Superficial veins:
- Small saphenous vein
- Great saphenous vein
- Other nameless veins
Perforating veins connect the deep system with the superficial system.
Deep veins:
- Common femoral vein
- Femoral vein
- Popliteal vein
- Anterior and posterior tibial vv.
- Peroneal veins
Superficial veins thrombosis:
- Superficial thrombophlebitis
- Chronic venous insufficiency

Deep veins thrombosis:
- venous throboembolism (VTE)
CEAP classification

Clinical
Etiology
Anatomy
Pathophysiology
C0 No visible or palpable signs of venous disease
C1 Telangiectases, reticular veins
C2 Varicose veins
C3 Edema without skin changes
C4 Skin changes, including pigmentation, eczema, lipodermatosclerosis, and atrophie blanche
C5 Healed venous ulcer
C6 Active venous ulcer
Other criteria

**Etiology**

Ec: congenital  
Ep: primary  
Es: secondary  
En: no venous cause identified

**Anatomy**

As: superficial veins  
Ap: perforating veins  
Ad: deep veins  
An: no venous location identified

**Pathophysiology**

Pr: reflux  
Po: obstruction  
Pr,o: reflux and obstruction  
Pn: no venous pathophysiology identifiable
VTE constitutes 20% of the diagnoses made within 3 months of a surgical procedure.

Schwartz p. 918

Manifests through deep veins thrombosis (DVT) and pulmonary embolism (PE)
### Risk factors for venous thromboembolism

**Acquired**
- Advanced age
- Hospitalization/immobilization
- Hormone replacement therapy and oral contraceptive use
- Pregnancy and puerperium
- Prior venous thromboembolism
- Malignancy
- Major surgery
- Obesity
- Nephrotic syndrome
- Trauma or spinal cord injury
- Long-haul travel (>6 hours)
- Varicose veins
- Antiphospholipid antibody syndrome
- Myeloproliferative disease
- Polycythemia

**Inherited**
- Factor V Leiden
- Prothrombin 20210A
- Antithrombin deficiency
- Protein C deficiency
- Protein S deficiency
- Factor XI elevation
- Dysfibrinogenemia

**Mixed Etiology**
- Homocysteinemia
- Factor VII, VIII, IX, XI elevation
- Hyperfibrinogenemia
- Activated protein C resistance without factor V Leiden
superficial veins thrombosis

- Prior history of superficial phlebitis, DVT, and PE
- Recent surgery or pregnancy,
- Prolonged immobilization,
- Underlying malignancy.
- Estrogen therapy, contraceptives
- Vasculitis (polyarteritis nodosa (periarteritis nodosa) and Buerger disease (thromboangiitisobliterans))
- Tobacco use
Signs and Symptoms of Superficial veins thrombosis

**Symptoms:**
- Dull ache or pressure sensation in the legs after prolonged standing
- Legs feel heavy, and mild ankle edema develops occasionally

**Signs:**
- Skin ulcerations near the ankle
- Reddened, warm, and tender cord extending along a superficial vein
- The surrounding area may be red and edematous
Deep Venous Thrombosis (DVT)

DVT is the underlying source of 90% of acute PEs.

DVT is the most common venous thrombosis
Edema - Most specific symptom.

Leg pain - Occurs in 50% of patients but is nonspecific.

Tenderness - Occurs in 75% of patients.

Warmth or erythema of the skin over the area of thrombosis.

Clinical symptoms of PE as the primary manifestation.
Physical findings in DVT:

- Homans sign
- A palpable, indurated, cordlike, tender subcutaneous venous segment
- Variable discoloration of the lower extremity
- Blanched appearance of the leg because of edema (relatively rare)
Cerulea Phlegmasia

- Alba: the thrombosis involves only major deep venous channels of the extremity, thus sparing collateral veins.

- Dolens: the thrombosis extends to collateral veins, resulting in severe venous congestion with massive fluid sequestration and more significant edema.
DVT of an upper extremity

Also called **Paget–Schroetter disease**
Typically occur in the axillary or subclavian veins. "Effort-induced thrombosis" : occurs due to the damage of the aforementioned vessels.
Symptoms: sudden onset of pain, warmth, redness, blueness and swelling in the arm.
Leg symptoms and clinical suspicion for DVT

Determine pretest probability of DVT.

Low probability
- d-dimer test
  - Negative: DVT excluded
  - Positive or not available: Venous ultrasound examination
    - Negative: DVT excluded
    - Positive: DVT confirmed

Moderate or high probability
- Venous ultrasound examination
  - Negative: d-dimer test
    - Negative: DVT confirmed
    - Positive: DVT confirmed
  - Positive: Follow-up studies (e.g., second venous ultrasound examination, venography)

Treat.
Table 3  Wells clinical DVT model

<table>
<thead>
<tr>
<th>Clinical characteristic</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active cancer (patient receiving treatment for cancer within 6 months or currently receiving palliative treatment)</td>
<td>1</td>
</tr>
<tr>
<td>Paralysis, paresis, or recent plaster cast immobilization of the lower extremities</td>
<td>1</td>
</tr>
<tr>
<td>Recently bedridden for 3 days or more, 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>Entire leg swollen</td>
<td>1</td>
</tr>
<tr>
<td>Calf swelling at least 3 cm larger than the asymptomatic side (measured 10 cm 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 (non-varicose)</td>
<td>1</td>
</tr>
<tr>
<td>Previously documented deep vein thrombosis</td>
<td>1</td>
</tr>
<tr>
<td>Alternative diagnosis at least as likely as deep vein thrombosis</td>
<td>-2</td>
</tr>
</tbody>
</table>

A score of ≤0 indicates that a low pretest probability of deep vein thrombosis. A score of 1 or 2 points indicates a moderate risk of DVT and a score of 3 or higher indicates a high risk of deep vein thrombosis [152]
Figure 1. Illustration demonstrating the anatomic compression seen in May-Thurner syndrome.
Symptoms of PE

- Tachypnea (respiratory rate >16/min) - 96%
- Rales - 58%
- Accentuated second heart sound - 53%
- Tachycardia (heart rate >100/min) - 44%
- Fever (temperature >37.8°C [100.04°F]) - 43%
- Diaphoresis - 36%
- S 3 or S 4 gallop - 34%
- Clinical signs and symptoms suggesting thrombophlebitis - 32%
- Lower extremity edema - 24%
- Cardiac murmur - 23%
- Cyanosis - 19%
- Hemoptysis (13%)
Post-thrombotic syndrome

- Pain (aching or cramping)
- Heaviness
- Itching or tingling
- Swelling (edema)
- Varicose veins
- Brownish or reddish skin discoloration
- Ulcer

Symptoms are worse after walking or standing
Duplex Ultrasonography
Duplex Ultrasonography

The examination begins at the ankle and continues proximally to the groin.

DVT DUS findings:
- Lack of spontaneous flow
- Inability to compress the vein
- Absence of color filling of the lumen by color flow DUS
- Loss of respiratory flow variation
- Venous distention
Superficial Thrombophlebitis Dx

Key questions in cases of superficial thrombophlebitis:
- location and extent of the thrombosis,
- proximity to the deep venous system at the saphenofemoral or saphenopopliteal junction.

Ultrasonography is the main modality
Duplex Ultrasonography

Normally

1

DVT

2

Pic. is taken from Schwartz 10th ed.

Before compression

During compression

3
Other diagnostic options for DVT
<table>
<thead>
<tr>
<th>Clinical characteristic</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous PE or DVT</td>
<td>1</td>
</tr>
<tr>
<td>Heart rate</td>
<td></td>
</tr>
<tr>
<td>75-94 beats/min</td>
<td>1</td>
</tr>
<tr>
<td>≥ 95 beats/min</td>
<td>2</td>
</tr>
<tr>
<td>Surgery or fracture within last month</td>
<td>1</td>
</tr>
<tr>
<td>Hemoptysis</td>
<td>1</td>
</tr>
<tr>
<td>Active cancer</td>
<td>1</td>
</tr>
<tr>
<td>Unilateral lower limb pain</td>
<td>1</td>
</tr>
<tr>
<td>Pain on lower limb deep venous palpation and unilateral edema</td>
<td>1</td>
</tr>
<tr>
<td>Age &gt; 65 years</td>
<td>1</td>
</tr>
</tbody>
</table>

### Pulmonary Embolism Rule-Out Criteria

<table>
<thead>
<tr>
<th>Variable</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age &lt;50 years</td>
<td></td>
</tr>
<tr>
<td>Pulse &lt;100 beats per minute</td>
<td></td>
</tr>
<tr>
<td>$\text{SaO}_2 \geq 95%$ on room air</td>
<td></td>
</tr>
<tr>
<td>No hemoptysis</td>
<td></td>
</tr>
<tr>
<td>No exogenous estrogen use</td>
<td></td>
</tr>
<tr>
<td>No prior venous thromboembolism</td>
<td></td>
</tr>
<tr>
<td>No surgery or trauma requiring hospitalization within the past 4 weeks</td>
<td></td>
</tr>
<tr>
<td>No unilateral leg swelling</td>
<td></td>
</tr>
</tbody>
</table>

If the answer is "Yes" to all questions - we rule out PE in low-risk patients
PE diagnosis
Specific considerations

Migratory thrombophlebitis (Suspect malignancy!):
- antigen (CEA) testing,
- prostate-specific antigen (PSA) testing,
- colonoscopy,
- computed tomography (CT),
- mammography.

Spontaneous thrombophlebitis (test for the following):
• Resistance to activated protein C (most often due to factor V Leiden)
• Protein C deficiency
• Protein S deficiency
• Antithrombin III deficiency
• Antiphospholipid antibodies
• Prothrombin gene 2010-a mutation (factor II mutation)
Superficial veins thrombosis

Preferred medications:
Nonsteroidal anti-inflammatory drugs (NSAIDs)
Low-molecular-weight heparin (LMWH)
Fondaparinux

Available surgical measures:
Excision and Ligation
Puncture and Evacuation
Subfascial endoscopic perforator surgery (SEPS)
DVT anticoagulation

General principles:
Anticoagulant therapy remains the mainstay.

Long-term anticoagulation is necessary to prevent the high frequency of recurrent venous thrombosis or thromboembolic events.

Anticoagulation does not remove the thrombus. It inhibits its propagation.

First-line therapy for non-high risk venous thromboembolism (VTE) or pulmonary embolism (PE): oral anticoagulants (dabigatran, rivaroxaban, apixaban, or edoxaban) over vitamin K antagonists (Warfarin). VKAs are also recommended over low-molecular-weight heparin (LMWH).

If there is an underlying malignancy – LMWHs are preferable

when the VTE recurrence risk is low in these patients, surveillance over anticoagulation is suggested
Available options

Antithrombotic therapy

- Unfractionated heparin
- Low molecular weight heparins (Enoxaparin, Dalteparin)
- Vitamin K inhibitors (Warfarin)
- Direct thrombin inhibitors (Rivaroxaban, Apixaban)
- Acetylsalicylic acid (ASA)

Surgical management
DVT radical measures

Catheter-Directed Thrombolysis
Inferior Vena Caval Filters
Operative Venous Thrombectomy
Thanks for your attention!