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PTE in PREGNANCY

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DEFINITION

PE refers to obstruction of the pulmonary artery or one of its branches by material (eg, thrombus, tumor, air, or fat) that originated elsewhere in the body.

CLASSIFICATION

1) Acute (massive or submassive)

2) chronic

Massive acute PE causes **hypotension**, defined as a systolic blood pressure <90 mmHg or a drop in systolic blood pressure of ≥40 mmHg from baseline for >15 minutes.

All acute PE not meeting the definition of massive PE are considered submassive PE.

Epidemiology

Acute pulmonary embolism (PE) is a common and often fatal disease

more than half of all PE are probably undiagnosed

In more than 50 percent of confirmed DVT(deep vein thrombosis) patients

Pregnancy and the puerperium are well-established risk factors for venous thromboembolism (VTE)

Incidence of VTE ranging from 4 to 50 times higher in pregnant versus non-pregnant women, with an absolute incidence rate of 1 in 500 to 2000 pregnancies (0.025 to 0.10 percent)

- In most reports the incidence of antepartum VTE equally distributed across trimesters

- The incidence of VTE is nearly twice as many postpartum than antepartum events.

- Postnatal risk factors included cesarean section, premature delivery, or history of cardiac disease. Multiple births were an antenatal risk factor.

- DVT is three times more common than pulmonary embolism
- The risk of PTE is highest during the first six weeks postpartum
- pulmonary embolism is 15 times more likely to occur in the postpartum period than during the pregnancy.

- The risk of DVT is approximately twice as high after cesarean delivery than vaginal birth.

- DVT is far more common in the left than the right leg.

Increased venous stasis in the left leg related to:

1) compression of the left iliac vein by the right iliac artery
2) compression of the inferior vena cava by the gravid uterus itself

- Pelvic vein DVT is felt to be more likely in pregnancy, perhaps making the diagnosis more difficult.

Virchow's triad:

- The increased venous stasis (due to pregnancy-associated changes in venous capacitance and compression of large veins by the gravid uterus)
- Endothelial injury (due to changes at the uteroplacental surface and vascular injury during delivery)
- Hypercoagulable state (pregnancy is associated with progressive increases in several coagulation factors, a decrease in protein S, and a progressive increase in resistance to activated protein C)

Mortality

Approximately **30** percent without treatment, primarily due to recurrent embolism.

However, accurate diagnosis followed by effective anticoagulant therapy decreases the mortality rate to **2 to 8** percent

Pulmonary embolism accounted for **20** percent of the maternal mortality, higher than both *maternal hemorrhage* (17 percent) and *pregnancy-associated hypertension* (16 percent) [8].

symptoms

Dyspnea at rest or with exertion

pleuritic pain

cough

>2-pillow orthopne

calf or thigh pain or swelling

wheezing

signs

Tachypnea

tachycardia

rales

decreased breath sounds

an accentuated pulmonic component of the S2

jugular venous distension

Diagnosis

- The clinical diagnosis is insensitive and nonspecific .
- lower extremity swelling and discomfort
- Dyspnea, the most frequent symptom of PE, occurs at some point in up to 70 percent of normal pregnancies, often stabilizing near term

❖The symptoms and signs of PE are highly variable, nonspecific, and common among patients with and without PE. Thus, additional testing is needed to confirm or exclude the diagnosis of PE.

❖ Diagnosis of VTE during pregnancy can be complicated by:

1)physiologic changes associated with pregnancy

2)Reluctance of parents and clinicians to expose the fetus to even small amounts of ionizing radiation.

Predictive scoring systems (Wells score system)

Paralysis, paresis or recent orthopedic casting of lower extremity (1 point)
Recently bedridden (> 3 d) or major surgery within past 4 weeks (1 point)
Localized tenderness in deep vein system (1 point)
Swelling of entire leg (1 point)
Calf swelling > 3 cm (10 cm below the tibial tuberosity) (1 point)
Pitting edema greater in the symptomatic leg (1 point)
Collateral non varicose superficial veins (1 point)
Active cancer or cancer treated within 6 months (1 point)
Alternative diagnosis more likely than DVT (Baker's cyst, cellulitis, muscle damage, superficial venous thrombosis, post phlebitic syndrome, inguinal lymphadenopathy, external venous compression) (-2 points)

3-8 Points: High probability of DVT

1-2 Points: Moderate probability

-2-0 Points: Low Probability

- Wells Scoring systems have not been validated in pregnancy.

- Three objective variables were highly predictive of DVT:

  1) symptoms in the left leg

  2)calf circumference difference ≥2 cm

  3) first trimester presentation

Laboratory studies

- **ABG (Arterial blood gas):**

  Insensitive & nonspecific

  Respiratory alkalosis is a very common feature of both pregnancy and PE

- **D-Dimer**

  A breakdown product of cross-linked fibrin

  Detectable by enzyme-linked immunosorbent assay (ELISA)

  low specificity & high sensitivity & high negative predictive value for ruling out the presence of VTE

Elevations in D-dimer are found in uncomplicated pregnancy, increasing with gestational age and peaking at the time of delivery and in the early postpartum period.

Radiographic evaluation

- **Doppler ultrasound**

  - lack of compressibility of a thigh vein with the ultrasound probe

  - highly sensitive (95 percent) and specific (>95 percent) for symptomatic proximal vein thrombosis

  -The addition of Doppler analysis of flow variation with respiration in the left lateral decubitus position assists in diagnosing isolated iliac vein thrombosis

- **Magnetic resonance imaging (MRI)**

- It can detect both thigh and pelvic vein DVT with a sensitivity that approaches 100 percent in the nonpregnant population.

- The safety of MRI during pregnancy has not been proven, although no adverse effects have been documented to date .

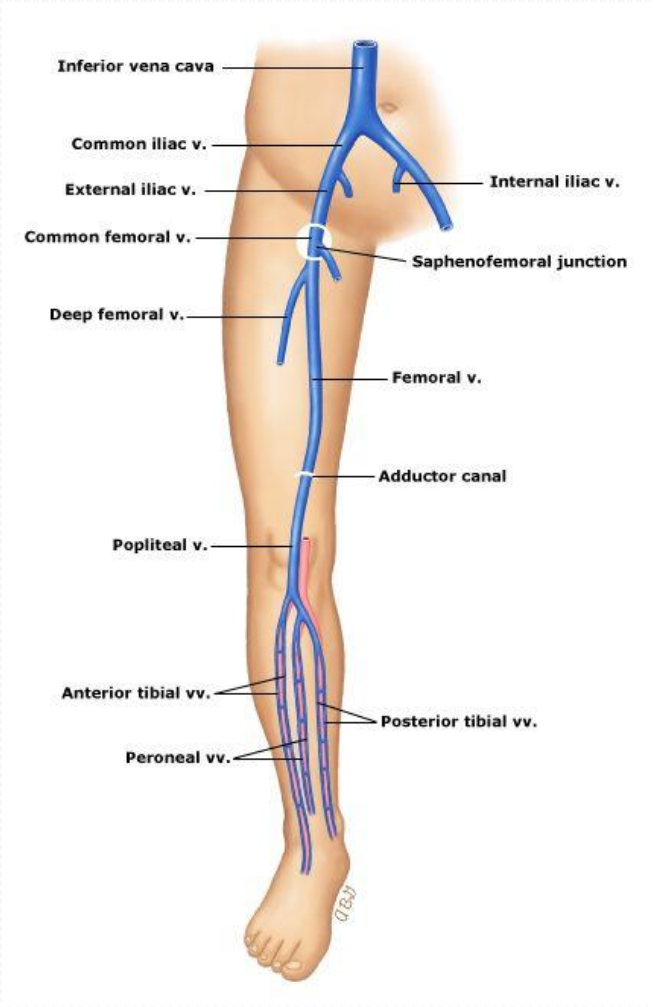
-When strong clinical suspicion exists for pelvic vein thrombosis, MRI should be performed, although Doppler ultrasound of the iliac vein or venography are acceptable alternatives

- **Ascending contrast venography**

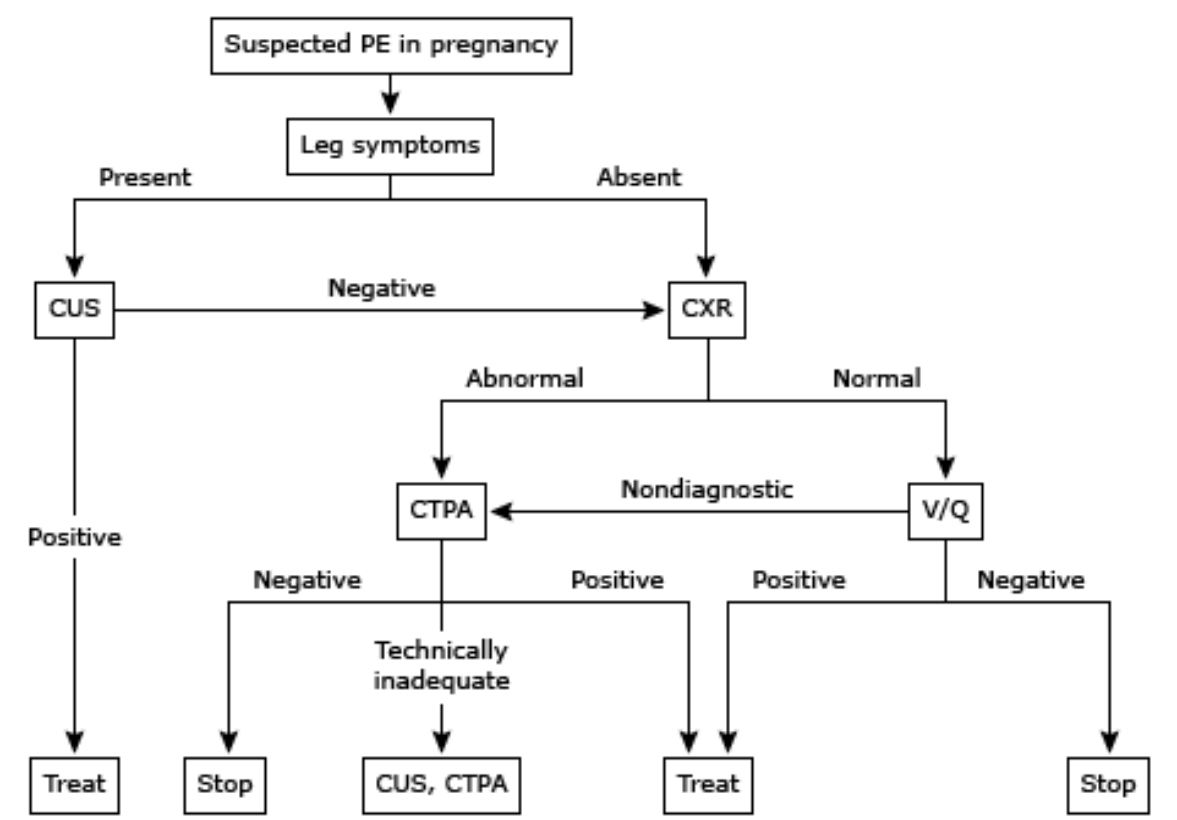
Gold standard for the diagnosis of lower extremity DVT in both the pregnant and the non-pregnant populations.

venography is rarely performed Although the delivered radiation to the fetus is small (<500 mcGy) when venography is performed with abdominal-pelvic shielding, shielding renders the test relatively insensitive to isolated iliofemoral thrombosis

Deep veins of the lower extremity



Diagnostic algorithm for suspected pulmonary embolism in pregnancy



PE: pulmonary embolism; CUS: compression ultrasound; CXR: chest radiography; CTPA: computed-tomographic pulmonary angiography; V/Q: ventilation-perfusion.

- In patients with suspected both PTE & DVT bilateral venous compression ultrasound of the lower extremities is the first radiologic procedure that should be performed

- Because of the superior accuracy of lung scintigraphy (V/Q scanning) along with lower maternal breast irradiation, we recommend the use of lung scintigraphy, rather than CTPA, as the diagnostic test of choice in the workup of pulmonary embolism in pregnancy in women with a negative chest X-ray In those patients with an abnormal chest X-ray, we suggest the use of CTPA over lung scintigraphy

Treatment

- ANTICOAGULATION
- INFERIOR VENA CAVA FILTERS
- THROMBOLYTIC THERAPY

GENERAL APPROACH

Initial management of suspected VTE depends upon the degree of:

1) clinical suspicion for acute PE

2)whether there are contraindications to anticoagulation

3)whether PE, DVT, or both are suspected

- High clinical suspicion for acute PE empiric anticoagulant therapy is indicated prior to the diagnostic evaluation. Anticoagulant therapy is discontinued if VTE is excluded.

- low or moderate clinical suspicion for PE, empiric anticoagulant therapy prior to diagnostic evaluation is determined on a case-by-case basis.

- PE is suspected but anticoagulant therapy is contraindicated: diagnostic evaluation should be expedited. Anticoagulation-independent therapy (eg, inferior vena cava filter) is indicated if VTE is confirmed.

- suspicion for DVT alone (no clinical evidence of acute PE): anticoagulant therapy is generally withheld until VTE is confirmed, assuming that diagnostic evaluation can be performed in a timely fashion

ANTICOAGULATION

- American College of Chest Physicians (ACCP) guidelines on VTE and pregnancy

Anticoagulation should be initiated using :

1)subcutaneous low molecular weight heparin (SC LMWH)

2) Jntravenous unfractionated heparin (IV UFH)

3)subcutaneous unfractionated heparin (SC UFH)

- Subcutaneous LMWH is preferred over IV UFH or SC UFH in most patients because it is easier to use and it appears to be more efficacious with a better safety profile. It was also more likely to reduce thrombus size and less likely to cause major hemorrhage

- In contrast, IV UFH is preferred in patients who have a markedly elevated risk of bleeding or persistent hypotension due to PE. This preference is based on clinical experience. The rationale is because of its short half-life and near complete reversal with protamine

- UFH (either IV or SC) is preferred over SC LMWH in patients who have severe renal failure

Dosing

- Enoxaparin : **initiate with 1 mg/kg every 12 hours . The dose is then titrated 1 to 2 IU/mL for once daily administration** *at least 24 hours prior to delivery*

- IV UFH : **Initial dosing of IV UFH consists of an IV UFH bolus of 80 units/kg, followed by a continuous infusion of 18 units/kg per hour. The infusion is titrated every six hours** *which can be discontinued 4 to 6 hours prior to delivery*
- **SC UFH** : A reasonable initial dose of SC UFH is 17,500 units every 12 hours. The dose is then titrated to achieve a therapeutic aPTT. The first aPTT is generally measured six hours after the second dose

After delivery

A heparin regimen (SC LMWH, IV UFH, or SC UFH) should be restarted

12 hours after a cesarean delivery or

6 hours after a vaginal birth

assuming that significant bleeding has not occurred.

Anticoagulant therapy continue at least six weeks postpartum .

Total duration of anticoagulant therapy of at least three months for women whose only risk factors for VTE were transient (eg, pregnancy)

Patients with persistent risk factors for VTE may require longer therapy

Thrombolytic therapy :

for pregnant or postpartum patients with life-threatening acute PE (ie, persistent and severe hypotension due to the PE).

prevention

- The need for thromboprophylaxis should be assessed in every woman who is pregnant or postpartum.

Antepartum :

one or more of the following risk factors :

- Single prior episode of VTE plus a higher risk thrombophilia
- Multiple prior episodes of VTE
- Antithrombin deficiency

Inherited Risk factors :

- Factor V Leiden mutation
- Prothrombin gene mutation
- Protein S deficiency
- Protein C deficiency
- Antithrombin deficiency
- Dysfibrinogenemia
- Hyperhomocysteinemia

Higher risk thrombophilias

- persistent antiphospholipid antibodies
- compound heterozygosity for the prothrombin and factor V Leiden mutations
- homozygosity for the prothrombin mutation
- homozygosity for the factor V Leiden mutation

❖ no higher risk (Protein C deficiency, Protein S deficiency, and hyperhomocysteinemia)

postpartum :

- lower threshold for initiating thromboprophylaxis during the postpartum period

- It is indicated for:

  1)one or more episodes of VTE

  2) any type of thrombophilia, even those that are not considered higher risk

Cesarean section

- Increases the risk of VTE, especially when performed emergently

- thromboprophylaxis is NOT recommended for women whose only risk factors for VTE are the pregnancy and CS.

Diagnostic algorithm in patients with suspected deep vein thrombosis