

# Neonatal neurology

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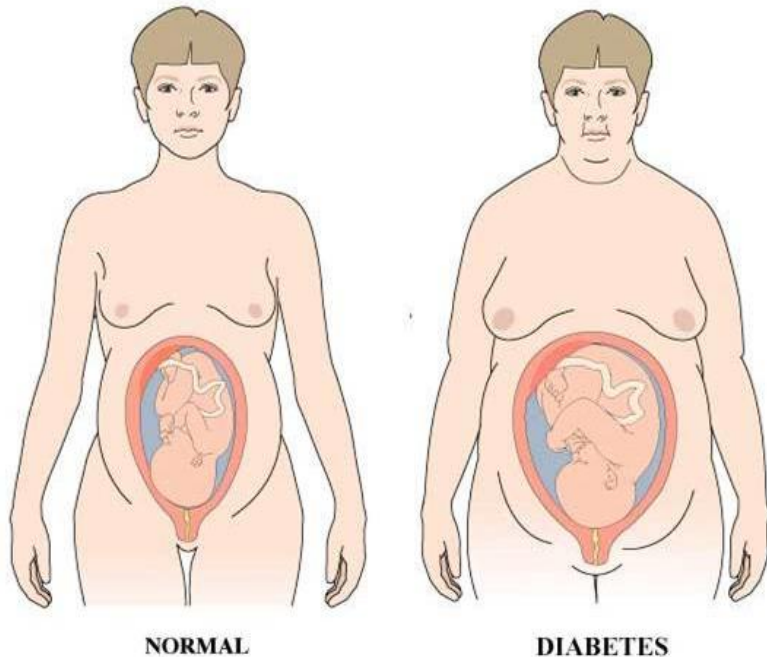
# Outline

- Birth injuries
- Meningomyelocele
- Intracranial haemorrhages
- Hypoxic-ischaemic encephalopathy
- Neonatal seizures
- Inborn errors
- Congenital infections
- Floppy infant

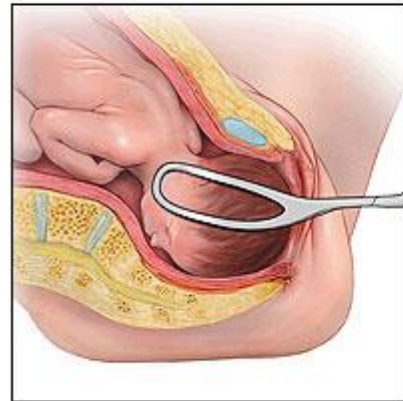
# Birth injuries

Risk factors for birth trauma:

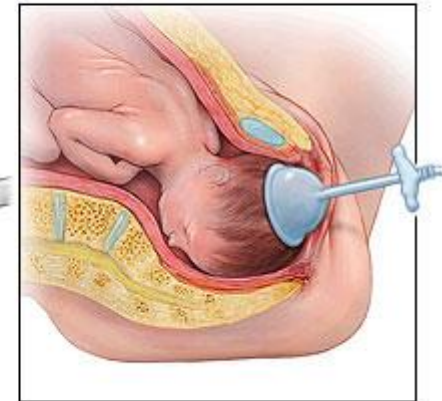
- ✓ large-for-date infants, especially infants who weigh more than 4500 g
- ✓ instrumental deliveries, especially forceps or vacuum
- ✓ vaginal breech delivery
- ✓ abnormal or excessive traction during delivery



Forceps



Vacuum extraction



# Cephalhaematoma

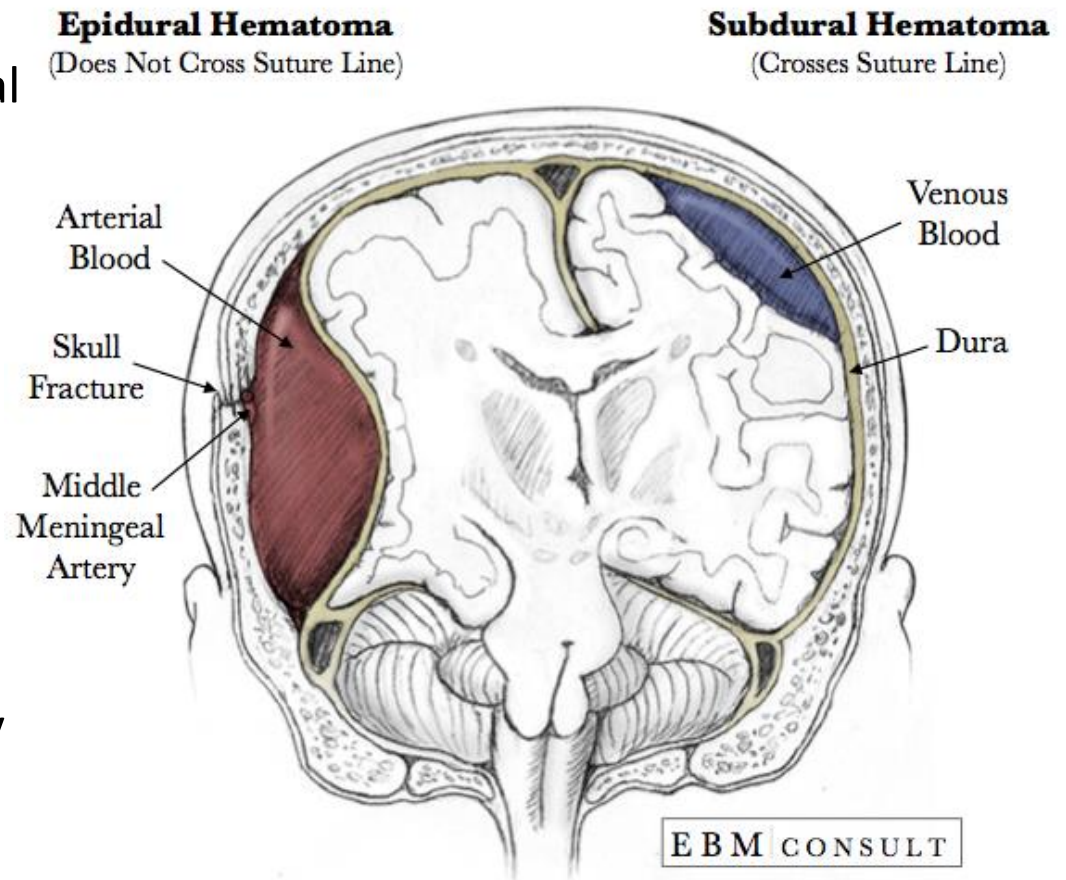
- common, incidence 1.5% to 2.5% of all deliveries
- in 15 % of patients presents bilaterally
- linear fractures are seen in 5 % of unilateral lesions and in 18% of bilateral lesions
- collection of blood beneath the periosteum
- limited by suture lines (if no associated skull fracture)
- more common with forceps and vacuum extraction
- generally benign
- if large, may exacerbate jaundice, anaemia
- takes weeks to months to resolve
- usually does not require treatment
- may occur with coagulation abnormalities (vitamin K, factor VIII deficiency)

# Subgaleal haematoma

- Vacuum extraction predisposes
- scalp swelling
- falling hematocrit
- massive bleeding  
can cause hypovolemic shock
- coagulation studies should be performed

# Epidural and subdural haematoma

- Most frequently related to birth trauma or nonaccidental injury
- Coagulation abnormalities
- Subdural hematoma more common
- Small subdural haematoma common – inconsequential
- Large subdural/epidural hematoma – raised intracranial pressure
- Early surgical evacuation may be lifesaving



## Risk of Intracranial Injury According to Type of Delivery

Mode of Delivery	Incidence of Intracranial Injury
Vacuum	1/860
Forceps	1/664
Combined vacuum-forceps	1/256
Cesarean	
In labor	1/907
Without labor	1/2750
Spontaneous vaginal delivery	1/1900

Adapted from Towner D, Castro MA, Eby-Wilkens E, Gilbert WM: Effect of mode of delivery in nulliparous women on intracranial injury. *N Engl J Med* 341: 1709-1714, 1999.

# Facial nerve palsy

Result of application of forceps



# Brachial plexus injury



Brachial plexus is stretched due to traction

# Brachial plexus injury

Incidence - 0.5-2 / 1000 live births

Most cases - Erb palsy

Entire brachial plexus involvement occurs in 10 % of cases

Traumatic lesions associated with brachial plexus injury:

- fractured clavicle (10%)

- fractured humerus (10%)

- subluxation of cervical spine (5%)

- cervical cord injury (5-10%)

- facial palsy (10-20%)

Spontaneous recovery – 90 %

## Erb palsy



**C5-6**

## Klumpke palsy



**C7-Th1**

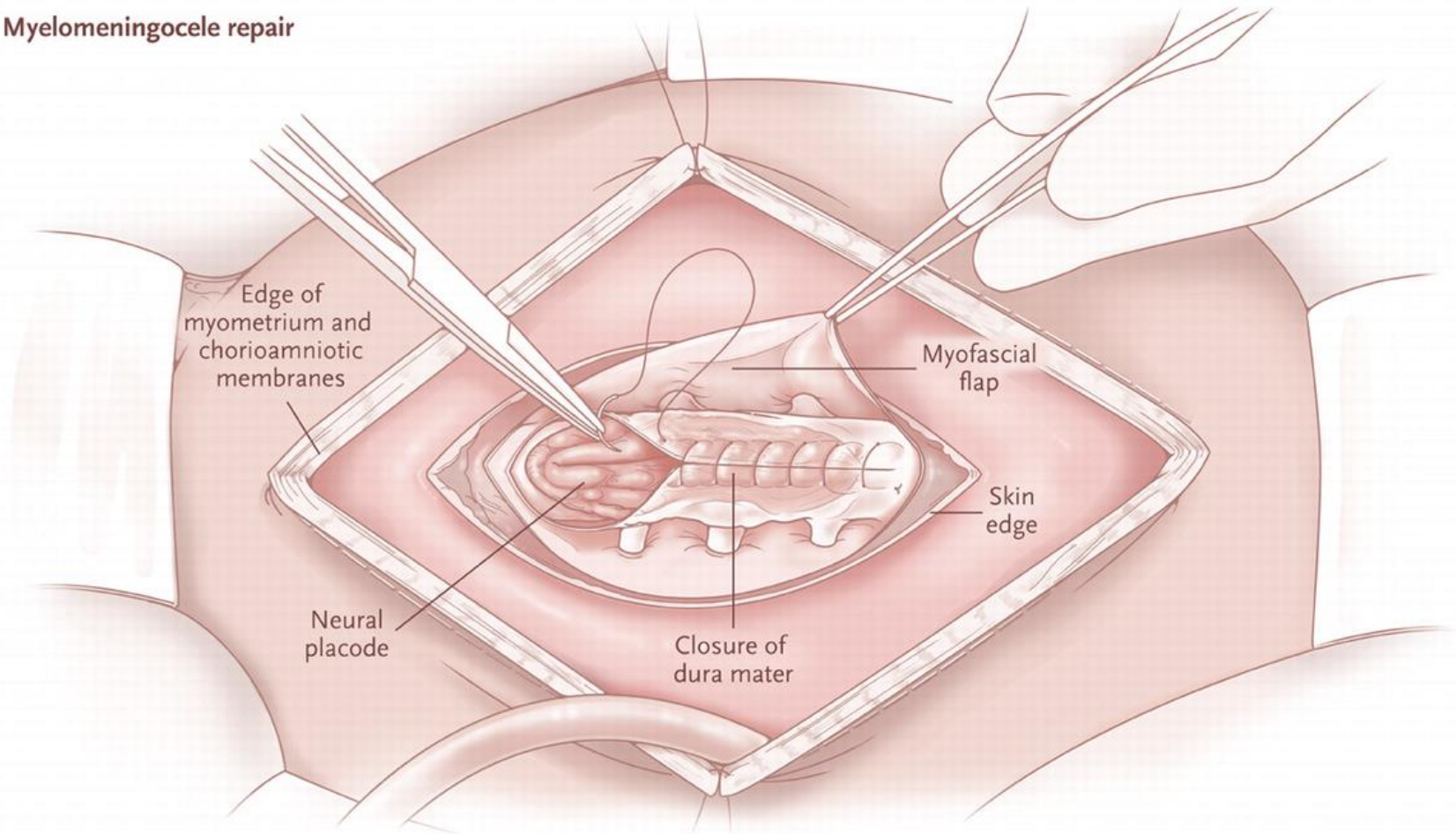
Rare, results in weakness of the intrinsic muscles of the hand; the grasp reflex is absent. Horner syndrome: if cervical sympathetic fibers of the first thoracic spinal nerve are involved

# Myelomeningocele

Incidence:  
1-2/1000  
live births



C Myelomeningocele repair

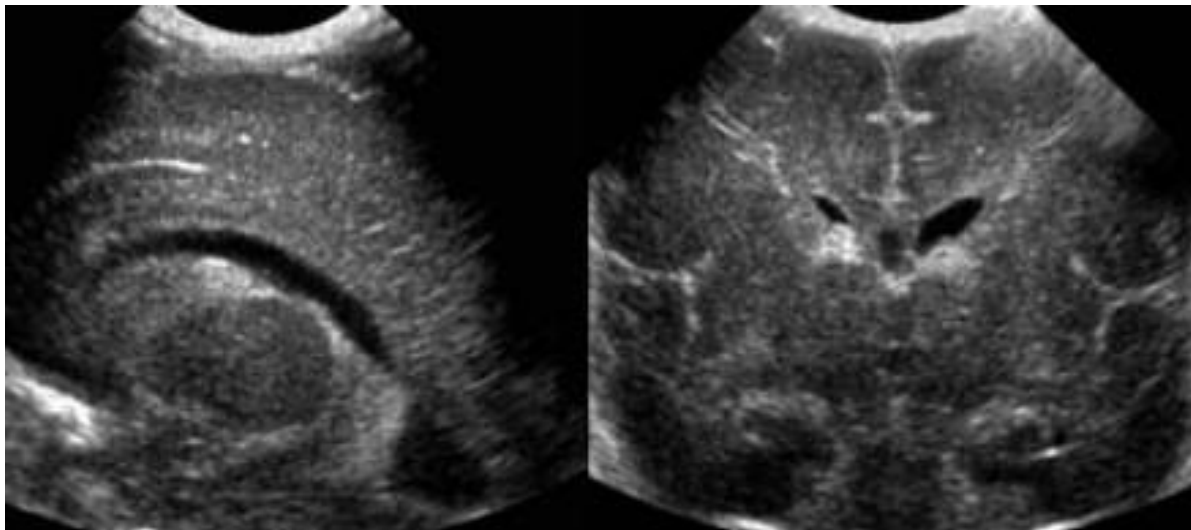
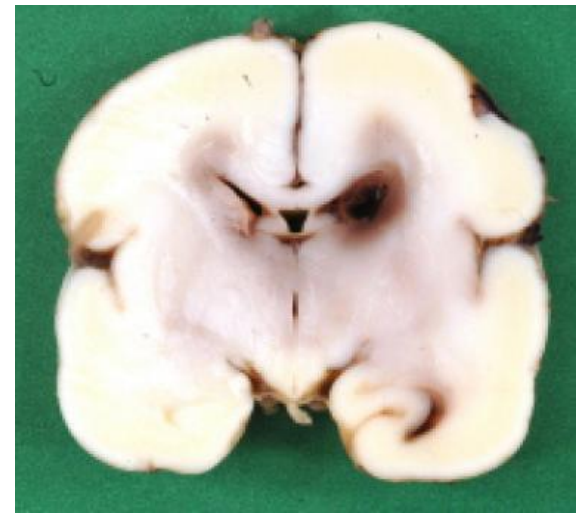


# Intracranial haemorrhage

## Intracranial hemorrhage

*Classification according to Papile*

- Grade 1.** Hemorrhage limited to subependymal matrix
- Grade 2.** Hemorrhage extending into ventricular system, < 50%, without acute ventriculomegaly
- Grade 3.** Hemorrhage extending into ventricular system, with acute dilatation because of flooding of 50% or more of one or both lateral ventricles
- Grade 4.** Hemorrhage grade 1, 2 or 3 with extension into brain tissue



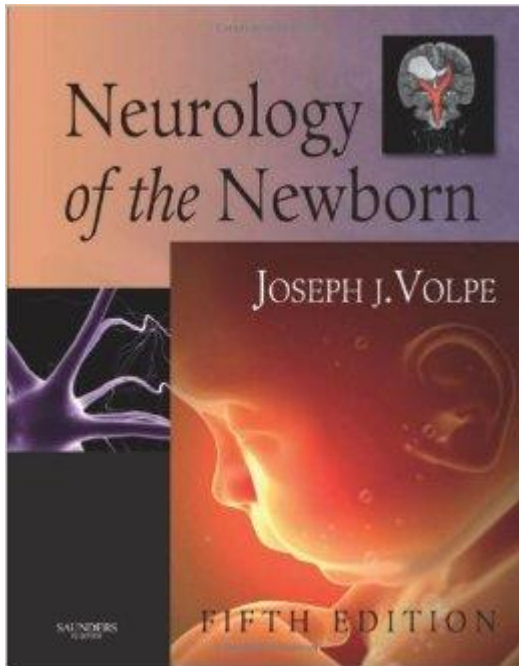
### Grade 1 intracranial haemorrhage

Subependymal hemorrhage located in the groove between the thalamus and the nucleus caudatus

Sagittal and coronal US

# IVH grades as determined by degree of haemorrhage

Volpe



A



B



C



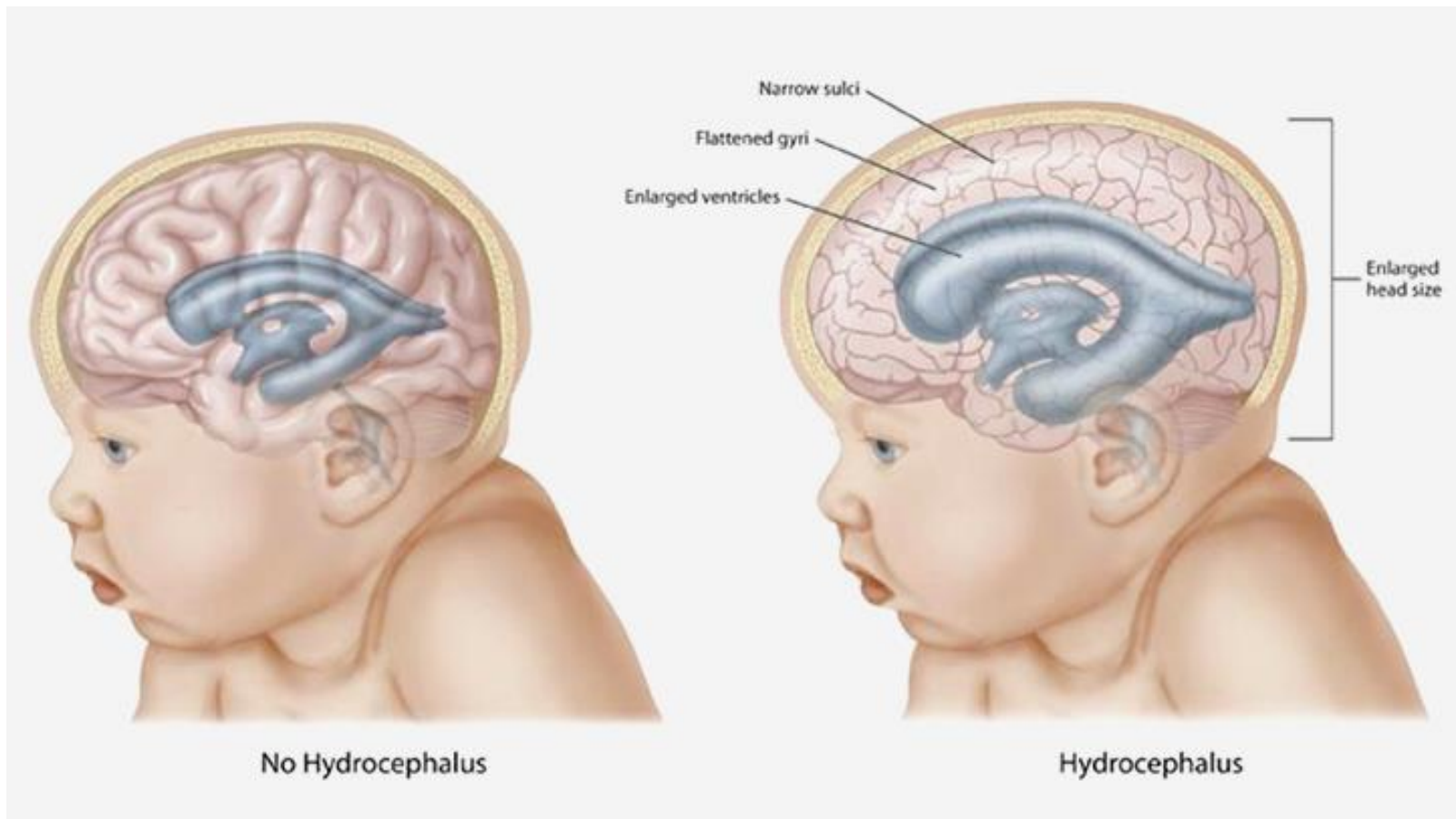
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A	Grade I	< 10 %
B	Grade II	10-50 %
C	Grade III	> 50 % + ventricular dilatation
D	Grade IV	Parenchymal infarction

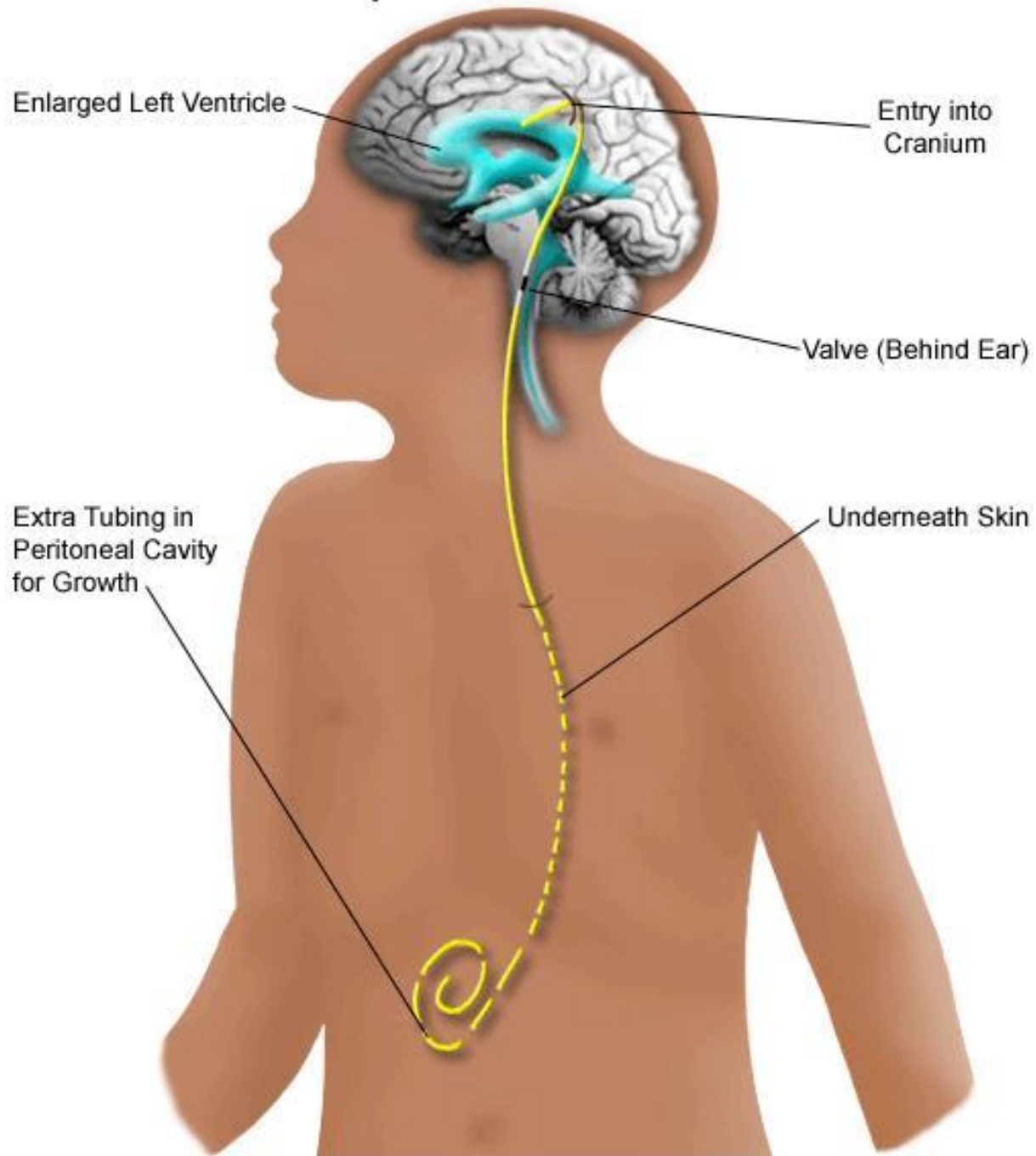


# Hydrocephalus

1. **Communicating hydrocephalus:**  
decreased absorption of CSF secondary to obstruction of arachnoid villi by blood and debris or the development of arachnoiditis
2. **Obstructive hydrocephalus:**  
obstruction to CSF circulation



# Ventriculoperitoneal Shunt Placement



# Encephalopathy of prematurity

## Periventricular leukomalacia

**Incidence:** 5 % of VLBW

**Pathophysiology:** hypoxia, ischemia, inflammation injure oligodendrocyte progenitor cells in the periventricular white matter

**Classical PVL:** focal necrotic lesions + surrounding areas of gliosis, with cyst formation – detectable typically 2-4 wk after birth

Both cystic and non-cystic forms are usually bilateral and symmetric

Most commonly affected: white matter dorsolateral to the trigones and frontal horns

Diffuse loss of brain tissue results in ventriculomegaly, enlarged extra-axial CSF spaces and immature gyral development

# Neonatal seizures

Incidence: term newborns: 0.7-2.7/1000 live births

Classification:

- subtle seizures (50 %)
- clonic seizures (25 %)
- myoclonic seizures (20 %)
- tonic seizures (5 %)
- non-paroxysmal repetitive behaviors

# Neonatal seizures

## Aetiology:

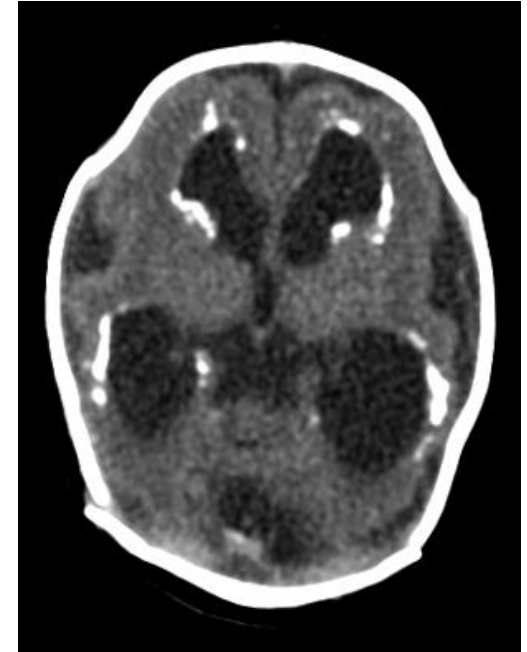
- hypoxia-ischaemia
- haemorrhage
- malformations of cerebral development
- metabolic
- infections
- trauma
- drug withdrawal

# Congenital infections

- The later the infection occurs in the gestation – the less severe the disease
- Approx. 1 % of all children are congenitally infected
- Only 10 % of these newborns are born symptomatic
- CMV: most common

# Congenital CMV infections

- Signs and symptoms
  - ✓ Intracranial calcifications
  - ✓ Migrational CNS defects
  - ✓ Non-neurologic manifestations:
    - ✓ thrombocytopenia
    - ✓ intrauterine growth retardation
    - ✓ hepatosplenomegaly
    - ✓ hyperbilirubinaemia
    - ✓ chorioretinitis
    - ✓ sensorineural hearing loss
- Dg:
  - ✓ maternal serum antibodies IgM, IgG – nonspecific
  - ✓ Viral culture of amniotic fluid - 100 % specific, high false-negative rate
  - ✓ Postnatal dg: urine CMV
  - ✓ CMV specific immunoglobulin (IgM)
  - ✓ Serum PCR to detect CMV DNA
  - ✓ MRI, US
- Therapy: gancyclovir

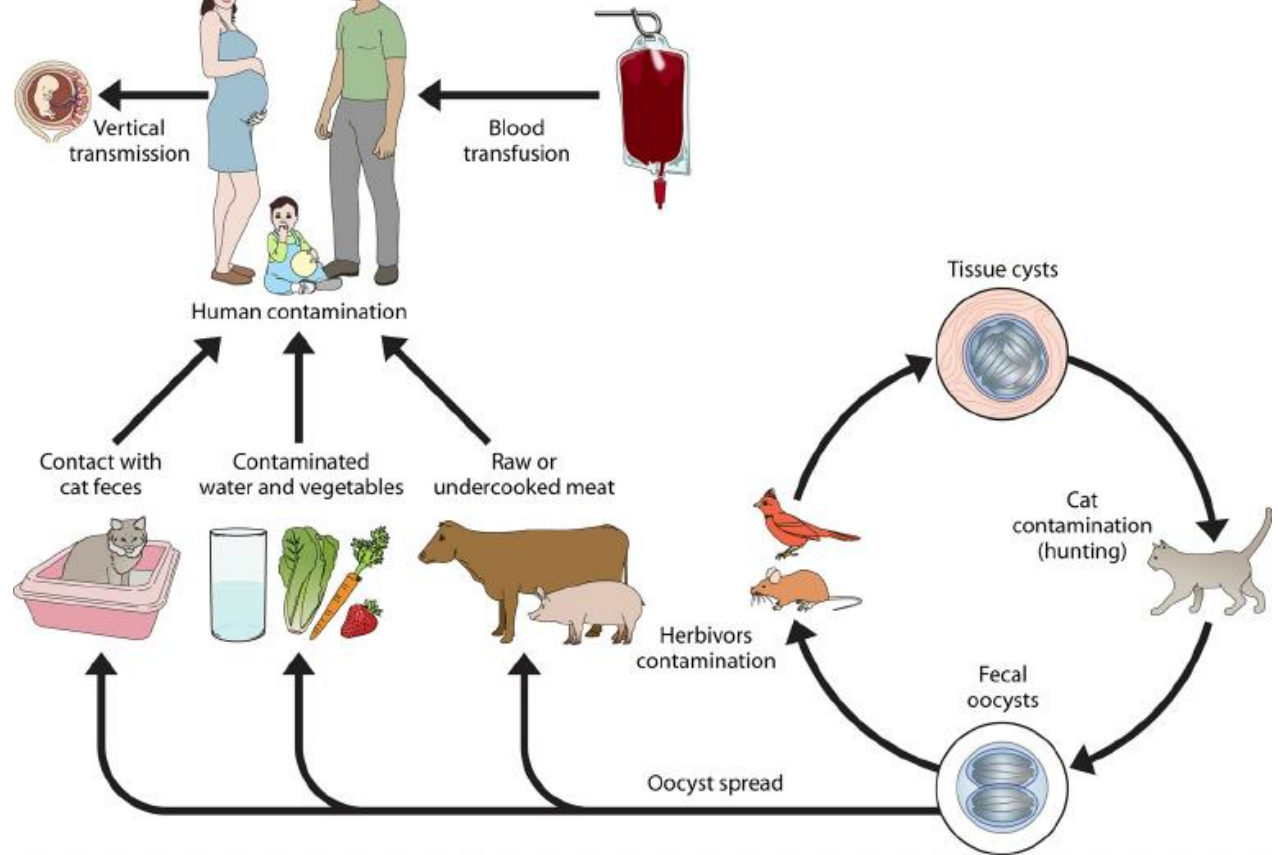


# Toxoplasmosis

Incidence: 0.1-1/1000 live birth

*Toxoplasma gondii*

Cat is the primary host



Therapy: pyrimethamine-sulfadiazine and folic acid for about 1 yr is recommended



# Herpes simplex virus (HSV)

Usually due to transmission of HSV2

Symptoms and signs typically presents 1-3 wk after birth

- ✓ poor feeding
- ✓ lethargy
- ✓ apnea
- ✓ bulging fontanel
- ✓ irritability
- ✓ seizure
- ✓ fever
- ✓ respiratory distress
- ✓ hepatomegaly
- ✓ jaundice
- ✓ DIC

Treatment: iv acyclovir

# Tone abnormalities - Floppy infant

Hypotonia: reduced resistance to passive range of motion in joints

Weakness: reduction in the maximum power that can be generated

Hypotonia can exist without weakness

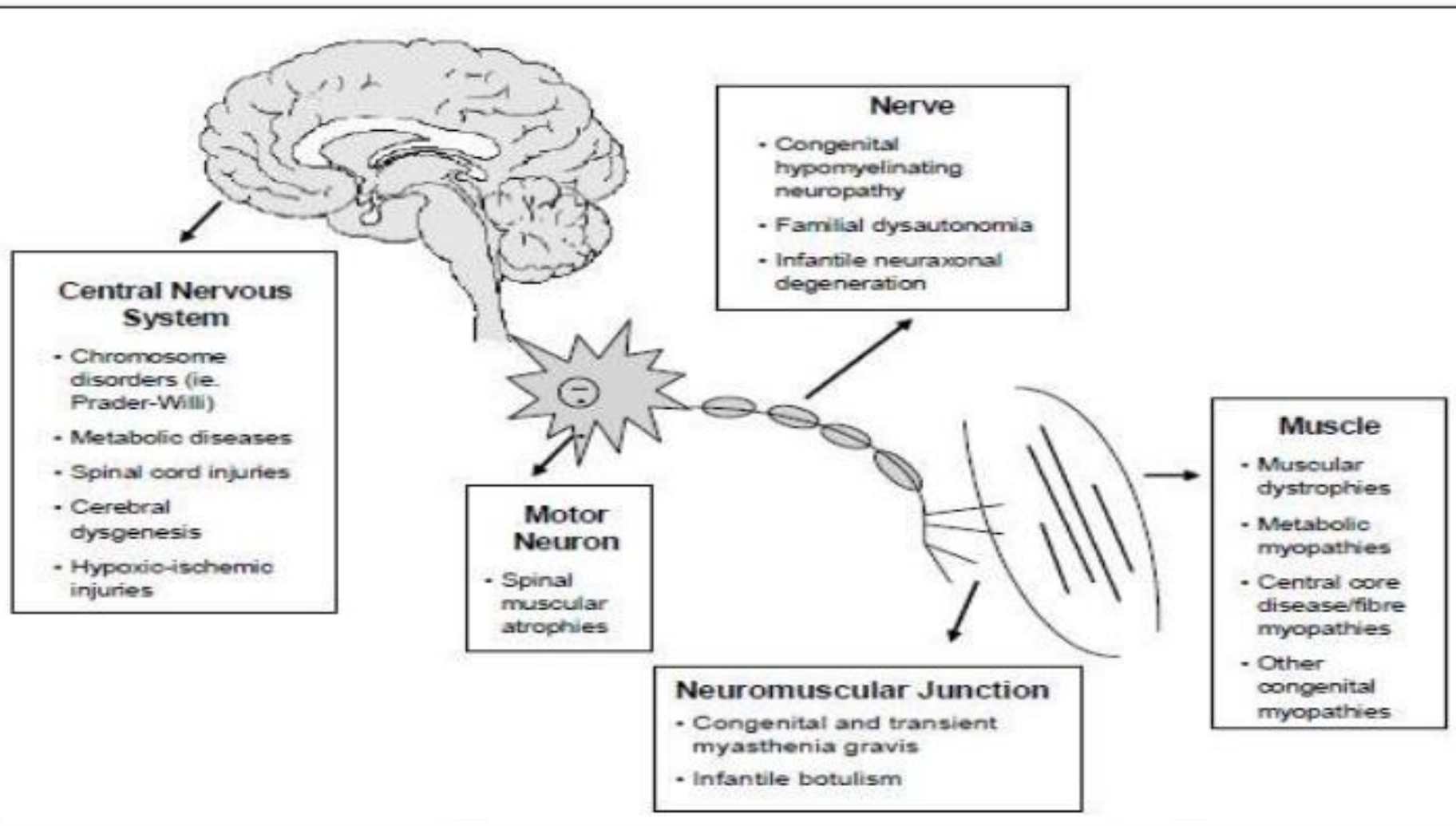


Normal Baby



Floppy Baby

# Common causes of hypotonia



**Figure 1)** Anatomical-clinical correlation illustrating differential diagnosis of hypotonia in infancy