Pathology of the newborn
Basic definitions

- Abortion
- Delivery
- Fetus immaturus non vitalis
- Fetus immaturus vitalis
- Fetus maturus
- Fetus permaturus

- dead born fetus < 1000 g
- alive born fetus < 500 g, if survives no longer than 24 hours
Basic definitions

- Abortion
- Delivery
- Fetus immaturus non vitalis
- Fetus immaturus vitalis
- Fetus maturus
- Fetus permaturus

- alive born fetus over 500 g
- alive born fetus under 500 g, surviving more than 24 hours
Basic definitions

- Abortion
- Delivery
- Fetus immaturus non vitalis
- Fetus immaturus vitalis
- Fetus maturus
- Fetus permaturus

- weight less than 1000 g
- usual length under 38 cm
- born before 28 week of gestation
Basic definitions

- Abortion
- Delivery
- Fetus immaturus non vitalis
- **Fetus immaturus vitalis**
- Fetus maturus
- Fetus permaturus

- weight 1000 – 2500
- 29 – 38 week
Basic definitions

- Abortion
- Delivery
- Fetus immaturus non vitalis
- Fetus immaturus vitalis
- Fetus maturus
- Fetus permaturus
Basic definitions

- Abortion
- Delivery
- Fetus immaturus non vitalis
- Fetus immaturus vitalis
- Fetus maturus
- Fetus permaturus

- weight over 4000 g
- length over 52 cm
- born after 41 week of gestation
Hypotrophy of the fetus

- Small for date
- Multiple pregnancy

- placental insufficiency
- metabolic diseases
- alcohol
- ...
Pathology of the newborn

Basic definitions

Apgar score

Mors praenatalis

Mors neonatalis

Pneumopathology of the newborn

Hypotrophy of the fetus

- Small for date
- Multiple pregnancy

- physiological
- child is small, but usually quickly catches up
Apgar score

- Heart rate
- Respiration
- Muscular tone
- Reaction to nasal catheter
- Color

- not present (0 points)
- under 100 (1 point)
- over 100 (2 points)
Apgar score

- Heart rate
- Respiration
- Muscular tone
- Reaction to nasal catheter
- Color

- not present (0 points)
- slow, irregular (1 point)
- good, cry (2 points)
Apgar score

- Heart rate
- Respiration
- Muscular tone
- Reaction to nasal catheter
- Color

- week (0 points)
- extremities flexed (1 point)
- active movements (2 points)
Apgar score

- Heart rate
- Respiration
- Muscular tone
- Reaction to nasal catheter
- Color

- no response (0 points)
- grimace (1 point)
- cry (2 points)
Apgar score

- Heart rate
- Respiration
- Muscular tone
- Reaction to nasal catheter
- Color

- general cyanosis (0 points)
- body pink, extremities cyanotic (1 point)
- whole newborn is pink (2 points)
Results of Apgar score

- AS < 2
- AS 4 – 6
- AS > 7

- mortality 50 %
Results of Apgar score

- **AS < 2**
- **AS 4 – 6**
- **AS > 7**

- mortality 20 %
Results of Apgar score

- AS < 2
- AS 4 – 6
- AS > 7

- almost all newborns survive
Mors praenatalis

- No signs of life
- Maceration (I. – III. grade)
- Intrauterine asphyxia

- no respiration, heart action, movement
Mors praenatalis

- No signs of life
- Maceration (I. – III. grade)
- Intrauterine asphyxia

- I.: skin
- II.: organs, brain
- III.: softening of ligaments and joints
Mors praenatalis

- No signs of life
- Maceration (I. – III. grade)
- Intrauterine asphyxia

- alteration of the heart rate
- petechiae, ecchymoses
- release of meconium into the amniotic fluid
- premature activation of respiration
- aspiration of amniotic fluid (lanugo, meconium bodies)
Macerace, gr. III.
Macerace, gr. III.
Mors neonatalis

- Before the 28th day
  - Mechanical trauma during the delivery
  - Ischemia during the delivery
  - Morbus haemorrhagicus neonatorum
  - Sepsis neonatorum
  - Congenital malformations, genetic diseases
  - Congenital tumors

- early newborns: up to 7th day
Mors neonatalis

- Before the 28th day
- Mechanical trauma during the delivery
- Ischemia during the delivery
- Morbus haemorrhagicus neonatorum
- Sepsis neonatorum
- Congenital malformations, genetic diseases
- Congenital tumors

- CNS hemorrhage
- rupture of the tentorium
- spinal column trauma
- bone fractures
- hematomas
Mors neonatalis

- Before the 28th day
- Mechanical trauma during the delivery
- Ischemia during the delivery
- Morbus haemorrhagicus neonatorum
- Sepsis neonatorum
- Congenital malformations, genetic diseases
- Congenital tumors

- damage and bleeding into the CNS (especially in immature newborns)
Mors neonatalis

- Before the 28th day
- Mechanical trauma during the delivery
- Ischemia during the delivery
- Morbus haemorrhagicus neonatorum
- Sepsis neonatorum
- Congenital malformations, genetic diseases
- Congenital tumors

- Hemorrhagic diathesis (lack of vitamin K)
- Multiple organ bleedings
Mors neonatalis

- Before the 28th day
- Mechanical trauma during the delivery
- Ischemia during the delivery
- Morbus haemorrhagicus neonatorum
- Sepsis neonatorum
- Congenital malformations, genetic diseases
- Congenital tumors

- abruption of the placenta
- chorioamnionitis
- generalized infection of the mother
- respirators, catethers (umbilical catethers)
Mors neonatalis

- Before the 28th day
- Mechanical trauma during the delivery
- Ischemia during the delivery
- Morbus haemorrhagicus neonatorum
- Sepsis neonatorum
- Congenital malformations, genetic diseases
- Congenital tumors

- organ malformations (CNS, the heard and blood vesels, urogenital tract)
Mors neonatalis

- Before the 28th day
- Mechanical trauma during the delivery
- Ischemia during the delivery
- Morbus haemorrhagicus neonatorum
- Sepsis neonatorum
- Congenital malformations, genetic diseases
- Congenital tumors

- teratomas
- Willms tumor
- nephroblastoma
- retinoblastoma
- hepatoblastoma
Immaturity

- Lungs
- CNS
- Kidney
- Intestine

- to 24. week: tubuloalveolar
- to 28. week: transformation to alveolar lung
- to 29. week: the lungs are fully alveolar
- further development, pneumocytes of the 1st and 2nd type, surfactant production
Pathology of the newborn

Basic definitions
Apgar score
Mors praenatalis
Mors neonatalis
Pneumopathology of the newborn

Immaturity

- Lungs
- CNS
- Kidney
- Intestine

- gyrification of the brain: after 6th month
- persistency of the germinative periventricular layer
Immaturity

- Lungs
- CNS
- Kidney
- Intestine

- immature glomeruli
Pathology of the newborn

Basic definitions
Apgar score
Mors praenatalis
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Pneumopathology of the newborn

Immaturity

- Lungs
- CNS
- Kidney
- Intestine
Pneumopathology of the newborn

- Hyaline membranes
- Bronchopulmonary dysplasia
- Interstitial emphysema
- Aspiration of amniotic fluid
- Adnate bronchopneumonia
- Atelectasis

- immaturity of pulmonary parenchyma
- affects immature newborns
Pneumopathology of the newborn

- Hyaline membranes
- Bronchopulmonary dysplasia
- Interstitial emphysema
- Aspiration of amniotic fluid
- Adnate bronchopneumonia
- Atelectasis

- Affects newborns, who survived the RDS with hyaline membranes
- Corresponds to reparation of pulmonary tissue
Pneumopathology of the newborn

- Hyaline membranes
- Bronchopulmonary dysplasia
- Interstitial emphysema
- Aspiration of amniotic fluid
- Adnate bronchopneumonia
- Atelectasis

- caused by artificial ventilation of the newborns with atelectasis
- gas bubbles enter the the interstitium
- may get as far as soft tissues of the mediastinum
Pneumopatologia of the newborn

- Hyaline membranes
- Bronchopulmonary dysplasia
- Interstitial emphysema
- **Aspiration of amniotic fluid**
- Adnate bronchopneumonia
- Atelectasis

- fetal asphyxia
- premature activation of the respiratory reflex
Pneumopathology of the newborn

- Hyaline membranes
- Bronchopulmonary dysplasia
- Interstitial emphysema
- Aspiration of amniotic fluid
- Adnate bronchopneumonia
- Atelectasis

- Infection of the mother
- Amniotic fluid infection
Pneumopatology of the newborn

- Hyaline membranes
- Bronchopulmonary dysplasia
- Interstitial emphysema
- Aspiration of amniotic fluid
- Adnate bronchopneumonia
- Atelectasis

- not enough air within the lungs
Hyaline membrane syndrome

- Affects immature newborns
- RDS, immature lung
- Oxygen administration is necessary
- Toxic oxygen damages alveolar lining

- under 2000 g
Hyaline membrane syndrome

- Affects immature newborns
- RDS, immature lung
- Oxygen administration is necessary
- Toxic oxygen damages alveolar lining

- no surfactant (pneumocytes of the 2nd type)
- the lung collapses during the expirium
- inspiration requires increased effort
Hyaline membrane syndrome

- Affects immature newborns
- RDS, immature lung
- **Oxygen administration is necessary**
- Toxic oxygen damages alveolar lining

- Increased concentration of oxygen is inevitable (incubator)
- It is necessary to keep oxygen levels as low as possible
- Lung damage
- Retinal damage (retrolental fibroplasia)
Hyaline membrane syndrome

- Affects immature newborns
- RDS, immature lung
- Oxygen administration is necessary
- Toxic oxygen damages alveolar lining

- necrotic alveolar lining and exudate forms hyaline membranes
- especially ventilated alveoli are damaged
- the condition improves in surviving patients
Hyaline membranes
Bronchopulmonary dysplasia

- Clinical signs
- Pathogenesis
- Histology

- immature newborns
- survived RDS, who were treated with oxygen therapy and artificial ventilation
- changes develop gradually during months
- death often within 6 months, surviving have pulmonary disease
Bronchopulmonary dysplasia

- Clinical signs
- Pathogenesis
- Histology

- ventilated alveoli damaged by oxygen disappear (fibrosis)
- perialveolar fibrosis develops in partially damaged alveoli
- previously unventilated (atelectatic) alveoli develop normally (or get hyperexpanded)
Bronchopulmonary dysplasia

- Clinical signs
- Pathogenesis
- Histology

- the surface of the lungs is uneven
- fibrosis, irregular dilatation of alveoli (compensatory emphysema)
Bronchopulmonary dysplasia
Aspiration of the amniotic fluid

- Problem with blood supply of the fetus
- Clinical picture
- Histology
- Prognosis

- insufficiency of the placenta
- strangulation of the umbilical cord
- large infarcions of the placenta and other placental pathology
Aspiration of the amniotic fluid

- Problem with blood supply of the fetus
- Clinical picture
- Histology
- Prognosis

- alteration of fetal sounds
- stress of the fetus leads to meconium release
- activation of the respiratory reflex
Aspiration of the amniotic fluid

- Problem with blood supply of the fetus
- Clinical picture
- Histology
- Prognosis

- tiny keratotic squames, lanugo, meconium bodies, amnial cells are aspired to bronchi and alveoli
- variable extent
Aspiration of the amniotic fluid

- Problem with blood supply of the fetus
- Clinical picture
- Histology
- Prognosis

- Massive aspiration is lethal
- Condition may be complicated by bronchopneumonia, especially in infected amniotic fluid
Pathology of the newborn

Basic definitions
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Mors praenatalis
Mors neonatalis
Pneumopatology of the newborn

Aspiration of the amniotic fluid
Aspiration of the amniotic fluid
Adnate pneumonia

► Inflammation of the lung before, during and short after the delivery
► Etiology
► Prognosis
Adnate pneumonia

- Inflammation of the lung before, during and short after the delivery
- Etiology
- Prognosis

- disease of mother (virosis . . .)
- aspiration of infected amniotic fluid
- incubator
Adnate pneumonia

- Inflammation of the lung before, during and short after the delivery
- Etiology
- Prognosis

► serious complication of overall condition of the child
Adnate pneumonia
Adnate pneumonia
Atelectasis

- Areas of unventilated lung in a newborn
- Usually alteration with areas ventilated normally
- Etiology
- Prognosis

- firm, dark areas of consolidated tissue
- alveoli contain no air (therefore protected against toxic oxygen)
- (collapse: not ventilated pulmonary tissue, which was ventilated previously)
Atelectasis

- Areas of unventilated lung in a newborn
- Usually alteration with areas ventilated normally
- Etiology
- Prognosis

- surrounding tissue is hyperventilated
- prominent especially in artificially ventilated babies (emphysema)
Atelectasis

- Areas of unventilated lung in a newborn
- Usually alteration with areas ventilated normally
- Etiology
- Prognosis

- immaturity of pulmonary tissue
- aspiration
Atelectasis

- Areas of unventilated lung in a newborn
- Usually alteration with areas ventilated normally
- Etiology
- Prognosis

- tendency to spontaneous healing
Atelectases, tetralogy of Fallot