Neonatal sepsis
- Neonatal sepsis is a disease that may start with minimal or nonspecific symptoms and has a relatively low incidence yet a high risk of mortality
- The treatment is benign relative to this high risk condition
- Many more babies are evaluated and treated for sepsis than actually have the condition.

INCIDENCE
- 1-2 Cases per 1000 births in the USA (blood or csf culture positive)
- 10 fold higher in VLBW infants
- More common in PT infants than FT
  
  Pediatrics 2001;108:1094
  jmicrobiol Immunol 2004;301

RISK FACTORS
- PROM >= 18 hours
- Intrapartum maternal fever >= 38 C (>=100.4)
- Chorioamnionitis-Clinical chorio:maternal fever, uterine tenderness, fetal tachycardia, foul smelling amniotic fluid
- Premature delivery
- Maternal Group B streptococcus –GBS-colonization

RISK FACTORS
- Low APGAR score( <5 at 1 minute)
- Risk factors are additive
  -PROM – 1 % incidence of proven sepsis
  -PROM & Preterm – 4-6%
SIGNS AND SYMPTOMS
- Respiratory distress – 90%
  - Tachypnea
  - Grunting or flaring
  - Retractions
  - Hypoxia

SIGNS AND SYMPTOMS
- High temperature > 99.6°F / 37°C
  - Not due to environmental causes
- Neurologic
  - Apnea-in FT always abnormal
  - Seizures
  - Irritability/High pitched cry
  - Lethargy/hypoactivity
  - Hypotonia

SIGNS AND SYMPTOMS
- Cardiovascular
  - Hypotension
  - Metabolic acidosis
  - Tachycardia
- Gastrointestinal
  - Vomiting/Poor feeding
  - Abdominal distention/Ileus

SIGNS AND SYMPTOMS
- Temperature instability -sustained
  - Hypothermia is a non-specific finding during the first hours of life, many neonates may have some difficulty with temperature control during the transition to postnatal life
  - Difficulty maintaining stable temperature in or out of the incubator
  - Increasing incubator temperature to maintain stable temperature

SIGNS AND SYMPTOMS
- Skin
  - Pallor or skin mottling
  - Petechiae
  - Cold skin
  - Jaundice

Immunity in the newborn
- In the PT infant the IgG levels are decreased
- Ig A, Ig M, Ig D & Ig E do not cross the placenta
- Responses to polysaccharides antigens are blunted until 18-24 months of age, more susceptible to H. Influenza & GBS infections
- Limited ability to accelerate neutrophils production in response to infection
Immunity in the newborn

- Neutrophil migration is decreased
- Reduced levels of Complement 9, needed bacterial lysis of certain gram negative bacteria, E Coli

Infec Immun 2006;74:1999
Infectious diseases of the fetus & newborn 2001;25

The premature baby.
Problems

- No temperature control: no energy stores.
- Feeding problems: Immature gut.
- Respiratory problems: Immature system
- Prone to infections: Immature immune system.
- Higher bilirubins and more sensitive for brain transfer: Immature liver and brain
- Higher hospital stays, higher costs. Hospital acquired infections.
- Higher possibilities of brain bleeds: Fragile vessels.

Infant mortality rate by year USA 1915-1997
Indications for Intrapartum GBS Prophylaxis

- Previous infant with invasive GBS disease
- GBS bacteriuria during current pregnancy
- Positive GBS screening test during current pregnancy
- Unknown GBS status AND any of the following:
  - Delivery at <37 weeks’ gestation
  - Amniotic membrane rupture ≥18 hours
  - Intrapartum temperature ≥100.4°F (≥38.0°C)

Evaluation of asymptomatic infants ≥37 weeks’ gestation with risk factors for sepsis. The diagnosis of chorioamnionitis is problematic and has important implications for the management of the newborn infant.

Polin RA, and the COMMITTEE ON FETUS AND NEWBORN Pediatrics 2012;129:1006-1015
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LABORATORY FINDINGS

- Complete blood count – findings suggestive of sepsis
  - Decreased WBC < 5000/mm³
  - Absolute neutrophils count –ANC <1000
  - Immature to total neutrophil count –I/T >.2
  - Thrombocytopenia –can be found in NB asphyxia, IUGR, Maternal hypertension
  - First WBC can be normal, need serial 8-24 hrs

CRP

- Rapidly responsive acute phase reactant synthesized by the liver within 4-6 hours of an inflammatory stimulus, usually becoming abnormal within 24 hours of the onset infection
  - A value of > 1 mg/dl (10 mg/liter) in newborns is accepted as an elevated level, on serial samples
LABORATORY
- Chest x ray /ABG
- Urine culture
  - Not useful in perinatal period – 3 days of life
  - Important for late sepsis, after 6 days of life
- Lumbar puncture – indications
  - Sepsis is considered primary diagnosis
  - Blood culture positive
  - Neurologic signs or symptoms

BACTERIAL MENINGITIS
- 15% newborns with bacteremia
- GBS – 5-10% early onset meningitis
  - 25% late onset meningitis
- Clinical presentation of meningitis very similar to neonatal septicemia.
- Most common presentation
  - Temperature instability - - 60% cases

BACTERIAL MENINGITIS
- Clinical presentation
  - Irritability -60%
  - Poor feeding/vomiting – 50%
  - Respiratory distress- 33-50%
  - Seizures-20-30%
  - Apnea -10-30%

Omphalitis
- Redness and edema umbilical stump
- Discharge
- S. aureus, S. pyogenes, Gram negative organism

Group B streptococcus-GBS
- GBS – primary pathogen causing early onset sepsis in USA
- Colonizes the human genital and gastrointestinal tracts
- 20-30% of american women are colonized
- 1-2% of colonized infants developed invasive GBS disease.

Infant dis Clin N Am 1999;13:711
Infectious Disease of the fetus and Newborn, 2006:247
GBS
- Early onset sepsis
  - Present within 12 hours
    - Respiratory distress, irritability
    - Poor perfusion
    - Hypotension/pulmonary hypertension
    - Shock
    - Death

- Early onset GBS sepsis
  - Bacteremia – 80-85 %
  - Pneumonia - 10 %
  - Meningitis 7 %

  Incidence of GBS sepsis declined 80% from 1.7 cases per 1000 live birth in 1993 to 0.34 per 1000 live births in 2003-2005, as a result of intrapartum antibiotic prophylaxis - IAP.

E. Coli
- Second most common organism in early neonatal sepsis - EOS
- Increase incidence in VLBW infant
- Bacteremia, Shock, DIC
- Late onset: UTI – direct hyperbilirubinemia

Late onset sepsis
- After first week of life
- Preterm, VLBW infants with prolong hospital stay
- Nosocomial infection
- Intravenous catheter / mechanical ventilation

Late onset sepsis
- CONS, Gram negative bacteria, Acinetobacter Baumannii, Candida species
- Pseudomonas – highest mortality
- For late onset sepsis the choice of antibiotic therapy should be based in part, on the prevailing flora of the individual NICU, colonization and the infection history of the patient.
Case baby R
- 3 week old, 25 weeks PT, on mechanical ventilation, weaning
- Sign out - wean to CPAP AM
- During the night nurse report patient is requiring higher oxygen and have increase work of breathing

Necrotizing Enterocolitis
Predominantly disorder of prematures: less 1,500
70-90% High risk LBW
Sporadically or in clusters. 10-25% in FT.

NEC Risk Factors
Asphyxia and acute pulmonary disease.
Enteral feedings
Prematurity
Polycythemia
Exchange transfusions
Feeding volumes and rapid advancements
Enteric pathogens

Presentation of NEC
- Abdominal distension
- Ileus
- Increased of gastric aspirates
- Bilious aspirates
- Frank signs of shock, bloody stools, peritonitis or perforation
- Insidious signs of labile temperature, apnea, bradycardia, or other signs of suspected sepsis.

Treatment of NEC
- Bowel rest and decompression
- Antibiotics
- Treatment of hematological and electrolyte imbalances
- Respiratory, cardiovascular and nutritional support
- Surgical intervention

When do you think in TORCH?
Intrauterine Infections
- T=Toxoplasmosis
- O=Other (Syphilis)(Other viruses.)
- R=Rubella
- C=Cytomegalovirus (CMV)
- H=Herpes simplex (HSV I- II)

CONGENITAL INFECTIONS
- TORCH infection
- CMV-cytomegalovirus-signs at birth
  - IUGR
  - Microcephaly
  - Jaundice/Petechiae
  - Hepatosplenomegaly
  - Pneumonitis

When do you think “TORCH“
- Low birth weigh
- Enlarged liver and spleen
- Low platelets
- Skin rash
- Maternal History
- Microcephaly. Macrocephalic

Brain CT.

Toxoplasmosis congénita.

HERPES-HSV
- Herpes simplex virus
  1. Disseminated disease
  2. CNS disease
  3. SEM disease
- Fever, irritability, seizures
- More than 75% of NB with HSV infection are born to mother who had no history of HSV infection

Red book 2009,363
HERPES-HSV

- For diagnosis: swabs of the mouth, nasopharynx, conjuntivae, and rectum
- CSF- PCR
- Treatment IV acyclovir

Herpesvirus oftalmic

Herpesvirus scalp

Herpesvirus oftalmic/skin/scalp

Presentations of congenital HSV
Cytomegalovirus (CMV)
- Most common congenital viral infection
- ~40,000 infants per year in the U.S.
- Mild, self limiting illness
- Transmission can occur with primary infection or reactivation of virus
  - 40% risk of transmission in primary inxn
- Studies suggest increased risk of transmission later in pregnancy
  - However, more severe sequelae associated with earlier acquisition

Clinical Manifestations
- 90% are asymptomatic at birth!
- Up to 15% develop symptoms later, notably sensorineural hearing loss
- Symptomatic infection
  - SGA, HSM, petechiae, jaundice, chorioretinitis, periventricular calcifications, neurological deficits
  - >80% develop long term complications
  - Hearing loss, vision impairment, developmental delay

CMV
- CNS-periventricular calcifications
- Chorioretinitis
- Leukopenia thrombocytopenia/lymphocytosis
- Hearing loss

Ventriculomegaly and calcifications of congenital CMV

CMV: intracellular inclusion bodies
Congenital syphilis

- Most patients asymptomatic at birth
- Hepatosplenomegaly, jaundice
- Skin rash – vesiculobullous, on palms and soles

Rinitis and oral lesions

Skin lesions

Sífilis congenita temprana

Lesiones en huesos largos.
Thank You