

Newborn Critical Care Center (NCCC) Clinical Guidelines

Post-Hemorrhagic Hydrocephalus Guidelines for Management

BACKGROUND

Post-hemorrhagic hydrocephalus (PHH) resulting in increased intracranial pressure (ICP) can be a complication of any grade intraventricular hemorrhage, but is more common with grade III and/or IV intraventricular hemorrhage. The signs and symptoms of increased ICP are bulleted below. Follow head circumferences and palpate the anterior fontanelle daily after a \geq Grade II hemorrhage is identified on head ultrasound to aid in detecting worsening hydrocephalus. Weekly head ultrasounds initially may be beneficial in detecting changes within the ventricles that have not yet manifested as rapidly increasing head circumference. If there are no changes or stable hydrocephalus, obtaining head ultrasounds every 2 weeks or perhaps monthly may be indicated.

It is important to note that the subarachnoid space communicates with the ventricular system. Another cause of PHH can be hemorrhage into the subarachnoid space by ruptured aneurysms, arteriovenous malformations, trauma, or systemic bleeding disorders.

Initial neurosurgical management could include ventricular punctures. Repeated direct ventricular punctures can create porencephaly, and share the potential risks of infection and brain injury with placement of ventricular access devices.

Ventricular access devices such as ventricular reservoirs or ventricular subgaleal shunts are typically used to manage progressive hydrocephalus in the preterm infant. The risks of these devices are infections, brain tissue damage, brain hemorrhage, skin breakdown, anesthesia exposure, and failure of the device.

Consult Neurosurgery for all patients with PHH and evidence of increased ICP (pager 123-2642)

SIGNS AND SYMPTOMS OF INCREASED ICP

- Rapidly enlarging head circumference (> 1.5 cm in < 7 days)
- Increased splaying of the cranial sutures
- Progressively full and/or tense fontanelle
- Worsening of apnea and/or bradycardia episodes
- Lethargy
- Feeding intolerance
- Progressive ventricular dilatation or thinning of cortical mantle on serial HUS

CSF DRAINAGE FROM VENTRICULAR TAP OR VENTRICULAR RESEVOIR

- ***Intermittent withdrawal of CSF from ventricular taps or ventricular reservoirs should be performed by Pediatric Neurosurgery or by direction of Pediatric Neurosurgery.***
- Recommended drainage volume is 10-15 mLs/kg
 - Guided by discretion of the neurosurgeon and clinical status of the infant
 - If > 10 mLs/kg is removed, consider IV replacement fluid (typically normal saline) and monitoring serum sodium concentrations
 - Monitor post-withdrawal of CSF for hypotension, hypovolemia and tolerance of procedure
- Notify Neurosurgery if symptoms of increased ICP do not improve after CSF withdrawal
- Use symptoms of increased ICP, opening pressure, closing pressure, changes in head ultrasounds and Pediatric Neurosurgery consult to determine frequency of CSF withdrawal until PHH stabilizes and/or the need for a permanent shunt is determined

References:

1. De Vries, L., Annemieke, B., & Groenendaal, F. (2012). Posthaemorrhagic ventricular dilatation when should we intervene? *Archive of disease in childhood fetal neonatal edition*. doi:10.1136/archdischild-2012-303158.
2. Kormanik, K., Praca, J., Garton, HJL., & Sarkar, S. Repeated tapping of ventricular reservoir in preterm infants with post-hemorrhagic ventricular dilatation does not increase risk the risk of reservoir infection. *Journal of Perinatology*, 2010, 30: 218-221.
3. Robinson, S. Neonatal post hemorrhagic hydrocephalus from prematurity: pathophysiology and currently treatment concepts. *Journal of Neurosurgery Pediatrics*, 2012, 9: 242-258.
4. Shooman, D., Pertess, H., & Sparrow O. (2009). A review of the current treatment methods for posthaemorrhagic hydrocephalus of infants. *Cerebrospinal Fluid Research*. doi: 10.1186/1743-8454-6-1.