

Intraventricular Hemorrhage

2002/01(制定)

2013/04(修)

Pathogenesis

Bleeding source: germinal matrix

Cerebral hemodynamic changes: Perinatal asphyxia or RDS

Coagulation anomaly

Papile's classification

Grade I: subependymal hemorrhage

Grade II: IVH

Grade III: IVH with ventricular dilatation

Grade IV: IVH with ventricular dilatation and parenchymal extension

Volpe's classification

Grade I	Germinal matrix hemorrhage with no or minimal intraventricular hemorrhage < 10% of intraventricular area on parasagittal view)
Grade II	Intraventricular hemorrhage (10-50% of ventricular area on parasagittal view)
Grade III	Intraventricular hemorrhage (> 50% of ventricular area on parasagittal view; usually distends lateral ventricles)
Separate notation	Periventricular echodensity (location and extent)

Prevention of IVH

Prevention of premature birth

Optimization of prenatal care

Transportation in utero

Prenatal pharmacological intervention

Optimal management of labor and delivery

Correct neonatal resuscitation

Respiratory stabilization

Adaptation to the ventilator

Blood pressure and blood volume stabilization

Minimal handling

Correction with fresh frozen plasma infusion, vitamin K or coagulation factors

Antenatal strategies

- Prevention of preterm delivery
- ✓ Tocolytics
- Treatment of maternal complication
- Intrapartum fetal surveillance
- ✓ Biophysical monitoring
- ✓ Prompt delivery upon recognition of fetal compromise
- Obstetric interventions
- ✓ Controlled vaginal delivery
- ✓ Outlet forceps
- ✓ Cesarean section
- ✓ Anesthesia
- Pharmacologic agents
- ✓ Vit K: uncertain or no benefit
- ✓ Phenobarbital: uncertain or no benefit
- ✓ Steroid

Postnatal prevention

- Supportive measures
 - ✓ Resuscitative measures as indicated
 - ✓ Maintenance of adequate oxygenation, ventilation, and acid-base balance
 - ✓ Mechanical ventilator settings at minimal to prevent pneumothorax and other air leaks and to minimize circulatory disturbance
 - ✓ Minimization of abrupt hemodynamic alterations
 - Stabilization of blood pressure
 - Minimal handling to prevent hypertensive spikes
 - Slow volume infusion to treat hypotension
 - Inotropic agents/pressors to maintain stable, normal range blood pressure and circulation
 - ✓ Careful administration of surfactant while carefully monitoring associated systemic hemodynamic change
 - Pharmacologic agents of uncertain benefit
 - ✓ Pancuronium
 - ✓ Ethamsylate
 - ✓ Phenobarbital
 - ✓ Vit E
 - ✓ Indomethacin
 - 1) decrease in cerebral blood flow
 - 2) inhibition of the synthesis of free radicals
 - 3) acceleration of maturation of micro-vessels in the germinal matrix
- acute effect: renal insufficiency, impaired platelet aggregation, decreased mesenteric and retinal

blood flow

Ment 1996: low-dose 0.1mg/kg/d q24h x 3 days, infused slowly , > 30 minutes

Another report:may increase risk of NEC and chronic lung disease

Prevention of progression of the hemorrhage

- Adaptation to the ventilator to avoid fluctuating CBF and management of ventilatory setting
- Avoidance of fluctuating or increased systemic blood pressure
- Minimal handling
- Maintenance of PCO₂ and PO₂ in the physiological range as far as possible
- Control of acidosis
- Avoidance of hyperosmolar solution and rapid volume expansion
- Control of seizures
- Avoidance whenever possible of drugs known to increase CBF
- Avoidance whenever possible of interventions that abruptly increased CBF (ductus arteriosus ligation)

Post hemorrhagic hydrocephalus (ventriculomegaly)

- Obstruction of the CSF pathway by blood clots, at posterior fossa cisterns
- Posthemorrhagic inflammatory changes in the arachnoid villi → delayed absorption
- Periventricular and parenchymal hemorrhagic injury, ischemic white matter injury → passive dilation from atrophy

Diagnosis

Increased Hcf \geq 2cm/wk, bulging fontanelle, inability to wean from ventilator, increased episodes of apnea and bradycardia

Cranial ultrasonography every 5-7 days following an IVH

Prevention of posthemorrhagic hydrocephalus

- Lumbar puncture:restricted to cases with S/S of IICP
- Diuretics: side effects:acidosis, CO₂ retention, increased CBF velocity, poor feeding, electrolyte disturbance, nephrocalcinosis, osteopenia, diarrhea and vomiting
- Fibrinolytic endoventricular treatment

Management of PHH or PHVM

- Medications to decrease CSF production:
not indicated after randomized controlled trial
- Medication to promote fibrinolysis: no effect at present time
- Serial lumbar punctures: 10-15mkg, not decrease the incidence of death or disability, carries the risk of CNS infection. Only when IICP before shunt placement
- Direct ventricular drainage
- VP shunt

超音波看到腦室大的代表意義

Complication :post hemorrhagic hydrocephalus

Late persistent ex vacuo ventriculomegaly

Location and extent of accompanying parenchymal lesions

Outcome following PHVM

Severity of hemorrhage

Greater amount of CSF protein

Persistence of VM after intervention

A greater number of shunt revisions

The presence of PVL

Seizures disorders

Lower birthweight and GA

→ Deficits in the visual motor and visual-spatial area

建議：

- 小於 2000 公克，懷孕周數小於 36 周的早產兒，應常規的接受一次腦部超音波檢查，於第四天開檢驗單。
- 住進 NICU 者，建議出生後馬上做一次(不開單)，以為 baseline。
- 如有 IVH 或 moderate 至 severe PVE 者，應每一兩週追蹤一次超音波，至穩定沒有變化，之後於住院中可一個月追蹤一次。另外應每一周測量一次頭圍,注意前凶門的變化。
- GA <= 30 wks，第一次正常者，於 PMA 36-40wks 時，再追蹤一次。(uptodate)