



## **Episode 7 – Pregnancy-related Emergencies**

*Prepared by Dr. Lucas Chartier*

### Introduction

Pregnant patients are challenging due to the normal physiologic changes they undergo, altering both vital signs and laboratory values, the worse outcomes they sometimes sustain, and the presence of the fetus, which alters the therapies and imaging modalities that are otherwise considered.

### ***Causes of chest pain or SOB for which pregnant patients are at higher risk than non-pregnant patients***

Pulmonary embolus (PE), peri-partum cardiomyopathy, myocardial infarction, aortic dissection and mitral stenosis.

### Vital signs changes in pregnancy

Increase in heart rate (by 10-15bpm) and respiratory rate (up to 24/min), decreased blood pressure with a nadir in the 2<sup>nd</sup> trimester (due to volume redistribution and decreased peripheral vascular resistance – down to sBP of 90), and supine hypotension syndrome (where the gravid uterus compresses the inferior vena cava and prevents venous return, easily corrected by placing the patient in the left lateral decubitus position).

### Murmurs in pregnancy

Can be physiologic secondary to hyperdynamic state and volume overload, sometimes creating a higher cardiac-thoracic ratio; pathologic murmurs to think about in pregnant patients presenting with chest pain and/or shortness of breath: diastolic murmur – mitral stenosis (most common valvular abnormality in pregnancy) and new aortic regurgitation (indicating possible aortic dissection); systolic murmur – tricuspid regurgitation (can occur in massive PE).

### ECG changes in PE (regardless of pregnancy status)

Nothing (!) is most common, then sinus tachycardia (often around 120), inverted T waves in anterior leads, inverted T waves in anterior and inferior leads (very specific for PE), S<sub>1</sub>Q<sub>3</sub>T<sub>3</sub>, right heart strain, RBBB; in general, inverted T waves in the anterior leads can also be caused by strain (eg, LVH) or ischemia, or toxins (digoxin), electrolyte abnormalities.

### CXR changes in PE

Nothing (!) is the most common, elevated hemidiaphragm is the most common abnormality, pleural effusion, and the very rare Westermark's sign and Hampton's hump; however, it is usually performed to rule out other diagnoses than PE; radiation dose very small (400 CXR is about equivalent to 1 CT scan), so CXR should be done in pregnant patients (with abdominal shielding) if indicated.



### Differential diagnosis of elevated jugular venous pressure (JVP) with CLEAR lung fields

Massive PE, tension pneumothorax, right ventricular infarction, SVC syndrome, cardiac tamponade.

### D-dimer in pregnancy

Quite useless as its utility for PE is in low-risk patients, which pregnant patients are not by virtue of their pregnancy (moderate risk at least); d-dimer also becomes increasingly positive in normal pregnant patients (50% are positive in the first trimester increasing to almost 100% in 3<sup>rd</sup> trimester), and takes a full 4-6wks postpartum before returning to baseline level).

### Algorithm for suspected PE

If patient stable, get Doppler ultrasound (70% of pregnant patients with PE have a DVT, and 85% of them in the left leg): if positive, investigations are stopped and patient treated; if negative (iliac vein DVTs are frequent in pregnancy, but not seen on Doppler examination), further imaging must be undergone.

In one study, in FIRST-TRIMESTER pregnant patients with LEFT leg symptoms and calf CIRCUMFERENCE >2cm more in affected leg, 70% have a DVT.

If patient unstable, get definitive imaging study.

### CT scan versus V/Q scan (controversial!)

CT scan delivers less ionizing radiation to fetus (1 to 2-3rad, which is below the teratogenic cutoff of 5-10rad), but delivers a significant radiation dose to the mother's breast tissue, putting her at increased risk for breast cancer; less accurate in pregnant patients than in non-pregnant patients (possibly due to inconsistent uptake of contrast from inferior vena cava compression), but has the advantage over V/Q of providing alternate diagnoses.

V/Q scan delivers more radiation to fetus (difference even greater the earlier in the pregnancy), and can result in "non-conclusive" scan for which a CT scan needs to be performed subsequently; radiation dose can be minimized in pregnancy by using a ½ dose perfusion scan and only using ventilation imaging if the perfusion scan is abnormal.

Both are carcinogenic and increase the likelihood of the fetus developing leukemia later on in life; all in all, however, missing a PE is probably more dangerous than the radiation dose necessary to diagnose it.

### Management of PE

Low-molecular weight heparin (LMWH) right away and throughout pregnancy, with unfractionated heparin (UFH) only for unstable patients and/or possible thrombolysis candidates, imminent delivery or recent surgery or C-section; coumadin is prohibited due to teratogenic potential.



### Changes to ACLS in pregnancy

Defibrillation is safe for the fetus and should be used for witnessed arrest; good CPR is essential for optimal fetal flow; epinephrine (although it decreases uteroplacental circulation) can be used; thrombolysis has only been reported in case reports so decision must be individualized.

Positioning: left lateral decubitus is not practical, so put towels under the patient's right side in order to tilt the patient 20-30° towards the left; have a dedicated team member manually displace the uterus to the left side and superior.

Emergency C-section (during cardiac arrest) must be considered early and completed within 5min of arrest; hence the "4-minute rule" (4 minutes maximum to start C-section); this might save the fetus, but it is mainly done to save the mother by decreasing the physiologic demand.

Procedure: while CPR is ongoing, do vertical incision through all the abdominal wall layers from epigastrium to pubic symphysis, then perforate uterus at fundus and extend incision vertically down with scissors by inserting 2 fingers in the uterine cavity to separate it from the fetus, deliver the fetus, then hold the baby below the mother, clamp the cord and cut it.

### **Important differential diagnoses of 1<sup>st</sup> trimester abdominal pain and fever**

Appendicitis (most common non-obstetric surgery in pregnancy), urinary tract infection and pyelonephritis, ovarian torsion, and pelvic inflammatory disease (which can present without fever or cervical motion tenderness in pregnancy, and incidence decreases after 1<sup>st</sup> trimester).

### The immaculate conception

Studies show that 7-15% of women who assure it's IMPOSSIBLE they are pregnant end up being pregnant, so all women of childbearing age who present with abdominal pain should have a  $\beta$ -hCG drawn, regardless of their stated date of last menstrual period and usual regularity.

### Appendicitis considerations in pregnancy

Non-specific signs of both appendicitis and pregnancy can be written off as being "normal" (nausea, vomiting, anorexia); peritoneal signs may be delayed or absent due to the desensitization of the abdominal wall caused by stretching.

Despite the belief that pregnancy displaces the inflamed appendicitis to the RUQ, newer studies show that the appendix is located in the RLQ in the majority of patients, and most still present with RLQ pain and tenderness; the same proportion of pregnant as non-pregnant patients present with an atypical location (15%).

*Alvarado appendicitis score* has **not** been validated in pregnancy:

Migration of pain to RLQ (1 point), RLQ tenderness (2pts) and rebound pain (1pt), anorexia or acetone in urine (1pt for either or both), nausea or vomiting (1pt), fever (1pt), WBC>10,000 (2pts) with left shift [>75% neutrophils] (1pt)

<5pts: appendicitis less likely, 5-6pts: possibly, 7-8pts: probably, >8pts: very probably appendicitis



### Ultrasound in pregnancy

Although it is very operator dependent, is especially not accurate for ruptured appendicitis and is not useful after 35wks gestational age (due to the difficulties of doing graded compression because of the gravid uterus), it is still the initial modality of choice due to its safety.

### Other imaging modalities

CT scan: plain CT has been shown to be just as sensitive as contrast CT in the diagnosis of appendicitis in the general population; contrast should be avoided in pregnancy, if possible, even though there is no risk of teratogenicity (only fetal hypothyroidism in animal studies using very high contrast doses).

MRI scan: might be more appropriate than CT scan, although there is very low to nil availability in most centres; gadolinium (MRI contrast) has been shown to cross the placenta in animal studies; it is controversial whether there is harm to the fetus from gadolinium contrast.

### Complications of appendicitis in pregnancy

Non-perforated appendicitis carries a 5% fetal loss rate, and this jumps to 30% for ruptured appendicitis, as well as increased rates of pre-term labour (on top of a 4% death rate for the mother herself if perforation!)

### ***Cystitis, UTI and pyelonephritis***

Pyelonephritis is the #1 misdiagnosis of appendicitis in pregnancy because urinary frequency is often present in normal pregnancy, and appendicitis can cause pyuria.

Pregnant patients have the same rates of cystitis and asymptomatic bacteriuria as non-pregnant patients, but have higher rates of progression to pyelonephritis – which is why the 2 former need to be treated with antibiotics.

Antibiotic management of asymptomatic bacteriuria and cystitis in pregnancy:

First-line treatment is nitrofurantoin (even though there is a theoretical risk of haemolytic anemia of the fetus in G6PD mothers) or Cephalosporins (eg, Cephalexin, even though it does not cover enterococci).

SMX-TMP may be used in 2<sup>nd</sup> trimester (TMP is a folic acid antagonist and therefore contraindicated in the 1<sup>st</sup> trimester, and SMX may persist in fetal circulation after birth and lead to kernicterus if given shortly before delivery, so is not recommended in 3<sup>rd</sup> trimester);  $\beta$ -lactams (including penicillin and amoxicillin) are safe but have high rates of resistance to E.coli.

Length of treatment is a minimum of 3 days (EMC experts recommend 7 days)

Indications for admission to hospital: all pregnant women with pyelonephritis (needing IV cephalosporin or ampicillin-gentamicin) and women in their 3<sup>rd</sup> trimester with cystitis (because of risk of pre-term labor)

All pregnant women need follow-up urine cultures 1-2wks following diagnosis to ensure effective treatment ( $\frac{1}{3}$  have recurrence); complications of UTIs in pregnancy: pre-term labour, low birth weight and sepsis



## **Septic abortion**

### **Classic case**

Young woman with an unwanted pregnancy having an illegal abortion (in a country where abortions are illegal) or missed abortion not adequately followed and treated leading to retained products with infection.

### **Clinical presentation**

Pregnant patient in 1<sup>st</sup> trimester presenting with abdominal pain, vaginal bleeding and discharge, and fever, especially if there is a history of miscarriage or missed abortion

### **Treatment**

Antibiotics and urgent surgical (not medical) evacuation (i.e. dilatation and curettage)