Lecture 5

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Major Specific Neonatal infections:

1. Pneumonia:
   a. Congenital
   b. Aspiration
   c. Staphylococcal
   d. airborne

2. Pyogenic meningitis

3. Pylonephritis

4. Osteomyelitis + septic arthritis

5. Epidemic diarrhea

6. Tetanus neonatorum

1. Pneumonia:

   Inflammation of lung parenchyma

   Pneumonia classification according to the time of acquiring infection:
   a. Transplacental: HSV, CMV, TB, Rubella, Varicella-HZV
   b. Perinatal: Aerobic bacteria, clamydia, CMV, Enteric bacteria, GABHS, Hemophilus infleunzae, HSV, mycoplasma
Pneumonia can be:

1. **Congenital Pneumonia**: the most common type of neonatal pneumonia. More in preterm babies, it is contracted in utero mostly through ascending route after rupture of membranes, or transplantal. The microorganisms are GABHS, E Coli, Staph, occasionally clamydia and listeria.

   It has the same presentation as RDS, MAS. They presents with SOB, chest indrawing, granting, with or without cyanosis, decreased air entry bilaterally, dullness on percussion and crepitation. It is usually bronchopneumonia, but may begin as lobar. DX by CBP, BC&S, Chest X Ray, gastric aspirate C&S
   RX: Supportive like Incubator care, o2, IVF, resp. support.
   Specific: In the newborn with early-onset pneumonia or sepsis, a combination of penicillin and an aminoglycoside are the preferred initial treatment. For infants who have been hospitalized in a neonatal intensive care unit for more than 7 days, organisms such as methicillin-resistant Staphylococcus aureus and Staphylococcus epidermidis require vancomycin therapy.

2. **Aspiration pneumonia**: mostly in preterm because of weak suckling, swallowing, coughing reflexes, so when take milk directly will aspirate it, sometimes it may occur following regurgitation. It is usually bilateral pneumonia but may be in the right upper lobe. Now less incidence because of use of NG tube feeding. Clinically, they occur during or shortly after feeding which is followed by SOB, cyanosis which may lead to death if not treated.
   There may be bilateral crepitation on both lung bases. RX stop feeding, aspirate milk from oropharynx, put in incubator, o2, prophylactic antibiotics as milk is a good culture media for bacteria.

3. **Staphylococcal pneumonia**: it is a dangerous condition that affect neonates. The younger the neonate, the more possibility of getting infection. It is characterized by progression of illness, usually blood born from septic spots from the baby himself or another neonate in the NCU. It starts as lobar pneumonia then progress to empyema and then may spread to the other lung to produce bronchopneumonia with small abscesses, which may rupture into bullae then pneumatocele (group of dialated ruptured alveoli) causing emphysema or pneumothorax. Rx by supportive measures including incubator
care, O2, IVF, antistaph. antibiotics like cloxacillin + gentamicin, or newly used vancomycin, which should be continued for 3-4 weeks. The radiological improvement usually follows the clinical one.

4. **Airborn pneumonia**: it usually follows common cold by 2-3 days as secondary bacterial infection. There is progressive SOB with crepitation on both lung fields. CXR will show bronchopneumonia on both lung fields. RX by ampicillin + Cloxacillin, but may need to add 3rd generation cephalosporin.

2. **Pyogenic meningitis**:
   - Carries high morbidity and mortality (20-50%)
   - 1/3 of survivors have sequel like MR, epilepsy, CP, intellectual abnormalities
   - Organisms: G-ve like E. coli, GABHS, less Staph., salmonella
   - Clinical features: it start gradually as non specific symptoms as lethargy, hypothermia, vomiting, poor feeding, failure to gain weight, then classic symptoms of meningitis as irritability, bulging fontanels, convulsion, high pitched cry, then dangerous signs like ventriculitis, cerebritis (high mortality).
   - DX: CBP, B& cs, Blood sugar, LP and CSF exam., May need Head U/S, CT scan (ventriculitis and brain abscess).

Normal CSF in neonates show protein up to 150 mg/dl, sugar 46+- 10 mg/dl or 2/3 of blood sugar, cells up to 25 cell/cm3, of them up to 75% are lymphocytes. In meningitis, there will be turbid CSF, increase cell count, protein, decreased sugar. Gram stain, culture of CSF should also be done.

   - RX: supportive, specific as empiric antibiotics until results of C&S appear, then we can change antibiotics accordingly. Ampicillin and gentamicin for early onset meningitis. Vancomycin and gentamicin or cefotaxime for late and nosocomial meningitis to cover staph. for 21 days.
3. Pylonephritis:

- more in males and preterm
- Usually mild disease, but may present with fever, lethargy, poor feeding, failure to thrive, jaundice, diarrhea, septicemia
- Mostly associated with obstructive uropathy, which need to be corrected quickly.
- The difficulty in DX is in urine contamination, so do suprapubic aspiration of urine, or catheterization for urine exam and culture.
- The microorganisms usually G-ve like E Coli, enterococci.
- Treatment: antibiotics ampicillin+ 3rd generation cephalosporin for 10-14 days
- Repeat urine C&S after completing RX, U/S abdomen, later IVP, or MCUG. Prophylactic amoxicillin can be given until we can do IVP, or MCUG.

4. Osteomyelitis & septic arthritis:

- Rare in neonates, Mostly blood born, or direct extension from septic spot.
- Mostly due to staphylococci, other organisms like GABHS, G –ve as E coli, N. Gonorrhea.
- It presents with rigor, fever, irritability, excessive cry, localized erythema, pseudoparalysis with swelling of the limb and adjacent joint effusion. In septis arthritis, the most common joints involved are hip, knee, wrist, while in osteomyelitis, femur, humerus, tibia, maxilla.
- DX: by blood C&S, CBP, CRP, urine, CSF c&s, needle aspiration of affected joint. X ray needs 10 days to show changes.
- TR: Antistaph like cloxacillin, nafcillin, or vancomycin+ gentamicin for 3-4 weeks
• Joint effusion by surgical drainage, send for Gram stain, c&s

5. Epidemic diarrhea:

• Caused by salmonella, shigella, E. histolyica, and rota virus
• The source of organisms from birth canal, later mothers` hands
• Clinically present with: vomiting, diarrhea, poor feeding. Signs of dehydration, shock, oliguria develop early.
• Treatment: Correct dehydration by ORS, IVF, plasma and Antibiotics after C&S

6. Tetanus Neonatorum:

• Caused by poor care of umbilical cord, or unhygienic birth, by clostridium tetani organisms
• Prevented by tetanus toxoid to mothers after first trimester (2 doses)
• Onset 3-14 days of age
• Clinically: present with poor feeding, irritability, then features of tetanus like trismus, locked jaw, risus sardonicus, and difficulty in swallowing, arched back. Bronchopneumonia may occur due to aspiration
• Treatment: Human tetanus IG to neutralize toxin, omphalectomy, antibiotics like penicillin + metronidazole and Other supportive measures like anticonvulsant, respiratory support, muscle relaxants.

Principles for the Prevention of Nosocomial Infection in the Neonatal Intensive Care Unit:

Observe recommendations for universal precautions with all patient contact:
  Gloves
  Gowns, mask, and isolation as indicated
Nursery design engineering:
Appropriate nursing: patient ratio
Avoid overcrowding and excessive workload
Readily accessible sinks, antiseptic solutions, soap, and paper towels

Handwashing:
Improve handwashing compliance
Wash hands before and after each patient encounter
Appropriate use of soap, alcohol-based preparations, or antiseptic solutions
Alcohol-based antiseptic solution at each patient bedside
Provide emollients for nursery staff
Education and feedback for nursery staff

Minimizing risk of CVC contamination:
Maximal sterile barrier precautions during CVC insertion
Local antisepsis with chlorhexidine gluconate
Minimize repeated entry into the line for laboratory tests
Aseptic technique when entering the line
Minimize CVC days
Sterile preparation of all fluids to be administered via a CVC

Meticulous skin care
Encourage early and appropriate advancement of enteral feeding
Education and feedback for nursery personnel
Continuous monitoring and surveillance of nosocomial infection rates in the Neonatal intensive care unit

Quiz:

A 2.9-kg male infant is born by vaginal delivery at 39 weeks’ gestational age after rupture of membranes for 22 hours. Apgar scores are 8 and 8 at 1 and 5 minutes, respectively. He requires FiO2 of 0.4 in the delivery room.

He is tachypneic and has acrocyanosis. There are coarse rales noted bilaterally. Temperature is (37°C), pulse is 144 beats per minute, and respiratory rate is 65 breaths per minute.

Despite being given CPAP, his grunting and tachypnea worsen, and he requires intubation and ventilation for progressive increased work of breathing, respiratory acidosis, and oxygen requirement during the next 6 hours.

1. What is the most likely diagnosis?
2. What investigations he needs?
3. What initial antibiotics he needs?