Neonatal neurology

Developmental process of the human brain

Neuronal proliferation ---------- --- --- --- ---
Neuronal migration --- ---------- --- --- ---
Outgrowth of axons --- --- ---------- --- --- --- ---
Synapse formation --- --- ---------- --- --- --- ---
Glia cell proliferation --- --- --- --- ---------- ---
Myelination --- ---------- --- --- --- --- ---
Neuronal death --- --------- --- ---
Axon retraction --- --- --- ---------- --- ---
Synapse elimination --- --- --- --- --- --- ---------- --- ---

C 3M 6M B 1 y 10y 30 y

Birth injury

Caput succedaneum

edematous swelling
extends the sutures lines
some days after disappears

Birth injury

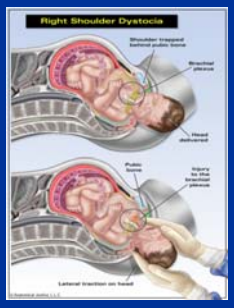
Cephalhematoma

subperiostal hemorrhage
does not extend the suture lines
skull fracture may occur

no therapy is needed

Birth injury

- Brachial plexus palsy
- Risk factors:
  - macrosomia
  - narrow pelvic outlet



Birth injury

Erb-Duchenne paralysis

excessive traction of the neck

injury of the brachial plexus (C5,C6)

Can not abduct, externally rotate and supinate

Biceps and Moro reflex are absent

Birth Injury

Klumpke paralysis

Injury of the brachial plexus (C7,C8)

Paralysed hand

1st th nerve injury may occur→Horner trias (ptosis, myosis, enophtalmus)

Birth injury

- Complete arm and hand paralysis (C5-C8)

Birth injury

Erb-Duchenne and Klumpke paralysis

Therapy:

Positioning to prevent contractures

Motion exercises

Electrotherapy

Surgery (neuroplasty)

Birth injury

Erb-Duchenne and Klumpke paralysis

Prognosis: complete recovery 70-90 percent

Nerve was not lacerated→ good, the function will return within a few months

Nerve was lacerated → permanent demage

Birth injury

Phrenic nerve palsy

diaphragmatic paralysis→respiratory distress

Breath sounds are diminished

Fractures skull, clavicle, extremities

Spinal cord injury, subdural hemorrhage

Hypoxic-ischemic encephalopathy Etiology

Intrauterin (uteroplacental insufficiency,abruptio placentae)

Intrapartum (umbilical cord compression)

Postpartum (infections, ptx,NRDS)

↓

Asphyxia

(hypoxia, hypercapnia, acidosis)

Hypoxic-ischemic encephalopathy

Asphyxia

↓

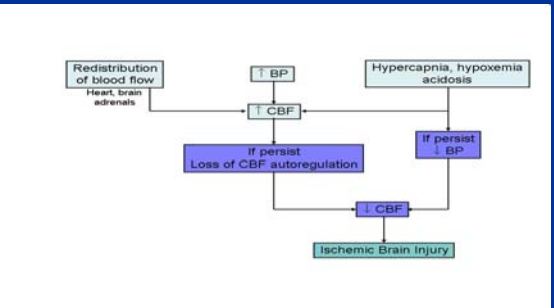
bradycardia→reduced tissue blood flow→diminisched blood flow to the brain →ischemia

↓

increased capillary permeability→cerebral edema, petechiae

Intracranial hemorrhage may be present

Hypoxic-ischemic encephalopathy



Hypoxic-ischemic encephalopathy Symptoms

Depends on:

the gestational age

time, severity and/or duration of asphyxia

Hypoxic-ischemic encephalopathy Symptoms in term infants

Mild asphyxia (stI)

- irritability, hyperalertness
- muscle tone is normal
- deep tendon reflexes are brisk
- mydriasis

Hypoxic-ischemic encephalopathy
Symptoms in term infants

Severe asphyxia (stII-III)

letargy, stupor

hypotonia

deep tendon reflexes may be absent

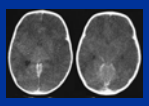
myosis

seizures

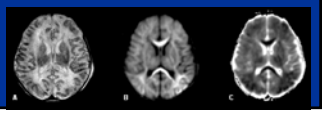
Hypoxic-ischemic encephalopathy
Symptoms in term infants

Ultrasound /MRI

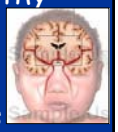
- cerebral oedema
- cortical necrosis
- lesions os basal ganglias



„bright thalamus"



Hypoxic-ischemic encephalopathy
in preterms



Circulation system and autoregulation is vulnerable,vessels have poor structural support

CBF autoregulation is narrow

↓

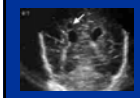
CBF become pressure-passive

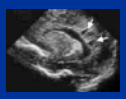
Hypoxic-ischemic encephalopathy
in preterms

Blood pressure's changes have a deep impact on border zone, vessels may rupture easier

- Hypercapnia,hypoxia→vasodilatation→increased cerebral bood flow
- Hypocarbia,hyperoxia→ vasoconstriction→decreased cerebral blood flow

Hypoxic-ischemic encephalopathy in preterms Consequence I





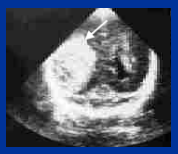
Periventricular leukomalacia

symmetrical ischemic infarction of the white matter adjacent to the lateral ventricules

Hypoxic-ischemic encephalopathy in preterms Consequence II

Periventricular intraventricular hemorrhage

Vulnerable region ! - periventricular, subependymal germinal matrix is highly vascularized



Hypoxic-ischemic encephalopathy Therapy

- Maintain adequate ventilation
- Maintain perfusion (dopamine, dobutamine)
- Fluid and glucose homeostasis
- Treatment of seizures (phenobarbital, lorazepam, phenytoin)

Hypoxic-ischemic encephalopathy Therapy

Hypothermia treatment (selective head or whole body cooling)

- 3-4°C below the baseline temperature
- no later than 6 hour

Possible mechanism:

- reduced metabolic rate and energy depletion
- decreased excytatory transmitter release
- reduced apoptosis and vascular permeability

Intracranial hemorrhage

In preterm:

(Frequent, up to 50%of under 1500 g)

Intracranial hemorrhage

Classification according to Papile

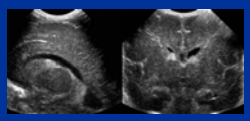
Grade 1. Hemorrhage limited to subependymal matrix

Grade 2. Hemorrhage extending into ventricular system, < 50%, without acute ventriculomegaly

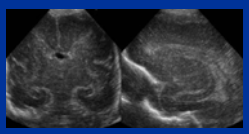
Grade 3. Hemorrhage extending into ventricular system, with acute dilatation because of flooding of 50% or more of one or both lateral ventricles

Grade 4. Hemorrhage grade 1, 2 or 3 with extension into brain tissue

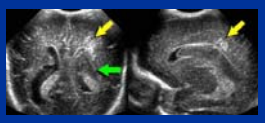
Intracranial hemorrhage



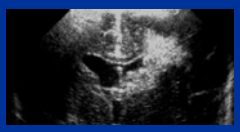
Grade I



Grade II



Grade III.



Grade IV

Intracranial haemorrhage

Causes in terms : malformation

(rare) trauma during delivery

coagulopathy

Subdural, subarachnoidal and intraparenchimal more frequent

Intracranial hamorrhage

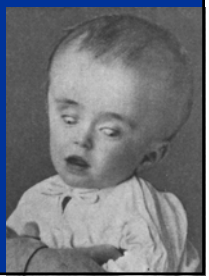
Diagnosis: - clinical manifestations

(shock, seizures, anemia,apnoe unconsciousness, bulging fontanel)

- cerebral ultrasonography
- CT
- Lp (in some cases are neded)

Hydrocephalus internus
Early complication of intracranial hemorrhage

- Head circumference grows rapidly
- Bulging fontanel
- „Setting sun phenomen"
- spasticity



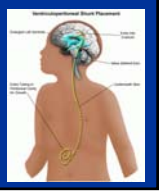
Intracranial hemorrhage
Therapy

-Supportive care (ventillation therapy,transfusion, drugs)

In a case of threatening hydrocephalus:

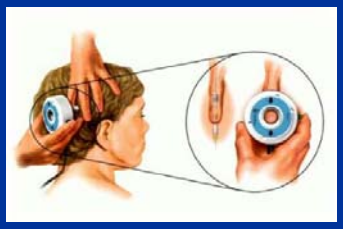
-Serial daily lumbal puncture, external ventriculostomy

-Ventriculoperitoneal shunt



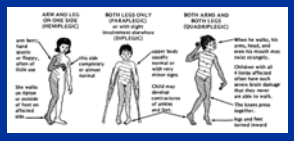
Hydrocephalus -VP-shunt

Programmable shunt with magnet



Complications in later ages

Cerebral palsy
Mental retardation
Hydrocephalus
Microcephaly
Visual and hearing problems
Epilepsy
ADHD



Thank you for attention !