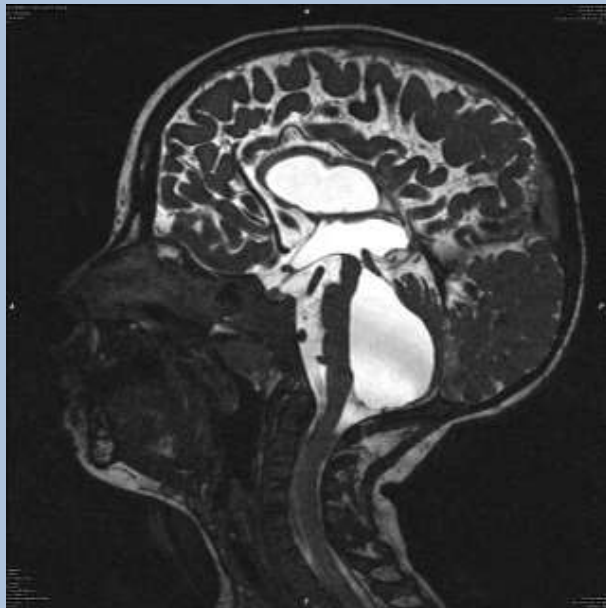
## Surgical methods and instruments



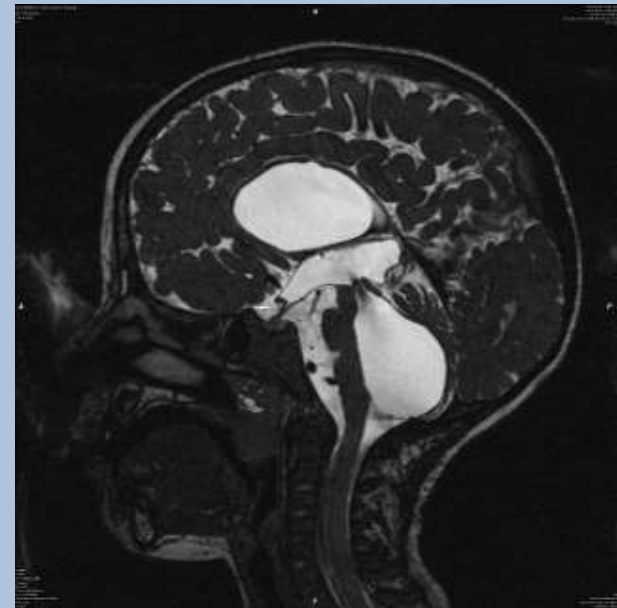
- Aqueductoplasty with Fogarty catheter
- Visualisation of neighboring ventricle with small rigid endoscope (diameter 2.7 mm)
- Stent placement with grasping forceps



# Treatment: Aqueductoplasty



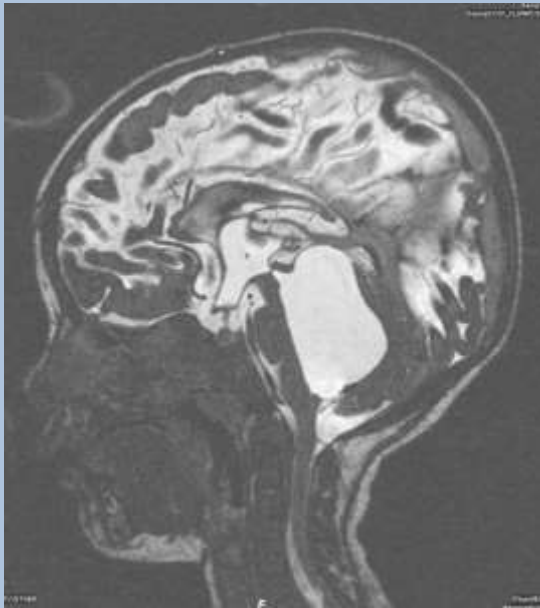
preop.



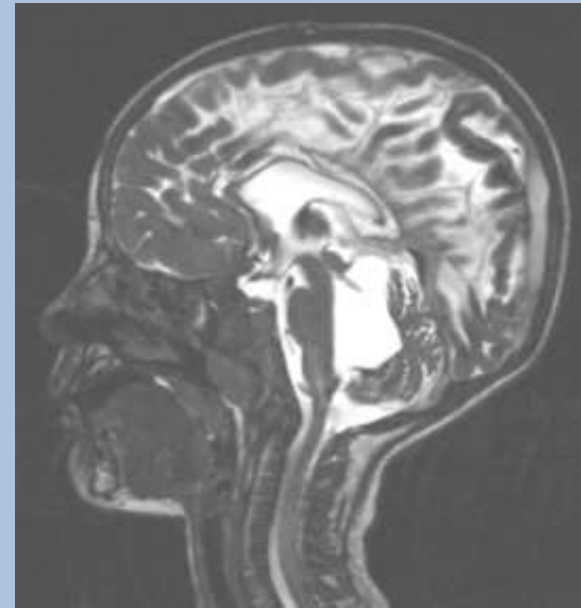
postop.



## Treatment: Aqueductal stenting (ant. appr.)



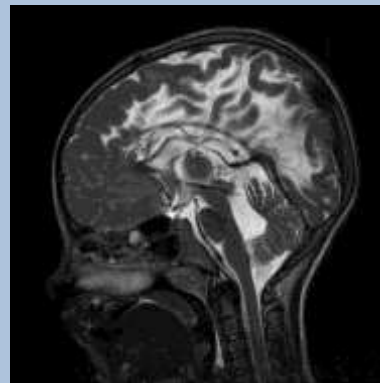
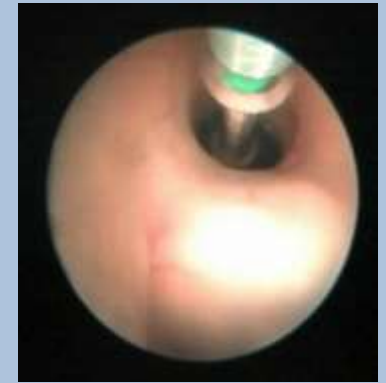
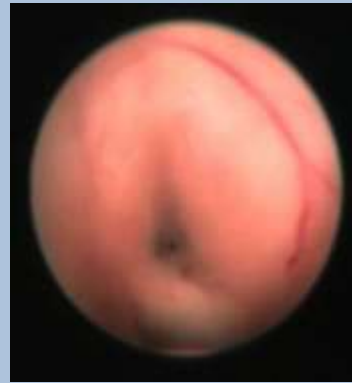
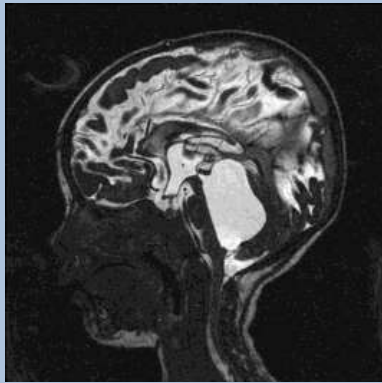
preop.



4 m postop.

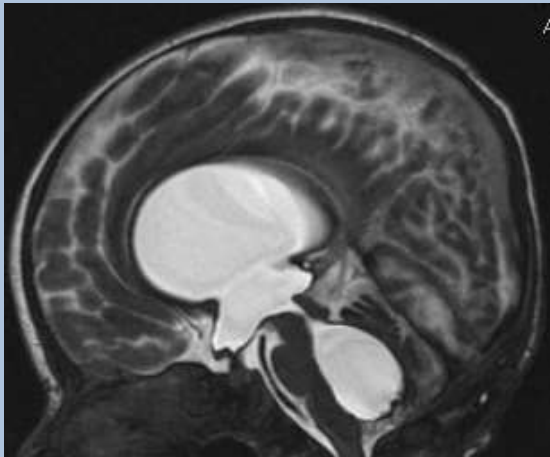


# Steps of the procedure (anterior approach)

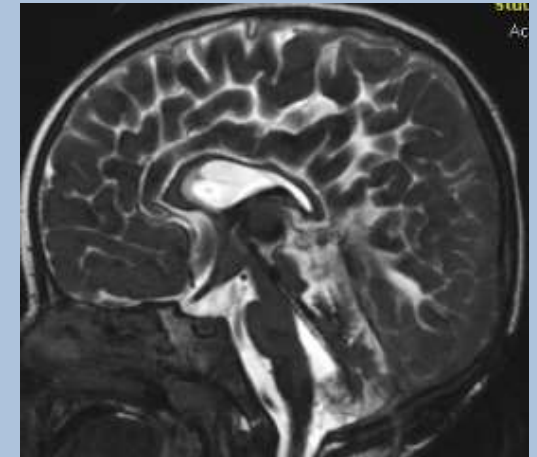
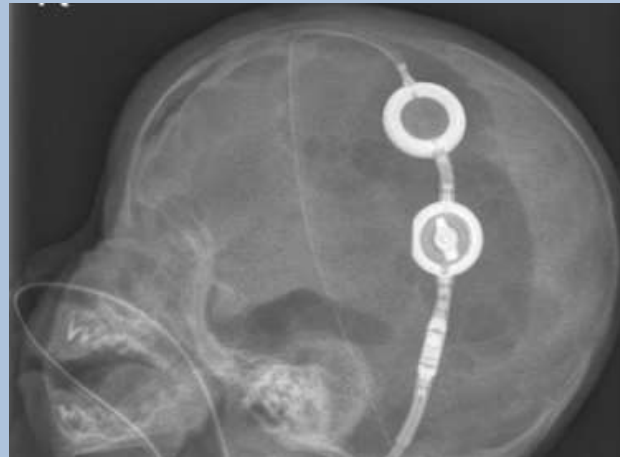




## Postoperative course (anterior approach)



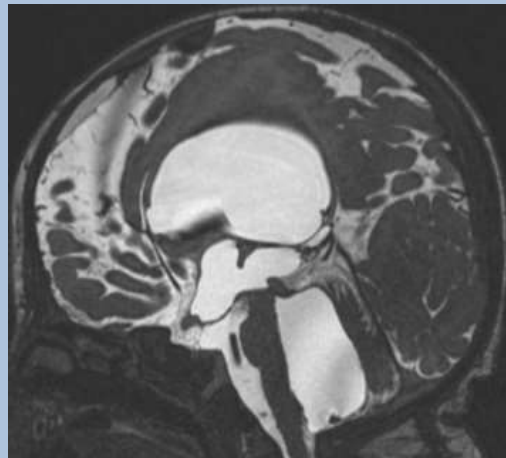
preop.



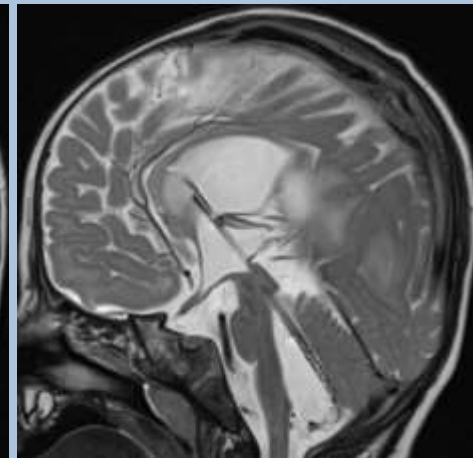
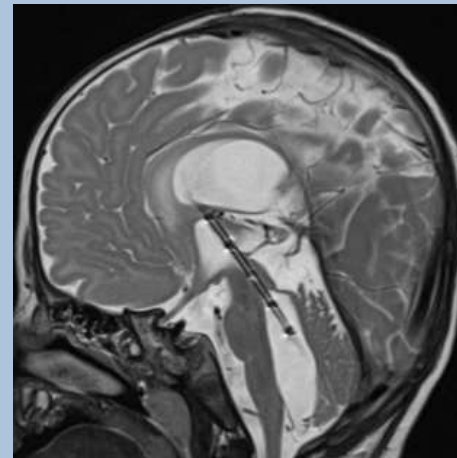
8 m postop.



# Postoperative course (anterior approach)



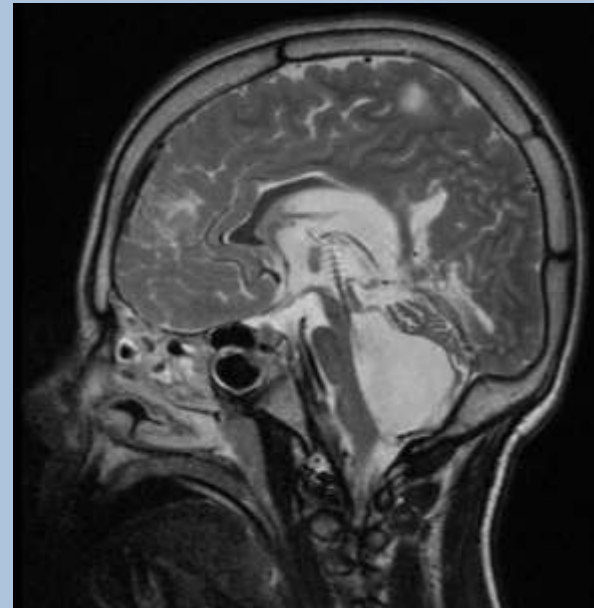
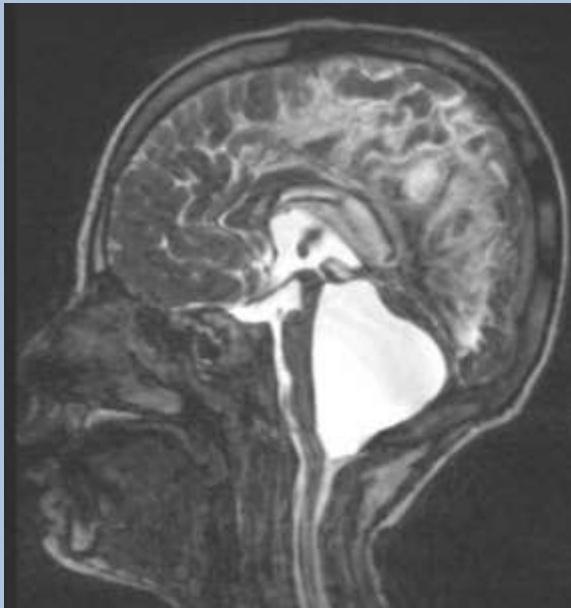
preop.



4 m postop.



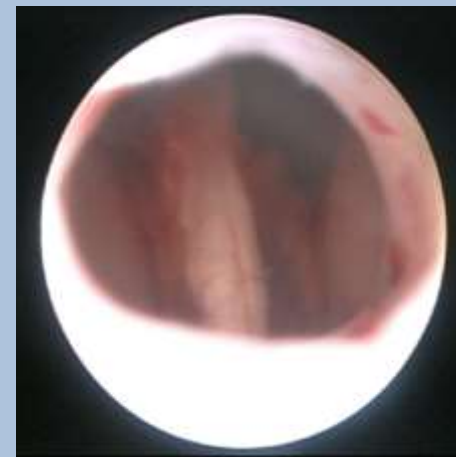
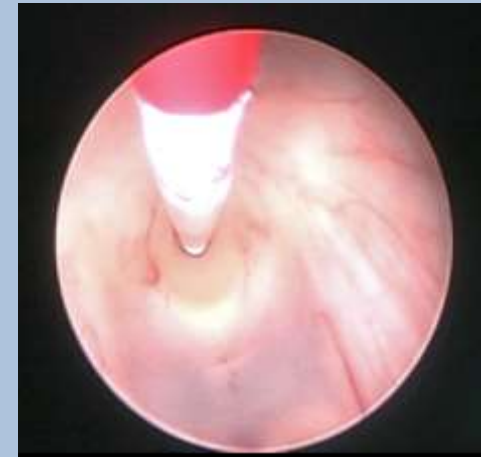
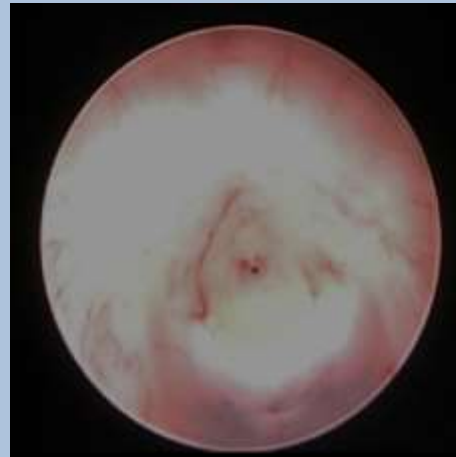
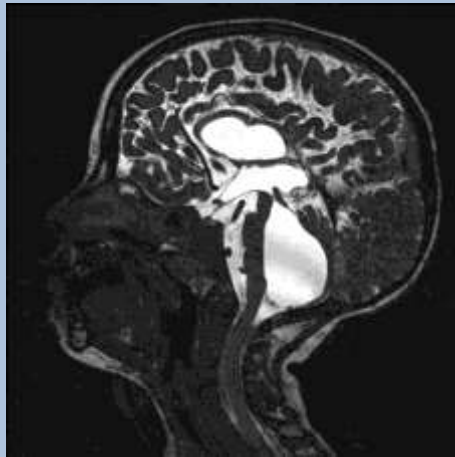
# Treatment: Aqueductal stenting (post. appr.)





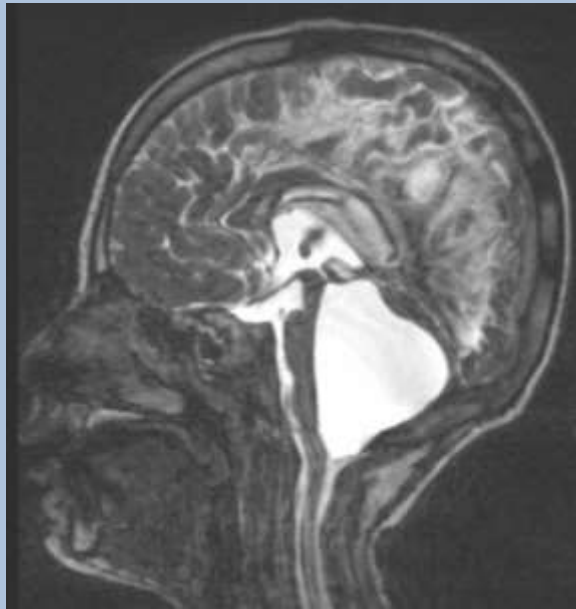


# Steps of the procedure (posterior approach)

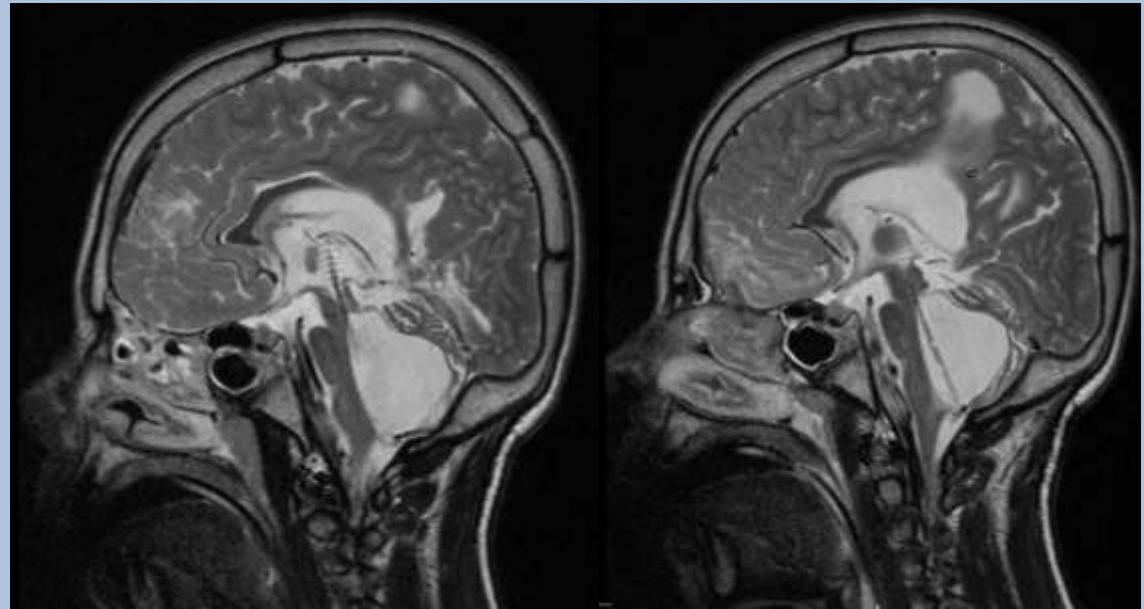




# Postoperative course (posterior approach)



preop.



4 y postop.



## Results

- 3 aqueductoplasties without stents: reclosure in all cases (1 – 9 months later) → stenting
- 1 aqueductoplasty without stent because of CSF infection → stenting 5 weeks later after CSF clearing (open aqueduct)
- 1 correction of slipped stent
- 17 aqueductal stentings (including secondary procedures)



## Results: Aqueductal Stent Placements

- 12 via frontal, 5 via suboccipital approach
- No neurological/infectious complications
- Eventually good outcome (clinically and radiologically) in all patients
- Follow-up 2-12 (median 8) years



## Conclusion

- Aqueductoplasty using a small rigid endoscope is feasible in short segment aqueduct closure
- Both frontal and suboccipital approaches are suitable – dependent of anatomy
- Brilliant view also to neighbouring ventricle
- Valuable alternative to flexible endoscope
- High reclosure rate after aqueductoplasty alone  
→ primary stent implantation recommended

