MANAGEMENT OF INTRA-AMNIOTIC INFECTION (IAI)

FLAME LECTURE: 128

BURNS / ROSENBAUM

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LEARNING OBJECTIVES

- Describe Intra-amniotic Infection
- Identify the risk factors for IAI
- Describe the management of IAI
- Prerequisites:
  - NONE
- See also – for closely related topics
  - FLAME 132 – Postpartum Fever
  - FLAME 133 – Postpartum Endometritis

DEFINITION & EPIDEMIOLOGY

- **Intra-amniotic infection (IAI)** refers to **intrauterine infection or inflammation**
  - Refers to infection of any intrauterine contents: amniotic fluid, chorion, placenta, fetus, decidua
    - Currently while "Triple I", Chorioamnionitis, and IAI are used almost interchangeably in common parlance, chorioamnionitis should be reserved for a histological diagnosis made after placental pathology, and IAI should be used clinically when chorioamnionitis is suspected
  - Incidence: up to 5% of term deliveries are affected by clinical IAI

RISK FACTORS

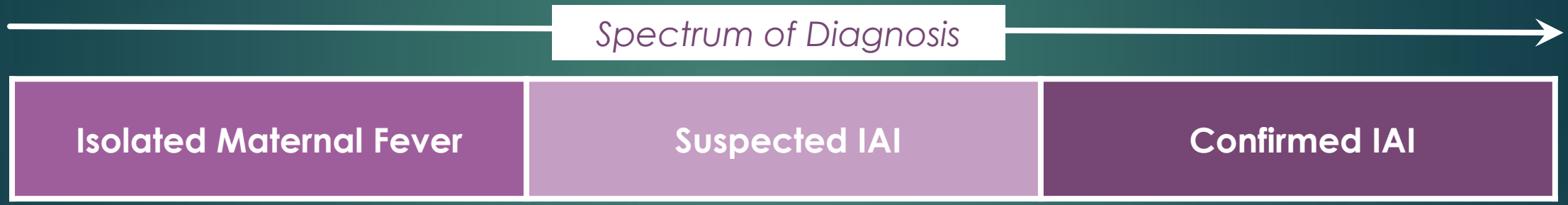
- **PPROM/PTD**: 40-70% will get IAI with expectant mgmt
- **PROM**: seen in 7% of pregnancies with PROM
- **Prolonged labor course**: 40% when ROM >24hrs, 12% in C-section after failed labor
- **Multiple digital vaginal exams**: 20% in women receiving >8 exams
- **Nulliparity**
- **Meconium-stained amniotic fluid**
- **Internal fetal/uterine monitoring**
- **Presence of pathologic reproductive tract microbes** (STIs, bacterial vaginosis, GBS, etc)
- **Alcohol and tobacco use**
- **H/o IAI in prior pregnancy**

PATHOGENESIS

- The uterus has its own microbiome, isolated from the rest of the reproductive tract
  - Vaginal and cervical flora are the most common pathogens noted in IAI
  - Hence, many risk factors listed on previous slide contribute to increasing microbial access to uterus (increased time for ascension of flora into the uterus, more exams manipulating the movement of the flora, ease of access through the amniotic barrier in PPROM/PROM)
- Pathogens are often polymicrobial, like cervicovaginal flora
  - **Ureaplasma**
  - **Mycoplasma**
  - **E. Coli**
  - **GBS**

DIAGNOSIS

- IAI is considered "suspected" until it can be confirmed on gram stain, culture or pathology
  - However, management is often necessary before such confirmation can occur
  - In lieu of confirmation, we use clinical diagnostic criteria



≥ 39° C oral temperature x1

OR

≥ 38° C oral temp x 2 (30 min apart)

Epidurals and misoprostol can also cause transient maternal hyperthermia

Maternal fever

+ 1 or more of

- WBC > 15,000 (sans BMZ)
- Purulent cervical discharge/amniotic fluid
- Fetal tachycardia ≥ 10 min

Amniocentesis: + gram stain OR glucose <15 OR + Cx (IL-6 >7.9 is up and coming)

OR

Placental, fetal membrane, or umbilical cord histopathology consistent with infection or inflammation

Since these take time or require delivery to complete, treat based on suspected IAI

MANAGEMENT: MATERNAL

- Delivery of baby is definitive management (removes source of infection)
  - Induction of labor if no contraindications. IAI is not an indication for C-section.
  - Augmentation of labor appropriate to facilitate delivery
- Antibiotics

Antibiotic	Dose
Ampicillin	2 g IV q 6hrs
Gentamicin	2 mg/kg IV loading dose
	1.5 mg/kg IV q 8hrs

- Antipyretics/Acetaminophen -> maternal fever alone can worsen fetal outcome
- Postpartum
  - Post-NSVD: No additional antibiotics needed postpartum
  - Post-C-section: 1 additional dose of Amp / Gent + add *clindamycin* or *metronidazole* or continue until patient is afebrile for 48 hrs

To prevent postpartum endometritis

PENICILLIN ALLERGIES

Mild PCN Allergy

Antibiotic	Dose
Cefazolin	2 g IV q 6hrs
Gentamicin	2 mg/kg IV loading dose
	1.5 mg/kg IV q 8hrs

Severe PCN Allergy

Antibiotic	Dose
Clindamycin 900 IV q8h	900mg IV q8hrs
OR	OR
Vancomycin 1g IV q12h	1g IV q12hrs
Gentamicin	2 mg/kg IV loading dose
	1.5 mg/kg IV q8hrs

ALTERNATIVE REGIMENS

Antibiotic	Dose
Ticarcillin-clavulanate	3.1 g IV q4hrs
Ampicillin-sulbactam	3 g IV q6hrs
Cefoxitin	2 g IV q8hrs
Cefotetan	2 g IV q12hrs
Piperacillin-tazobactam	3.375 g IV q6hrs or 4.5 g IV q8hrs
Ertapenem	1 g IV q24hrs

Note these regimens replace both the Ampicillin and the Gentamicin

MANAGEMENT: FETAL

- Concern for neonatal sepsis as a result from exposure to intra-amniotic pathogens
  - Certain pathogens rarely cause neonatal sepsis (*Ureaplasma, Mycoplasma)*
  - Versus GBS causes neonatal sepsis in 20% of newborns whose moms didn't receive adequate prophylaxis
- Newborns at risk for neonatal sepsis due to maternal IAI may are treated empirically for presumed/suspected sepsis
  - Even initially healthy appearing neonates can develop sepsis in the days following birth

MANAGEMENT: FETAL

- However, empiric treatment comes at a cost – many newborns are exposed to strong antibiotics that disrupt the fragile and developing neonatal microbiome
  - Empiric treatment stems from before GBS screening and other measures that have significantly decreased neonatal sepsis rates, thus current protocols are over-treating neonates
  - Unfortunately lack of quick diagnostic tools make empiric antibiotics prudent while awaiting further workup

MANAGEMENT: FETAL

- Preterm and term neonates born to moms with suspected IAI receive:
  - CBC with differential at birth
  - Blood culture at birth
  - ± CRP at 6-12hrs
  - Broad-spectrum antibiotics empirically
    - Ampicillin + Gentamicin x48hrs
- If + culture ➔ lumbar puncture
- If – culture with elevated WBC ➔ continue antibiotics

Prevention & Management of Neonatal Sepsis

Signs of Neonatal Sepsis	Yes →	**Full diagnostic evaluation + Antibiotics**
No		
Maternal IAI	No →	**Limited evaluation + Antibiotics**
No		
Mother met criteria for GBS prophylaxis	No →	**Routine clinical care**
Yes		
Mother received > 4hrs of GBS prophylactic antibiotics	Yes →	**Observation ≥ 48hrs**
No		
Term pregnancy with ROM <18hrs	Yes →	**Observation ≥ 48hrs**
No		
Preterm and/or ROM >18hrs	Yes →	**Limited evaluation + Observation ≥ 48hrs**

CDC - Prevention of perinatal group B streptococcal disease, 2010

COMPLICATIONS

MATERNAL / PREGNANCY

- Dysfunctional labor
  - C-section or operative delivery
  - Need for hysterectomy or blood transfusion
- Worsening or spreading infection
  - Maternal sepsis, septic pelvic thrombophlebitis, pelvic abscess
- Uterine atony with post-partum hemorrhage
- Postpartum endometritis
- ARDS

FETAL

- Neonatal infection – pneumonia, meningitis, sepsis, death
  - IAI associated with 40% of early onset neonatal sepsis cases
  - 2-4% mortality overall
  - 6-10% for E coli early sepsis
  - Increased morbidity with younger gestational age and lower weight at delivery
- Intraventricular hemorrhage
- Bronchopulmonary dysplasia
- Cerebral palsy

IMPORTANT LINKS & REFERENCES

1. Higgins RD, Saade G, Polin RA et al. Evaluation and management of women and newborns with a maternal diagnosis of chorioamnionitis: Summary of workshop. *Obstetrics & Gynecology*. 2016;127:426.
2. NICE. Intrapartum care: care of healthy women and their babies during childbirth. NICE clinical guideline 190. 2014:1–108
3. Uptodate – Intra-amniotic infection (clinical chorioamnionitis or triple I). Nov. 2017
4. ACOG Committee Opinion 712 – Intrapartum Management of Intraamniotic infection. August 2017.
5. Brady MT, Polin RA. Prevention and Management of Infants With Suspected or Proven Neonatal Sepsis. *Pediatrics* Jul 2013, 132(1)166-168
6. Prevention of perinatal group B streptococcal disease: prevention of perinatal group B streptococcal disease from CDC, 2010. *MMWR Recomm Rep*. 2010;59 [RR-10]:1–32.
7. Polin RA & The Committee on Fetus and Newborn. Management of Neonates With Suspected or Proven Early-Onset Bacterial Sepsis. *Pediatrics* May 2012, 129 (5) 1006-1015;