ICU Management of COVID in Pregnancy

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Overview

Very little data!
Not an overview of COVID management
• Risk to the fetus, in a critically ill mother
• COVID critical illness in pregnancy
• Mechanical ventilation in pregnancy
Risks to the fetus of a maternal ICU stay

- Hypoxia
- Hypercapnia
- Radiology
- Drug therapy
- Premature delivery

Fetal oxygenation – $O_2 \times Hgb \times \text{Blood flow}$
- guidelines suggest SpO$_2$ > 94% (?)
- ensure C.O: left lateral positioning
- avoid hyperoxegenation

Carbon dioxide – low CO$_2$ decreases uterine blood flow
decr fetal cerebral blood flow
high CO$_2$ – moderate well tolerated
- case reports of >100 mmHg

Hyperoxygenation
- see
- Raghuraman et al, 2018 Obstet Gynecol. 129:676
- McHugh et al, ACOG 2019, 220(4):397.e1-397.e8
Risks to the fetus of a maternal ICU stay

- Hypoxia
- Hypercapnia
- Radiology
- Drug therapy
- Premature delivery

**X-ray risks:**
- Carcinogenic (leukemia)
- Teratogenesis
- Neurological development

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Dose (mGy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chest X-ray</td>
<td>0.01</td>
</tr>
<tr>
<td>Chest CT</td>
<td>0.05 - 0.2</td>
</tr>
<tr>
<td>Abdominal CT</td>
<td>10 – 50</td>
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</tbody>
</table>

Depends on gestation > 50 – 100 mGy

**Drug therapy:**
- Inotropes: all decrease uterine blood flow!
  - Use usual: norepinephrine, phenylephrine
  - Data post epidural

- Sedation & analgesia: little data, minimize drugs
  - We use fentanyl ± propofol ± NMB
  - Warn neonatologist if delivery!

- Other drugs: don’t avoid anything necessary for mother
  - Dexamethasone cross the placenta, other steroids not
COVID Respiratory failure in Pregnancy

• Systematic review (Hee Kim et al, AJOG Aug 6, 2020)

  15 reports of pregnant women with COVID-19 in ICU

  85 ICU cases: 11 died = 12.9% case fatality (but 7 from one Iranian report)
  Excluding these = 5.3%
COVID Respiratory failure in Pregnancy

• Systematic review from New York (Blitz et al, AJOG June 15, 2020)

- 462 pregnant women with COVID
  - 70 severe
  - 13 required ICU
  - 2 died = 0.5%
  - Mechanical ventilation 8
  - Vasopressors 7
  - Hydroxychloroquine 11
  - Risk factors:
    - Hispanic
    - Obesity
    - Asthma/OSA
    - 46% no risk factors
  - Delivered: 7 (5 urgent C/S for resp. decompensation)

COVID Respiratory failure in Pregnancy

• Systematic review (Khalil et al, Lancet E-Clinical Med, July 3 2020)

- 17 studies (2567 pregnant women with COVID-19)
  - ICU required in 7%
  - Intubated 3.4%
  - ECMO 0.7%
  - Mortality 1%
  - Risk factors:
    - co-morbidity
    - Age > 35 yr
Mechanical ventilator support in pregnancy

Non-invasive Ventilation

- **Advantages**
  - avoids the upper airway
  - avoids sedation

- **Concerns**
  - nasal congestion
  - reduced lower esophageal sphincter tone
  - aspiration

Useful for shorter-term ventilator support: COVID?
Endotracheal intubation in pregnancy

Failed intubation 8x more common than non-pregnant patient

Affected by
- anatomical changes
- aspiration risk
- weight gain
- reduced oxygen reserve
- preeclampsia

Munnur et al, Crit Care Med, 2005, 33:S269

Evidence-based Mechanical ventilation

- ARDSnet trial (Vt 6 ml/kg)  
  - pregnant patients excluded  

- Oscillate (HFO) trial  
  - pregnant patients not mentioned  

- High v. low PEEP  
  - pregnant patients excluded  

- Cesar (ECMO trial)  
  - pregnant patients not mentioned  
  Lancet 2006; 368:1459-65

- Weaning trial  
  - pregnant patients not mentioned  

- ICU sedation trial  
  - pregnant patients not mentioned  
  JAMA 2012; 308:1985
Less Conventional interventions

• **Nitric oxide**
  - Conventional use for hypoxemia/pulm hypertension previous reported
  - Case series in COVID, use of intermittent high dose (160-200ppm)
    Fakhr et al. Obstet Gynecol 2020; Aug 26 (online)

• **ECMO**
  - Australian case-series during H1N1
    ANZICS. BMJ. 2010 Mar 18;340:c1279

• **Prone positioning**
  - case reports & arterial flow studies suggest safe
  - Feasible, comfortable
    Dennis et al. BMC Preg Childbirth 2018; 18:445

Prone positioning in pregnancy

Video 1: Prone positioning in male, pregnant patient.
  Created by Mary Catherine Tedes, MD, MS; and Jennifer R. McKinney, MD, MPH. Used with permission.

Video 2: Prone positioning in male, pregnant patient.
  Created by Mary Catherine Tedes, MD, MS; and Jennifer R. McKinney, MD, MPH. Used with permission.

Delivery of the fetus

• Given the physiological changes, it may be considered that delivery of the pregnant women with respiratory failure is beneficial to the mother

• Delivery for respiratory compromise in COVID-19
  – Report from New York
  – 12 patients requiring “respiratory support” (mainly O₂)
  – 6 underwent preterm C-S for maternal respiratory distress
    • Gestation 31 – 36 weeks
    • Only 1 was ventilated: subsequent ventilation: 19 days
    • Among non-intubated: some improved, none got worse

Delivery of the fetus

• Given the physiological changes, it may be considered that delivery of the pregnant women with respiratory failure is beneficial to the mother.

• NOT always an improvement:
  – Small oxygenation improvement
  – Little change in compliance or PEEP requirement

Delivery of the fetus

• Given the physiological changes, it may be considered that delivery of the pregnant women with respiratory failure may be beneficial.

• Not always an improvement:
  – Small oxygenation improvement
  – Little change in compliance or PEEP requirement

• Delivery:
  – If fetus is viable and at risk due to maternal hypoxia
  – May or may not improve maternal condition
  – C-section may be a significant physiological stress!


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