Venous and Lymphatic Disorders
Venous and Lymphatic Disorders

Varicose Veins

Deep Vein Thrombosis (DVT)

Lymphedema
What Is Varicose Veins?

Latin: Varicose = Varix = twisted

Abnormal venous dilatation
diameter > 3 mm
What Is Varicose Veins?
What Is Varicose Veins?
Normal venous circulation of lower extremities
Normal venous circulation of lower extremities
Direction of venous blood flow
Direction of venous blood flow

Calf muscle relaxed

Calf muscle contracts

Muscle squeezes veins

Veins dilated; blood still; valves closed

Veins constrict; blood moves; valves open
Direction of venous blood flow
“One way circulation”
Most common cause of varicose veins: “Valvular Reflux”
Reflux (sapheno-femoral incompetence)
Varicose veins

Pathogenesis

Genetic

Hormonal
- Progesterone > Estrogen
  - 2\textsuperscript{nd}-half of menstrual period

Pregnancy
- ↑ blood volume
- ↑ uterus size (\textit{obstruct venous return})
- ↑ hormone

Position
- Cross-leg
- Tight pants
Varicose veins

Pathophysiology

Primary

Reflux (valvular incompetence): most common
Incompetent saphenofemoral junction/saphenous vein
Most common cause
Varicose veins

Pathophysiology

Primary

Reflux (valvular incompetence): most common
Perforator incompetence
Incompetent perforators
Varicose veins

Pathophysiology

**Primary**
- Reflux (valvular incompetence): most common
- Perforator incompetence

**Secondary**
- Obstruction (in deep vein)
  - Deep vein thrombosis
  - Pelvic tumors
  - May-Thurner syndrome
Obstruction (in deep vein)
May-Thurner syndrome
Narrowed left iliac vein
(by pressure from right iliac artery)
Varicose veins

Symptoms

General appearance
Aching pain
Leg heaviness
Easy to fatigue
Superficial thrombophlebitis
External bleeding
Ankle hyperpigmentation
Lipodermatosclerosis
Venous ulcer

Symptoms are not related to varicose veins size
Varicose veins

Trendelenberg Test

Perthes test
Varicose veins

CEAP classification

C – Clinical classification
E – Etiology
A – Anatomy
P – Pathology
Varicose veins

CEAP classification

C-0 – Normal
C-1 – Spider veins, telangiectasias
C-2 – Varicose veins
C-3 – Varicose veins + edema
C-4 – Skin changes
C-5 – Skin changes w healed ulcer
C-6 – Skin changes w active ulcer
C-1 – Spider veins, telangiectasias
C-2 – Varicose veins

C-3 – Varicose veins + edema
C-4 – Skin changes

- Hyperpigmentation
- Venous eczema
- Lipodermatosclerosis
C-5 – Skin changes w healed ulcer
C-6 – Skin changes with active ulcer
Varicose veins

Treatment

Sclerotherapy

Saphenous vein ablation

Stripping

Endovenous surgery
วิธีการรักษา
นิวดยา (sclerotherapy)

1% Aethoxysclerol
วิธีการรักษา

นื้อยา (sclerotherapy)

ไข้มเล็กๆ (เบอร์ 30)

ได้ผล 70-90%

อาจต้องทำหลายครั้ง

ให้ดูเนื้อง 7-14 วัน

นื้อเด็กเล็กดับบ้านได้
Sclerotherapy
Sclerotherapy
วิธีการรักษา
นิ้วยา (sclerotherapy)
Varicose veins

Treatment

Saphenous vein ablation

- Stripping
- Endovenous surgery
Venous stripping

Vein Ligation and Stripping
วิธีการรักษา
ผ่าตัดเอาเส้นเลือดขอดออก
(venous stripping)
วิธีการรักษา
ฝ่าตั้งเอาเส้นเลือดของตอดอก
(venous stripping)

แปล 3-4 ซม.

แปล 2-3 ซม.
วิธีการรักษา
ผ่าตัดเอาเส้นเลือดออก
(venous stripping)

Spinal block
OR time 1-2 hrs
Hospital stay 2 – 3 days
Minor procedures?
Endo-venous surgery

1. Catheter inserted
2. Vein warmed and collapses
3. Catheter slowly withdrawn, closing vein

Vein Ligation and Stripping
Chronic venous ulcer  4-layer bandage
วิธีการรักษา

เปลี่ยนผ้าพุน
ส้านาทละครั้ง
วิธีการป้องกันเส้นเลือดขอ
หลีกเลี่ยงการยืน/นั่งนานๆ
ออกกำลังกายสม่ำเสมอ
ควบคุมน้ำหนัก
ใช้ถุงน่องรักษาเส้นเลือดขอ (ใต้เท้า)

สมรภูมิคร่อม ใช้ถุงน่องรักษาเส้นเลือดขอ 3 เดือนสุดท้าย
วิธีการป้องกันเส้นเลือดตีบ
วิธีการรักษา
ใช้ถุงน่องรักษาเส้นเลือดขอด
(compression stockings)
ใช้ถุงน่องรักษาเส้นเลือดขอด (compression stockings)
วิธีการรักษา
ใช้ถุงน่องรักษาเส้นเลือดขอด
(compression stockings)

ความดันที่เข็มเท้า
15-20 mmHg
20-30 mmHg
30-40 mmHg

ถุงน่องเพื่อการรักษา
Deep Vein Thrombosis

Prophylaxis and Management
Deep Vein Thrombosis
Deep Vein Thrombosis (DVT)

Normal Blood Flow

Deep Vein Thrombosis

Embolus
Deep Vein Thrombosis

Risk factors
Prevention
Management
Risk factors: Virchow’s triad

Hypercoagulability
- Congenital hypercoagulability
- Malignancy
- Oral contraceptives
- Polycythemia
- Thrombocytosis

Venous stasis
- Immobility
- Varicose veins
- Advanced age
- Congestive heart failure
- Obesity

Endothelial Injury
- Trauma
- Recent surgery
- Severe infection
<table>
<thead>
<tr>
<th>Patient Group</th>
<th>DVT Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical patients</td>
<td>10 – 20</td>
</tr>
<tr>
<td>General surgery</td>
<td>15 – 40</td>
</tr>
<tr>
<td>Major gynecologic surgery</td>
<td>15 – 40</td>
</tr>
<tr>
<td>Major urologic surgery</td>
<td>15 – 40</td>
</tr>
<tr>
<td>Neurosurgery</td>
<td>15 – 40</td>
</tr>
<tr>
<td>Stroke</td>
<td>20 – 50</td>
</tr>
<tr>
<td>Hip or knee arthroplasty, hip fracture surgery</td>
<td>40 – 60</td>
</tr>
<tr>
<td>Major trauma</td>
<td>40 – 80</td>
</tr>
<tr>
<td>Spinal cord injury</td>
<td>60 – 80</td>
</tr>
<tr>
<td>Critical care patients</td>
<td>10 – 80</td>
</tr>
</tbody>
</table>
Deep Vein Thrombosis

Prevention

- Graduated compression stockings
- Intermittent leg compression
- Anticoagulation
Prophylaxis

Compression techniques

Graduated compression stockings (GCS)
Prophylaxis

Compression techniques

Intermittent pneumatic compression (IPC)

↑ Flow velocities in femoral and pelvic veins

Effective, up to 24 hr
Prophylaxis

General Surgery: Risk factors

Type and duration of surgery

Traditional risk factors: cancer, previous DVT, obesity, varicose veins, estrogen use

Type of anesthesia: spinal/epidural < general

General perioperative care: degree of mobilization, fluid status, transfusion
**Recommendation:**

**Anticoagulation**

Unfractionated heparin: 5,000 units sc bid / tid

or

LMWH (Enoxaparin): 40 units sc daily

Decrease risk of DVT > 60%

Bleeding complication - same

Advantage of LMWH – once-daily administration

Lower risk of heparin-induced thrombocytopenia (HIT)
<table>
<thead>
<tr>
<th>Patient Types</th>
<th>Dosage</th>
<th>Dosing Adjustment for Severe Renal Impairment (creatinine clearance &lt;30 mL/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical patients with restricted mobility†</td>
<td>40 mg SC once a day</td>
<td>30 mg SC once a day</td>
</tr>
<tr>
<td>Hip-replacement patients</td>
<td>40 mg SC once a day (initiated 12 (± 3) hours preop) or 30 mg q 12 h SC (initiated 12 to 24 hours post op)</td>
<td>30 mg SC once a day</td>
</tr>
<tr>
<td>Extended prophylaxis in hip-replacement patients</td>
<td>40 mg SC once a day</td>
<td>30 mg SC once a day</td>
</tr>
<tr>
<td>Knee-replacement patients</td>
<td>30 mg q12 h SC (initiated 12 to 24 hours post op)</td>
<td>30 mg SC once a day</td>
</tr>
<tr>
<td>Patient Types</td>
<td>Dosage</td>
<td>Dosing Adjustment for Severe Renal Impairment (creatinine clearance &lt;30 mL/min)</td>
</tr>
<tr>
<td>---------------------------------------------------</td>
<td>---------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Abdominal surgery patients</td>
<td>40 mg SC once a day (initiated 2 hours preop)</td>
<td>30 mg SC once a day</td>
</tr>
<tr>
<td>Unstable angina/non-Q-wave MI patients</td>
<td>1 mg/kg q 12 h SC (when concurrently administered with aspirin)</td>
<td>1 mg/kg SC once a day (when concurrently administered with aspirin)</td>
</tr>
<tr>
<td>Outpatient treatment for acute DVT without PE</td>
<td>1 mg/kg q 12 h SC (in conjunction with warfarin sodium therapy)</td>
<td>1 mg/kg SC once a day (in conjunction with warfarin sodium therapy)</td>
</tr>
<tr>
<td>Inpatient treatment for acute DVT with or without PE</td>
<td>1.5 mg/kg SC once a day or 1 mg/kg q 12 h SC (both in conjunction with warfarin sodium therapy)</td>
<td>1 mg/kg SC once a day (in conjunction with warfarin sodium therapy)</td>
</tr>
</tbody>
</table>
Recommendation
High Risk Surgery

- Brief procedures of < 30 min for benign disease:
  No need for prophylaxis

- Laparoscopic procedures + additional risk factors:
  IV heparin / LMWH / IPC / GCS

- All major abdomional surgery:
  Need for thromboprophylaxis

7th ACCP conferences on Antithrombotic and Thrombolytic Therapy 2004
# Wells’ clinical probability score

<table>
<thead>
<tr>
<th>Clinical Characteristic</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active cancer (patient receiving treatment for cancer within the previous 6 mo or currently receiving palliative treatment)</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 for 3 days or more, or major surgery within the previous 12 wk 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 that on the asymptomatic side (measured 10 cm below 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 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>

≥ 2 points = High probability of having DVT
Deep Vein Thrombosis

Investigation

D-dimer (> 500 ng/ml)

Duplex Ultrasound
Increased thrombin production due to
Surgery
Trauma
Infection
Inflammation
Disseminated intravascular coagulation
Pregnancy and delivery
Thrombosis

Fibrinopeptide A
Fibrinopeptide B
Fibrinogen
Fibrin clot
Plasmin
Fibrinolysis
Intermediate fragments
Complete clot lysis
$\alpha$-Dimer
Fragment E
Probability of DVT
Using clinical score + D-dimer

<table>
<thead>
<tr>
<th>Clinical score</th>
<th>D-dimer Negative</th>
<th>D-dimer Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \leq 2 ) points</td>
<td>1%</td>
<td>15%</td>
</tr>
<tr>
<td>( &gt; 2 ) points</td>
<td>20%</td>
<td>80%</td>
</tr>
</tbody>
</table>
Deep Vein Thrombosis

Assess Clinical Probability score

≤ 2 คะแนน

D-dimer

- Exclude DVT

+ Ultrasound

> 2 คะแนน
Ilio-femoral DVT

Acute DVT

IV heparin / SC heparin / LMWH
At least 5 days
+ Warfarin

Suspicious of DVT

Treatment while waiting for the test
Ilio-femoral DVT

Unfractionated heparin

- **IV Heparin**: 80 u/Kg IV bolus
  - 18 u/Kg/h
- **SC Heparin**: 5,000 units IV bolus
  - 17,500 u sc bid

PTT 1.5 – 2.5 prolongation
Ilio-femoral DVT

Low molecular weight heparin

Enoxaparin 1 mg/Kg sc q 12 hr
1.5mg/kg sc OD
Ilio-femoral DVT

Warfarin: target PT-INR 2.0-3.0

First episode DVT: reversible risk factor
  3 months

First episode DVT: idiopathic
  At least 6 - 12 months
  ? indefinite
Ilio-femoral DVT

**Warfarin**: target PT-INR 2.0-3.0

**Recurrent DVT**
- Indefinite

**DVT with cancer**
- Indefinite or cancer is resolved
Complications

Acute
- Pulmonary Embolism

Chronic
- Post-thrombotic Syndrome
Pulmonary emboli

Sudden chest pain & dyspnea
Pulmonary emboli
Pulmonary emboli

Urgently need

ACLS (Oxygen, ? Intubation)
EKG
Chest x-ray
Arterial blood gas

Respiratory alkalosis
↓ pO₂
↓ pCO₂
Wells’ clinical probability score

<table>
<thead>
<tr>
<th>Clinical Characteristics</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active cancer (treatment within 6 mo or palliative)</td>
<td>1</td>
</tr>
<tr>
<td>Surgery or bedridden for $\geq 3$ d during past 4 wk</td>
<td>1.5</td>
</tr>
<tr>
<td>History of deep venous thrombosis or pulmonary embolism</td>
<td>1.5</td>
</tr>
<tr>
<td>Hemoptysis</td>
<td>1</td>
</tr>
<tr>
<td>Heart rate of $&gt;100$ beats/min</td>
<td>1.5</td>
</tr>
<tr>
<td>Pulmonary embolism judged to be the most likely diagnosis</td>
<td>3</td>
</tr>
<tr>
<td>Clinical signs and symptoms compatible with deep venous thrombosis</td>
<td>3</td>
</tr>
</tbody>
</table>

$\geq 4$ points = High probability of having PE
Probability of PE
Using clinical score + D-dimer

<table>
<thead>
<tr>
<th>Clinical score</th>
<th>D-dimer Negative</th>
<th>D-dimer Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 4 points</td>
<td>1.6%</td>
<td>11%</td>
</tr>
<tr>
<td>&gt; 4 points</td>
<td></td>
<td>56%</td>
</tr>
</tbody>
</table>
Assess Clinical Probability score

≤ 4 คะแนน
D-dimer
- Exclude PE

> 4 คะแนน
D-dimer
+ CT Chest
Pulmonary emboli

Treatment = DVT

IV heparin or LMWH

Massive PE with hemodynamic unstable

IV thrombolytic therapy

Against catheter and surgical embolectomy
Caval filter

The Greenfield Filter traps blood clots as they travel up the vena cava preventing them from reaching the lungs. The cone-shaped design allows blood to flow around the captured clot.
Caval filter

Indications

Contraindication for anticoagulant treatment

Complication of anticoagulant treatment

Failure of anticoagulant treatment
Deep Vein Thrombosis

Treatments

- Absolute bed rest 5 days
- Leg elevation
- Anticoagulation
  - Heparin (IV = LMWH), check platelets
  - + Warfarin (PT-INR 2-3)
- Compression stockings
Post-phlebitic syndrome
Post-thrombotic syndrome

No treatment leg edema

At 2 years: 50% developed PTS
24% severe

GCS, 30 – 40 mmHg

At 2 years: 24% developed PTS
<5% severe
Deep Vein Thrombosis

Prophylaxis (?)

Diagnosis - Ultrasound

Management – bed rest
  enoxaparin + warfarin

Warfarin – indefinite (?)

GCS – at least 2 years
Lymphedema

Clinical presentation

Edema – slow, progressive, painless swelling

Skin changes – peau d’orange, pigskin ulcerations are rare
Lymphedema

Causes

Primary - congenital

Secondary – Filariasis
  Lymph node excision ± radiation
  Tumor invasion
  Trauma
  Infection
Thank you