

Infections in pregnancy

Lenka Krbková

Department of Pediatric Infectious Diseases
Faculty of Medicine, Masaryk University,
University Hospital, Brno

Intrauterine infections

the development of infections is no more common than that outside pregnancy

infection of the fetus is an exception

certain microorganisms have a propensity to cause intrauterine infection

Intrauterine infection

- Some pathogens are associated with specific syndromes
- Many infections present non-specifically:
 - **hepatosplenomegaly**
 - **petechial rash**

Specific diagnosis

- **Specific diagnosis** depends upon detection of:
 - **IgM ab in fetal or umbilical cord blood**
 - **detection of the pathogen (cultivation)**
 - **its antigen or genome (PCR)**

Infections in pregnancy and neonates

- **Prenatal** = congenital (acquired transplacentally)
- **Perinatal** (acquired following the rupture of the amniotic membranes and during delivery)
- **Postnatal** (acquired postnatally)

Transplacental pathogens

- Viruses
- Bacteriae
- Parazites

(S)TORCH(L)

X

CHEAP

TORCHES

Cheap (viral)

- C Chickenpox
- H Hepatitis B, C, E
- E Enteroviruses
- A AIDS (HIV)
- P Parvovirus B 19

- **Thalassozoa**
 - **Clade** (Ciliates, Loricata, Mycetozoa)
 - **Reproduction**
- **Ctenophores**
- **Hydrozoa** (many species)
- **Everything else** (tentacles)
- **Sponges**

Identification of new etiologies

- Lymphocytic choriomeningitis virus
- SARS coronavirus
- ZIKA virus
- *Coxiella burnetii*

Pathogenesis of MTCT

MTCT = mother-to-child transmission

Infection of the placental trophoblasts



Infection of the foetus

Embryopathies

- I. trimestr
- Teratogenous malformations
- **Blastogenesis** (1. – 2. week) – direct invasion
- **Organogenesis** (2. – 12. week) – hematogenous infection

Fetopathies

- From the 4. month of pregnancy
- Functional deficits
- Hematogenous spread
- Propensity of intracellular pathogens to cause intrauterine infection (viruses, Listeria, Toxoplasma)
- Multifactorial causes (race, behavior/lifestyle, nutrition, frequent pregnancies.....)

Results of infection in pregnancy

- 1) no congenital defect or infection
- 2) stillbirth/neonatal death
- 3) teratogenic malformations
- 4) birth of a neonate with LBW
- 5) active congenital infection
- 6) chronic congenital infection (> 1 month)
- 7) organ involvement without teratogenic damage

Findings in infants with congenital infection

- 1) Intrauterine growth retardation**
(Rubella, CMV, toxo)
- 2) Anemia with hydrops** (Parvovirus B19, CMV, syphilis, toxo)
- 3) Bone lesions** (rubella, syphilis)
- 4) Congenital heart disease** (rubella),
myocarditis (ENT- Coxs B, ECHO)

Neurological findings

- 5) **Cerebral calcification** (CMV, HSV – periventricular, toxo (widely distributed), parvo B19, HIV, LCV)
- 6) **Hydrocephalus** (CMV, syphilis, toxo)
- 7) **Microcephaly** (CMV, VZV, HSV, ZIKA, toxo)
- 8) **Limb paralysis** (VZV), **pseudoparalysis** (syphilis)

Other findings

9) **Hearing loss** (rubella, CMV, syphilis, toxo)

10) **Ocular findings** (CMV, rubella, HSV, ENT, parvo, syphilis, toxo)

11) **Hepatosplenomegaly, jaundice with/without thrombocytopenia** (CMV, rubella, HSV, ENT, parvo, syphilis, toxo)

12) **Progressive hepatic failure** (ENT, HSV)

Dermatological findings

13) **Maculopapular exanthem** (rubella, ENT, measles, syphilis)

14) **Purpura** (CMV, rubella, HSV, ENT, parvo, syphilis, toxo)

15) **Vesicles** (HSV, VZV, ENT, syphilis)

Viral infections in pregnancy

- **RNA viruses**
- Togaviridae (rubella virus)
- Picornaviridae (enteroviruses)
- Flaviviridae (VHC)
- Calicivirus-like (VHE)
- Retroviridae (HIV 1,2)
- **DNA viruses**
- Herpesviridae (HSV, VZV, CMV)
- Parvoviridae (parvovirus B19)
- Hepadnaviridae (VHB)

Congenital rubella

- Placental infection follows maternal viraemia
- Infection of the mother and placenta does not necessarily lead to fetal infection
- Fetal infection depends upon the stage of gestation

I. trimestr

- Risk of spontaneous abortion (20 %)
- or major malformation (10-52 %)
- **Congenital damage:**
- congenital heart disease (75 %)
- intrauterine growth retardation (60 %)
- thrombocytopenic purpura (55 %)
- cataracts (50 %)
- microphthalmia (18 %)
- bony lesions (22 %) „celery-stick“ osteitis

II. trimester

- Infection is less often associated with congenital defects
- Sensorineural deafness (often not apparent for months or years after birth)

Gregg's syndrome

- = typical embryopathy
- Congenital heart defects (ductus arteriosus persistens, pulmonary stenosis)
- Congenital cataract
- Congenital hearing loss

Cataract in congenital rubella



Congenital rubella

- Neonate will continue to excrete large amounts of rubella virus for a long time after birth (6-12 months/2 years)
- Fetal infection after maternal reinfection is rare
- Prevention: live attenuated rubella vaccine (not to pregnant women), MMR

Congenital CMV infection

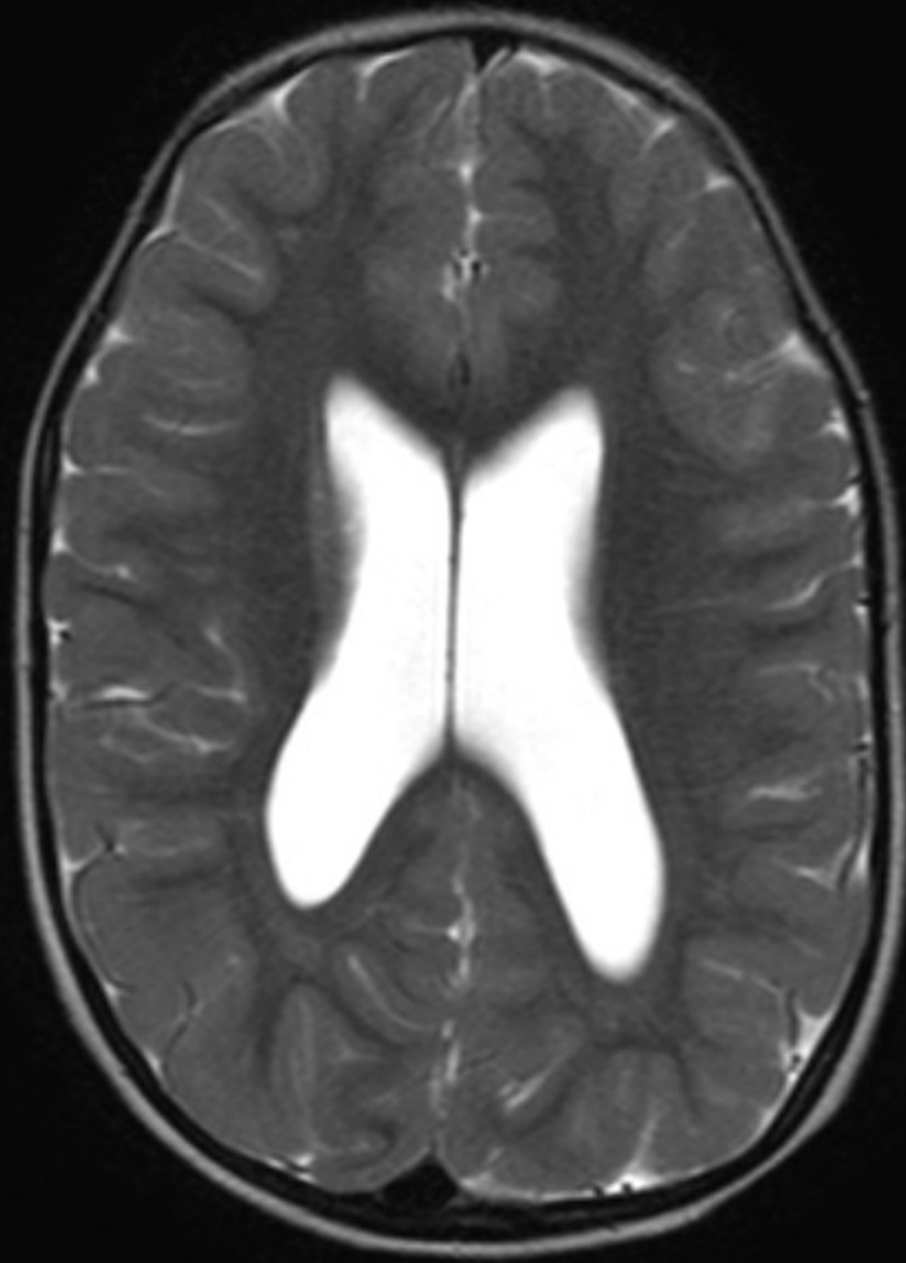
- Infection is rarely symptomatic
- The most common cause of mental retardation
- Congenital damage occur after primary infection during pregnancy

Congenital CMV infection

- Risk of congenital damage – 10 %
- Hepatosplenomegaly
- Petechial rash
- Hearing loss
- Chorioretinitis
- Severe mental retardation
- Hydrocephalus
- **No prevention**

Petechiae in congenital CMV infection





Hydrocephalus

Congenital HSV, VZV infection

- after primary infection during pregnancy
- incidence of congenital damage appears to be low
- HSV: low birth weight, chorioretinitis, microcephaly
- VZV: microcephaly, limb hypoplasia, chorioretinitis, mental retardation

Atypical chickenpox in a three-months-old baby



Specific VZV problem

- Chickenpox of the mother within **5 days prior to delivery and 48 hours after delivery**:
- risk of life-threatening fulminant hemorrhagic chickenpox (mortality 30 %)
- administration of VZIG (Varitect) i.v. within 72-96 hours
- during pregnancy: risk of development of shingles 3-6 months after delivery

Congenital HIV infection

- transplacental or intrapartum
- 90 % of all cases with AIDS in children-perinatally acquired
- early in pregnancy – intrauterine death
- diagnosis is problematic – specific IgM response is not present, anti HIV-IgG detection – maternal origin
- better marker – neonatal IgA anti HIV

Congenital Parvovirus B19 infection

- less than 5 % of infections in pregnancy
- intrauterine death
- stillbirth
- **hydrops foetalis** (viral DNA in tissues, typical intranuclear inclusions in erythroid precursors, short-lived RBCs, rapidly expanding red cell volume, ineffective immune response lead to chronic infection)
- fetal ascites
- myocardial inflammation – heart failure

Bacterial congenital infections

- Spirochetes:
 - mostly *Treponema pallidum*
 - rare (if ever)
 - Borrelia burgdorferi* s.l.
 - Leptospira interrogans*
- *Listeria monocytogenes*

Congenital syphilis

- therapy during the first 4 months of pregnancy – no infection of the fetus
- fetal or neonatal death (40 %), late abortion, stillbirth
- neonatal disease or latent syphilis (80 %)

Treatment decisions during pregnancy

- Identification of syphilis in the mother
- Adequacy of maternal treatment
- Presence of clinical, laboratory, or radiographic evidence of syphilis in the neonate
- Comparison of maternal (at delivery) and neonatal nontreponemal serologic titers

Congenital syphilis

- **syphilis fetalis** – stillbirth/neonatal death (40 %), premature delivery
- **syphilis congenita recens** (death <1 year of age)
- **syphilis congenita tarda**

Clinical signs of congenital syphilis

- **Early signs:**
- Osteochondritis
- Snuffles (rhinitis)
- Maculopapular desquamative rash
- Anemia
- Hepatosplenomegaly
- Jaundice
- Lymphadenopathy
- Mucous patches



Maculopapular syphilitic rash



Very infectious!!!!



Osteochondritis syphilitica



Late signs of congenital syphilis (Hutchinson's triad)

- generalized osteochondritis (affect the architecture of all bones) – saddle nose, frontal bosses, short maxillas, protruding mandible, high palatal arch
- interstitial keratitis
- eighth nerve deafness

Late signs of congenital syphilis

- Hutchinson's incisors
- Mulberry molars
- Sternoclavicular thickening
- Clutton's joints (swelling of the knees)
- Saber shins (prominent metaphyses of the lower extremities)



Parasitic infections in pregnancy

- *Toxoplasma gondii*
- *Plasmodium malariae*
- *Trypanosoma cruzi* (Chagas disease)

Congenital toxoplasmosis

- infection in the mother – asymptomatic, lymphadenopathy
- source: ingestion of undercooked meat containing encysted bradyzoites
- intrauterine death (6 %)
- live-borne infected cases – asymptomatic (75 %)

Congenital toxoplasmosis

signs of severe disease:

Sabin's triad:

intracerebral calcifications

microcephaly, hydrocephalus

chorioretinitis

mental retardation

seizures

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PF

RM
GT: -19.5
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SL: 5
CM:

Hydrocephalus with ventriculo-peritoneal shunt



Recommended clinical investigation for suspected congenital infection

- 1. Review maternal history
- 2. Physical examination of the neonate
gestational age, length, weight,
head circumference, liver/spleen size,
skin lesions, ophtalmological examination

Laboratory investigations

- Complete blood count
- Liver transaminases, bilirubin level
- CSF
- Maternal and infant sera for microbiological testing (cord blood not recommended)
- Total serum immunoglobulin M
- Hold pretransfusion blood for additional tests

Other investigation

- Cranial computed tomographic scan with enhancement
- Long bone x-rays (if syphilis, rubella likely)
- Placental pathology

- **Follow-up**
- Audiology assessment
- Serology

Peri-/postnatal infections

- Associated with the delivery
- 1) diagnostic procedures (amniocentesis, fetoscopy)
- 2) infected stillbirth
- 3) ascendent infection (reflux of amniotic fluid)
- 4) puerperal sepsis

Signs and symptoms of neonatal sepsis

- **Early**
- discomfort of the neonate
- turbid amniotic fluid
- RDS
- tachycardia
- hypo-/hyperthermia
- hypotension
- apnoe
- **Late**
- jaundice
- poor feeding
- letargy
- hypotonia
- seizures
- diarrhoea
- pale skin
- hyper-, hypothermia

Diff dg of neonatal sepsis

- 1) other infections: viral meningitis, herpetic infection, chronic congenital infection, pneumonia, IUT, peritonitis, fungal sepsis
- 2) respiratory: RDS, pneumothorax, aspiration of meconium, bronchopulmonary dysplasia, lung defects

II.

- 3) neurologic: intrakranial hemorrhage, seizures, CNS malformations
- 4) kardiovaskular: DA persistens, hypoplasia of the left heart
- 5) hematologic: ABO inkompatibilität, polycytemia, anemia
- 6) metabolisch: angeborene enzymatische Defekte
- 7) GIT: NEC, angeborene Malformationen

Bullous lesions in pemphigus neonatorum



Pemphigus neonatorum

- *Staphylococcus aureus*
- entry: umbilical stump, skin
- dissemination: septicemia, arthritis, osteomyelitis
- Ritter's disease (staphylococcal scalded skin syndrome)
- th: oxacillin, I. gen. cephalosporins, linkosamin

The same lesions after antibiotic treatment



Prevention

- Vaccination (MMR, VHB, chickenpox)
- Antimicrobial therapy of the mother (syphilis, HIV)
- Seronegative mothers (*T. gondii*) monthly screening during pregnancy
- CMV screening
- ! Drug abused mothers (risk of hematologic/sexual transmission)