OBJECTIVE:
To provide a diagnostic approach to the evaluation of pregnant patients with a clinical suspicion of deep vein thrombosis (DVT) or pulmonary embolism (PE).

BACKGROUND:
Pregnancy is a well established risk factor for VTE. DVT complicates 1-2 per 1,000 pregnancies and PE complicates 0.5 per 1,000 pregnancies. VTE occurs in all trimesters of pregnancy and the post-partum period. The daily risk of VTE is increased 5- to 10-fold during pregnancy and 15- to 35-fold early after delivery compared to non-pregnant women of similar age. Although most studies have reported that the elevated risk of VTE returns to baseline by the end of the sixth post-partum week, a recent paper suggests that a small residual increase in risk may persist for 12 weeks after delivery.

SIGNS AND SYMPTOMS OF DVT AND PE IN PREGNANCY:
The presentation of DVT in pregnancy differs from that in non-pregnant patients. The left leg is affected in >80% of cases and pregnant patients are much more likely to present with isolated iliac and/or femoral vein thrombosis, i.e. not arising by contiguous extension of a thrombus in the calf. These isolated iliofemoral thrombi often present with swelling of the entire leg with flank, buttock or back pain rather than symptoms lower in the leg, and carry a greater risk of embolization and of post thrombotic syndrome.

Symptoms that mimic VTE, such as leg swelling, groin discomfort and dyspnea are common in normal pregnancy. Therefore, the majority of pregnant women investigated for VTE (>90%) will not have VTE. However, in patients with unilateral leg swelling, particularly of the left leg, previous history of VTE, family history of VTE, increased BMI, age > 40, bedrest for 7 days or medical illness, the suspicion of VTE must be increased. Since the consequences of failing to diagnose VTE in pregnancy are significant, the threshold for investigating pregnant women with suspected DVT or PE must be low. In addition, the consequences of assuming VTE is present when it is not are also significant because: 1) prolonged anticoagulation throughout pregnancy is costly, requires daily subcutaneous injection and complicates delivery and 2) VTE prophylaxis with LMWH would be recommended in subsequent pregnancies. Therefore, the investigation of DVT and PE in pregnancy must be safe both for mother and fetus and should accurately diagnose (or exclude) clinically significant VTE.
INVESTIGATIVE STRATEGIES:
Because clinical prediction rules for VTE are not yet validated and D-dimer levels are generally elevated in pregnancy, objective imaging is essential if DVT or PE is suspected. Compression ultrasound is the first choice for investigation of either DVT or PE, as it is safe for mother and fetus and is readily available. Compression ultrasound should visualize the entire proximal venous system including the iliac veins to rule out DVT. The sensitivity of a single compression ultrasound in pregnant patients has been shown to be 91% and the negative predictive value 99%. However, good visualization of the iliac veins with compression ultrasound can be limited in many pregnant women.

**Diagnosis of Suspected DVT in Pregnant Women (see Figure 1)**

![Decision tree diagram]

Figure 1: SOGC algorithm for investigation of suspected DVT in pregnant patients.*

* Adapted from Chan et al, 2014.

If compression ultrasound is negative, it is prudent to repeat the ultrasound in 3-7 days, but anticoagulation is not necessary. However, if clinical suspicion is low, repeat compression ultrasound may not be necessary. In patients in whom the iliac system cannot be visualized and in whom symptoms are suggestive of isolated iliac vein thrombosis --such as whole leg swelling, buttock, back or flank pain -- magnetic resonance direct thrombus imaging (MRDTI) should be considered. Alternatively, if MRDTI is not available, anticoagulation should be started and compression ultrasound repeated in 2 to 3 days. MRI can be safely carried out in pregnant patients although the exact specificity and sensitivity of this technique is unclear.
**Diagnosis of Suspected PE in Pregnant Patients (see Figure 2):**
A normal chest x-ray, for which the fetal radiation dose is negligible (<0.1 mGy), is often helpful to rule out other causes of respiratory symptoms. If compression ultrasound is negative, but clinical suspicion for PE is moderate or high, further imaging is necessary. Options include ventilation/perfusion (V/Q) lung scan and computed tomography pulmonary angiography (CTPA). The calculated radiation risk to the fetus with V/Q scan is 0.5 mGy and for CTPA is 0.1 mGy, well below the threshold of 50 mGy associated with increased risk of fetal health problems. However, the calculated minimum radiation dose to each breast for an average 60 kg woman is significantly higher for CTPA (20 to 35 mGy) than for V/Q scan (0.28 mGy), raising concerns of increased breast cancer risk in pregnant women exposed to CTPA. Therefore, ventilation/perfusion scan is the preferred first choice, if available. Two modifications of the V/Q scan technique further reduce the radiation exposure:

1. If the chest x-ray is normal, the ventilation component of the V/Q scan can be omitted and
2. Reduction in the number of radioactive particles of the perfusion scan (usually by 50%) and increasing the scan time.

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**Figure 2: SOGC algorithm for investigation of suspected PE in pregnant patients.**

*Adapted from Chan et al, 2014.*
Investigation of suspected PE in pregnancy often creates anxiety in patients and physicians because of the radiation exposure to the mother and fetus. Clinical likelihood of PE, availability of imaging modalities and patient preference should all be taken into consideration. It is essential that patients and physicians understand the risks and consequences of not pursuing imaging and that patients and physicians are accurately informed of the potential radiation risks to mother and fetus before decisions are made.

SPECIAL CONSIDERATIONS:
Post partum, if DVT or PE is suspected, the patient should be investigated as in non-pregnant patients remembering that the pretest probability will be high as this is the highest risk time for VTE in pregnant patients. CT scan is safe in breastfeeding; however, radioisotopes used in V/Q scanning may contaminate breastmilk for 24-48 hrs.

OTHER RELEVANT THROMBOSIS CANADA GUIDES:
- Deep Vein Thrombosis: Diagnosis
- Pregnancy: Thromboprophylaxis
- Pregnancy: Venous Thromboembolism Treatment
- Pulmonary Embolism: Diagnosis

REFERENCES:


Radiation and Pregnancy: A Fact Sheet for Clinicians (2014)
https://emergency.cdc.gov/radiation/prenatalphysician.asp


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