Overview

Deep Vein Thrombosis (DVT) is an important and common condition that requires early diagnosis and treatment to prevent the potentially fatal complications of pulmonary embolism and recurrent deep vein thrombosis. However, accurate diagnosis is required to prevent unnecessary exposure to the risks of anticoagulation if DVT is not present. DVTs have an estimated annual incident of 67 per 100,000 among the general population with a recurrence rate of 3-10% per year. Of those who develop pulmonary embolism, 1-8% will die, while others may experience post-thrombophlebitic syndrome and chronic thromboembolic pulmonary hypertension.

Diagnostic Approach

No single symptom or sign can be used in isolation to diagnosis a DVT. It has been well established that the use of a clinical prediction rule that takes into account symptom, signs, and risk factors can be applied to stratify the risk of a DVT and guide investigations and treatment.

History

- Classic symptoms = pain, swelling, erythema of involved extremity
  - Note: site of thrombosis may not correlate with location of symptoms
- Review of risk factors of risk factors
- Review of systems addressing differential diagnosis

Physical

- Vital signs
- CV exam
- Respiratory exam
- MSK & peripheral vascular exam that includes assessment of:
  - Palpable cord (thrombosed vein)
  - Unilateral edema with calf diameter measurement
- Warmth
- Tenderness
- Erythema
- Superficial venous dilation
- Homan’s sign

Differential Diagnosis

- MSK injury
- Venous insufficiency
- Superficial thrombophlebitis
- Cellulitis
- Lymphedema
- Popliteal (Baker’s) cyst

Risk Factors for DVT

- Recent surgery
- History of immobilization
- Prolonged hospitalization/bed rest
- Obesity
- Prior episode of DVT
- Lower extremity trauma
- Malignancy
- Use of OCP or HRT
- Pregnancy or postpartum status
- Stroke

Investigations

- CBC, PT/INR, PTT, Cr
- D-dimer ➔ degradation product of cross-linked fibrin blood clot
  - Sensitive but not specific markers of DVT
  - Also elevated in recent major surgery, hemorrhage, trauma, pregnancy, cancer

Imaging

- Compression ultrasonography ➔ imaging test of choice
- Doppler colour flow helpful
- Can be limited to proximal veins in some centres ➔ sensitivity of 97%
- If DVT in calf veins, sensitivity only 73%
- Contrast venography

Use of a diagnostic algorithm

- Pre-test probability should be determined ➔ only after the completion of a history and physical examination, if DVT remains a diagnostic possibility!
- After clinical pre-test probability, perform D-dimer test

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Dr. Michael Evans developed the One-Pager concept to provide clinicians with useful clinical information on primary care topics.
**Pre-test Probability Tool**

<table>
<thead>
<tr>
<th>Clinical Variable</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active cancer (treatment ongoing, administered within previous 6 months or palliative)</td>
<td>1</td>
</tr>
<tr>
<td>Paralysis, paresis, or recent plaster immobilization of the lower extremities</td>
<td>1</td>
</tr>
<tr>
<td>Recently bedridden &gt;3 days or major surgery within the previous 12 weeks requiring general or regional anesthesia</td>
<td>1</td>
</tr>
<tr>
<td>Localized tenderness along the distribution of the deep venous system</td>
<td>1</td>
</tr>
<tr>
<td>Swelling of entire leg</td>
<td>1</td>
</tr>
<tr>
<td>Calf swelling &gt;3cm larger than asymptomatic side (measured 10cm below the tibial tuberosity)</td>
<td>1</td>
</tr>
<tr>
<td>Pitting edema confined to the symptomatic leg</td>
<td>1</td>
</tr>
<tr>
<td>Collateral superficial veins (nonvaricose)</td>
<td>1</td>
</tr>
<tr>
<td>Previously documented DVT</td>
<td>1</td>
</tr>
<tr>
<td>Alternative diagnosis at least as likely as DVT</td>
<td>-2</td>
</tr>
</tbody>
</table>

- if DVT likely ...
  - D-dimer positive:
    - Ultrasonography +/- Doppler
      - Positive = DVT
      - Negative = no DVT
  - D-dimer negative:
    - No DVT
    - No need for further testing

- if DVT unlikely ...
  - D-dimer positive:
    - Ultrasonography +/- Doppler
      - Positive = DVT
      - Negative = repeat U/S in 1 week
        - U/S positive = DVT
        - U/S negative = no DVT
  - D-dimer negative:
    - Ultrasonography +/- Doppler
      - Positive = DVT
      - Negative = no DVT

**Note:**
- D-dimer testing should not be performed in patients for whom DVT is not a possibility
- No D-dimer assay should be used to exclude DVT in patients who have high pre-test probability
- Patients likely to have DVT but have no diagnostic imaging available to them should receive an injection of low-molecular weight heparin until imaging arranged
- Patients who are unlikely to have DVT may have anticoagulation delayed until imaging becomes available (12-24 hours)

**Treatment Duration**

<table>
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<tr>
<th>Condition</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>First DVT secondary to transient risk factor</td>
<td>3 months</td>
</tr>
<tr>
<td>First idiopathic DVT</td>
<td>6 month minimum, then reassess based on risks/benefits</td>
</tr>
<tr>
<td>Recurrent DVT or strong thrombophilia</td>
<td>Long-term treatment</td>
</tr>
<tr>
<td>DVT secondary to cancer</td>
<td>Long-term treatment preferentially with LMWH during the first 3-6 months, then anticoagulate as long as the cancer is considered active</td>
</tr>
</tbody>
</table>

**Special Populations**

- **Pregnancy:**
  - Oral anticoagulation avoided due to teratogenic effects in first trimester and risk of fetal intracranial bleeding in 3rd trimester
  - LMWH = treatment of choice
  - Placement of retrievable inferior vena cava filter

- **Obesity:**
  - Dose of LMWH does not need to be capped

**Treatment**

Goal: minimize local extension, reduce the risk of recurrence, decrease the risk of post thrombotic syndrome.

**Initial Rx:**

1. Low-molecular-weight Heparin
2. Unfractionated heparin
3. Fondaparinux
4. Rivaroxaban
5. IVC filter (if contraindication to anticoagulation)

**Long-Term Rx:**

1. LMWH ➔ usually for cancer diagnosis
2. Warfarin with INR of 2-3
3. Rivaroxaban
4. IVC filter (if contraindications to anticoagulation or failure of anticoagulation)

**Bottom Line**

DVT is a common and potentially fatal condition that can routinely present to primary care practitioners. The use of a pre-test probability algorithm, D-dimer testing, and compression ultrasound provides for a validated approach to diagnosing or ruling out DVT. The mainstay of DVT treatment is anticoagulation, while the duration of use depends on whether the DVT occurred in the presence of a transient risk factor.

References can be found online at http://www.dfcm.utoronto.ca/programs/postgraduateprograme/One_Pager_Project_References.htm