Infantile Intraventricular Haemorrhage

Synonym: periventricular haemorrhage

Intraventricular haemorrhage (IVH) is a significant cause of morbidity and mortality in infants who are born prematurely. Increasing severity of IVH is associated with progressively higher rates of mortality and neurodevelopmental impairment compared with no IVH.\[^{[1]}\] Neurological complications include lifelong problems, including seizures, developmental delay and cerebral palsy.

IVH is uncommon in term infants but can be seen in association with trauma and asphyxia. In these cases the bleeding is usually in the choroid plexus.

Classification

It is classified according to radiological appearance as follows:\[^{[2]}\]

- **Grade I**: germinal matrix haemorrhage. Bleeding confined to the germinal matrix/subependymal region. Bleed occupies <10% of ventricle.
- **Grade II**: intraventricular blood without distension of the ventricular system. Bleed fills 10-50% of ventricle - approximately 40% of cases.
- **Grade III**: blood filling and distending the ventricular system. Dilated ventricles which are >50% full of blood.
- **Grade IV**: parenchymal involvement of haemorrhage, also known as periventricular venous infarction.

Epidemiology

Incidence

IVH occurs in 60-70% of neonates weighing 500-750 g and 10-20% of those weighing 1,000-1,500 g.\[^{[3]}\] Prematurity and low birth weight are the most important risk factors for grade IV haemorrhage.\[^{[4]}\] Research is also underway looking at the role of ventilation in the aetiology of IVH.\[^{[5]}\] There is an inverse relationship between the severity of the haemorrhage and the likelihood of survival.

Risk factors

- Prematurity - particularly <32 weeks.
- Low birth weight.
- Respiratory distress syndrome.
- Hypoxia.
- Sepsis.
- Hypotension.
- Hypovolaemia.
- Hypertension.
- Altered cerebral blood flow.
Presentation

Symptoms
Most cases present by the third day of life. However, much less commonly there is delayed haemorrhage occurring after the first week. The most common symptoms are:

- Diminished/absent Moro reflex.
- Poor muscle tone.
- Sleepiness.
- Lethargy.
- Apnoea.

Premature babies often show sudden deterioration on day two or three, with periods of apnoea, pallor or cyanosis, failure to suck properly, abnormal eye signs, shrill cry, twitching or convulsions, reduced muscle tone or paralysis.

Signs
- The fontanelle may be tense and bulging with severe IVH.
- Neurological depression may progress to coma.
- In mild forms there may be no clinical signs, or there may be alternating symptomatic and asymptomatic periods.

Differential diagnosis
- Apnoea of prematurity
- Neonatal sepsis
- Hypoglycaemia
- Hypermagnesaemia
- Periventricular leukomalacia

Investigations
- Arterial blood gases show metabolic acidosis.
- Reduced haemoglobin level which may fail to improve on transfusion.
- Transfontanelle ultrasound; this is the diagnostic tool of choice. All premature babies at less than 30 weeks of gestation have cranial ultrasound at 7-14 days of age.
- MRI is increasingly used to assess brain injury and its consequences on brain development.[6]

Management
This is initially mainly supportive and may include the correction of anaemia, acidosis and hypotension. Ventilatory support may also be required for some who deteriorate acutely. Long-term management may be required, such as for neurodevelopmental impairment, seizures and hydrocephalus.

Fluid/volume replacement
- Packed red blood cells or fresh frozen plasma for anaemia and shock.
- Sodium bicarbonate infusion (carefully) for metabolic acidosis.

Pharmacological
- Anticonvulsants for seizures.
- Acetazolamide can be used to decrease cerebrospinal fluid (CSF) production.[7] This limits late or rapidly progressive hydrocephalus.
- Intraventricular fibrinolytic therapy with streptokinase has been attempted. However, a 2007 Cochrane review felt it could not be recommended for neonates following IVH.[8]

Surgical
- Ventriculoperitoneal and ventriculosubgaleal shunts are the definitive treatments for posthaemorrhagic hydrocephalus.
- Serial lumbar punctures have been used in the management of late or rapidly progressive hydrocephalus; however, this role remains controversial.[9]

Prognosis
- Hydrocephalus: approximately 15% of preterm infants with severe IVH will require a permanent shunt for CSF diversion.[10]
- Infants with massive haemorrhage often rapidly deteriorate and die. Mortality from high-grade IVH may be 27-50%.
- A significant proportion will show motor and cognitive deficits.
- Infants who have extremely low birth weight with grades I-II IVH have poorer neurodevelopmental outcomes at 20 months than infants with normal cranial ultrasound.[11]
Prevention

- Antenatal steroids to the mother and low-dose indometacin to the infant. Indometacin has been shown to decrease the risk of high-grade IVH, without improving developmental outcome.[2]
- The Department of Health "recommends that all newborn babies are given vitamin K in the newborn period". Optimum timing and method of administration are unsure.
- Careful timing and management of delivery to avoid birth trauma and immaturity. Choice of tocolytic agent may be important.[12]

Further reading & references

9. Whitelaw A; Repeated lumbar or ventricular punctures in newborns with intraventricular hemorrhage. Cochrane Database Syst Rev. 2001;

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