

Learning Objectives

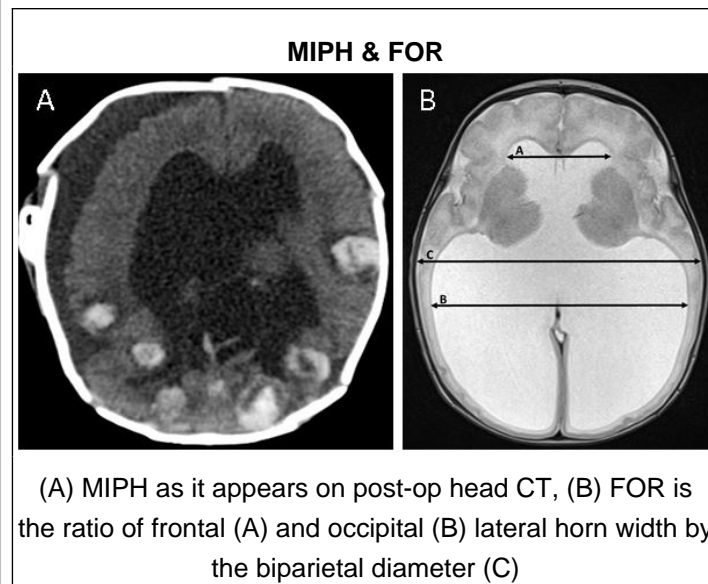
- Describe the incidence of MIPH in neonates undergoing VP shunt placement
- Understand the need for prospective evaluation of the effect of shunt valve selection on risk of MIPH and patient outcomes

Introduction

- Ventriculoperitoneal (VP) shunting is a routine pediatric neurosurgical procedure
- Postoperative intracerebral hemorrhage (ICH) is a rare but serious event
- We observed a subset of neonates who developed multifocal intra-parenchymal hemorrhages (MIPH) following shunt placement and sought to determine any predisposing perioperative variables
- Etiology of this potentially fatal complication remains unclear

Methods

- A retrospective review at Children's Hospital Colorado between 1998 and 2015
- Inclusion criteria: shunt placement in a child <1 year of age, with available pre- and post-operative brain imaging
- We collected ventricular size ratio, laboratory values, clinical presentation, shunt valve, as well as operative timing and approach
- The severity of hydrocephalus was reflected by the frontal and occipital horn ratio (FOR) using available pre- and postoperative imaging



Results

- 11 patients (9.5%) had MIPH following shunt placement
- Pre-operative FOR was significantly higher in MIPH patients, 0.65 vs 0.57 ($p < 0.001$)
- The change in FOR following shunting was significantly higher in the MIPH group 0.14 vs 0.08 ($p < 0.04$)
- 64% of MIPH patients developed subdural hematomas compared to 10% of controls
- Among neonates who developed MIPH, aqueductal stenosis was the most common etiology, occurring in 5 of 11 (45%)
- Preoperative clinical parameters including subjective increase in ventricular size, increase in head circumference, and coagulopathy were not significantly associated with developing MIPH

Variable	No MIPH (n=105)	MIPH (n=11)	P-value
Gender			1
Female	53 (50%)	6 (55%)	
Male	52 (50%)	5 (45%)	
Age (month)	10 (3)	11 (5)	0.9
Type of CSF Diversion			0.02
EVD/ETV	1 (1%)	1 (9%)	
Peritoneal	101 (96%)	8 (73%)	
Subgaleal	3 (3%)	2 (18%)	
Pre Term			1
No	72 (69%)	8 (73%)	
Yes	33 (31%)	3 (27%)	
Gestational Age (weeks)	36.76 (2.39)	35.27 (5.88)	0.43

Conclusions

- MIPH represents a not infrequent complication of neonatal shunted hydrocephalus
- Markers of severity of ventriculomegaly (FOR) and ventricular response to CSF diversion (deltaFOR), were significantly associated with developing MIPH
- The etiology of MIPH remains unclear
- Prospective study of MIPH prevention strategies and assessment of possible implications for patient outcome is needed

References

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