Periventricular-intraventricular hemorrhage complications

In severe cases, bleeding will occupy a significant portion of the ventricle and extend into the intraparenchymal area.

A subset of children develop posthemorrhagic hydrocephalus (PHH) with increased intracranial pressure (ICP), which may lead to reduced consciousness, reduced food intake, and developmental impairments.

Serial ventricular taps for periventricular-intraventricular hemorrhage (PIVH).: May be a viable short-term option for those infants who cannot tolerate LPs or in whom there is obstruction to CSF flow in the lumbar subarachnoid space (e.g. due to spinal subdural hematoma from previous LP). However it is not desirable for long-term use because of repeated trauma to brain (risk of porencephaly) and risk of intracerebral, intraventricular, or subdural hemorrhage.

If continued taps are likely (i.e., large hemorrhage, or rapid recurrence of intracranial hypertension as determined by palpation of fullness of anterior fontanelle (AF) following several taps), the acceptable options include:

1. continuing serial LPs

2. percutaneous ventricular taps: not recommended for more than a few treatments as it causes porencephaly.

Even in the absence of haemorrhagic infarction or posthaemorrhagic hydrocephalus, there is increasing evidence of neuropsychiatric and neurodevelopmental sequelae. The pathophysiology underlying this injury is thought to be due to a primary destructive and secondary developmental insult, but the exact mechanisms remain elusive and this has resulted in a paucity of therapeutic interventions. The presence of blood within the cerebrospinal fluid results in the loss of the delicate neurohumoral gradient within the developing brain, adversely impacting on the tightly regulated temporal and spatial control of cell proliferation and migration of the neural stem progenitor cells within the subventricular zone. In addition, haemolysis of the erythrocytes, associated with the release of clotting factors and leucocytes into the cerebrospinal (CSF), results in a toxic and inflammatory CSF microenvironment which is harmful to the periventricular tissues, resulting in damage and denudation of the multiciliated ependymal cells which line the choroid plexus and ventricular system. The ependyma plays a critical role in the developing brain and beyond, acting as both a protector and gatekeeper to the underlying parenchyma, controlling influx and efflux across the CSF to brain interstitial fluid interface. In a review Dawes explored the hypothesis that damage and denudation of the ependymal layer at this critical juncture in the developing brain, seen following IVH, may adversely impact on the brain microenvironment, exposing the underlying periventricular tissues to toxic and inflammatory CSF, further exacerbating disordered activity within the subventricular zone (SVZ). By understanding the impact that intraventricular hemorrhage has on the microenvironment within the CSF, and the consequences that this has on the multiciliated ependymal cells which line the neuraxis, we can begin to develop and test novel therapeutic interventions to mitigate damage and reduce the associated morbidity [1)]

Posthemorrhagic hydrocephalus of prematurity

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Dawes W. Secondary Brain Injury Following Neonatal Intraventricular Hemorrhage: The Role of the Ciliated Ependyma. Front Pediatr. 2022 Jun 30;10:887606. doi: 10.3389/fped.2022.887606. PMID: 35844746; PMCID: PMC9280684.