Diagnosis of PE in Pregnancy
Literature review and a proposed algorithm

Grand Rounds Summary Document
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For stable pregnant patients with low-intermediate pre-test probability for an acute PE, based on clinician gestalt

Suspected acute PE in a pregnant patient

Assess for YEARS criteria

Any criteria present

Symptoms of DVT

CUS and/or Duplex

D-Dimer

<0.50 mg/L

TREAT

PE RULED OUT

>0.50 mg/L

PE RULED OUT

>1.0 mg/L

D-Dimer

<1.0 mg/L

Hemoptysis and/or PE as the most likely diagnosis

CUS and/or Duplex

D-Dimer

<0.50 mg/L

TREAT

PE RULED OUT

>0.50 mg/L

PE RULED OUT

>1.0 mg/L

Abnormal CXR

Normal CXR

V/Q SPECT

Indet.

(-)

(+)

Indet.

(-)

(+)

TREAT

PE RULED OUT

DE CT/CTPA

Full video recording:
https://youtu.be/PZny9rbCLcg
Ultrasound in DVT
- Iliac clots are more common in pregnancy due to compression of the common iliac vein by the common iliac artery, which increases as the gravid uterus increases.
- Gold-standard is full leg compression ultrasound and iliac duplex – *we need to specifically indicate concern for iliac clot in our DI requisitions otherwise proximal doppler not always done*
  - Think about iliac clot with pelvic, back, abdo, groin pain or whole leg swelling
- Asymptomatic ultrasound has a very low yield – 1-2% will have DVT. *Do not delay diagnosis by ultrasounding asymptomatic patients.*
- LEFT rule – low probability of DVT if 0/3 criteria. *Not ready for use in isolation.*
  - Criteria:
    - Left leg
    - Unilateral edema (>2cm calf swelling)
    - First trimester presentation

Ddimer
- Ddimer increases as trimester increases – no agreed upon gestational-age based “normal” values or cut offs yet.
- Two prospective studies *(Revised Geneva and Pregnancy-Adapted Years)* with two attempted external validations

<table>
<thead>
<tr>
<th>Study</th>
<th>Algorithm</th>
<th>Study Cohort</th>
<th>CTPA Reduction</th>
<th>Missed VTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Righini et al, 2018</td>
<td>Revised Geneva</td>
<td>CT-PE</td>
<td>11.6%</td>
<td>0</td>
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<tr>
<td>Van der Pol et al, 2019</td>
<td>Pregnancy-Adapted YEARS</td>
<td>Artemis</td>
<td>39%</td>
<td>1 DVT (0.21%)</td>
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<tr>
<td>Langlois et al, 2019</td>
<td>Pregnancy-Adapted YEARS</td>
<td>CT-PE</td>
<td>21%</td>
<td>0</td>
</tr>
<tr>
<td>Goodacre et al, 2020</td>
<td>I – PA-YEARS</td>
<td>DiPEP</td>
<td>PAY – 21%</td>
<td>PAY – 5/12 PEs</td>
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<tr>
<td></td>
<td>II – Revised Geneva</td>
<td></td>
<td>rGS – 44%</td>
<td>rGS – 3/12 PEs</td>
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</tbody>
</table>

- Goodacre study used DiPEP cohort which was retrospectively risk stratified in a population where the majority of patients had received anticoagulation (prophylactic or therapeutic) prior to d-dimer measurement
- European Society of Cardiology ultimately incorporated recommendations to use ddimer in pregnant patients with suspected PE based on top three studies (above)
- For low test probability patients (as determined by clinician gestalt) with no YEARS criteria, can safely use 1.0mg/L FEU as ddimmer cutoff
  - YEARS criteria:
    - Hemoptysis
    - Clinical signs of DVT
    - PE most likely diagnosis

**Diagnostic Imaging**
- Dual Energy CTPA is use in Calgary and has far better rates of diagnostic studies compared to what is reflected in US literature
  - Uses 2 xray spectra instead of one, reduces issues with contrast bolus timing due to hyperdynamic state
- With a normal CXR, often can do perfusion-only SPECT (or “Q SPECT”). Nuclear Medicine makes this decision, not us

<table>
<thead>
<tr>
<th></th>
<th>Maternal breast tissue</th>
<th>Fetus</th>
</tr>
</thead>
<tbody>
<tr>
<td>CXR</td>
<td>&lt;0.01 mGy</td>
<td>0.001-0.01 mGy</td>
</tr>
<tr>
<td>CTPA</td>
<td>10-70 mGy</td>
<td>0.03-0.66 mGy</td>
</tr>
<tr>
<td>Q SPECT (Perfusion only)</td>
<td>0.2-1.2 mGy</td>
<td>0.1-0.6 mGy</td>
</tr>
<tr>
<td>V/Q SPECT</td>
<td>0.3-1.5 mGy</td>
<td>0.2-0.7 mGy</td>
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</tbody>
</table>

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<thead>
<tr>
<th></th>
<th>Maternal breast tissue</th>
<th>Fetus</th>
</tr>
</thead>
<tbody>
<tr>
<td>CXR</td>
<td>Less than a penny</td>
<td>Less than a penny</td>
</tr>
<tr>
<td>CTPA</td>
<td>$10-70</td>
<td>3-65 cents</td>
</tr>
<tr>
<td>Q SPECT</td>
<td>20 cents - $1.20</td>
<td>10-60 cents</td>
</tr>
<tr>
<td>V/Q SPECT</td>
<td>30 cents - $1.50</td>
<td>20-70 cents</td>
</tr>
</tbody>
</table>

- Making it simple for patients: 1mGy = $1
  - To increase relative risk of breast cancer by 14% - $10
  - Level of radiation required for potential harm to fetus (impaired organogenesis, childhood cancer) - $50
- **Negligible risk to fetus** with either modality. **Significant increase** in radiation to maternal breast tissue with CTPA
  - V/Q first choice with normal CXR
  - If abnormal CXR or alternate diagnosis suspected – CTPA

**Unstable Pregnant Patients**
- Imaging: Bedside echo or consider CTPA
- Contact PERT, can lyse based on echo findings alone
- UFH and thrombolysis are safe in pregnancy