INFRA-POPLITEAL DVT: What Do You DO?

Majdi Ashchi, DO, FACC, FSCAI, FSVM, FABVM

Drashchi@firstcoastheart.com
C (904) 400-3988
W (904) 423-0010

WWW.firstcoastheart.com
DISCLOSURES

• NONE
OBJECTIVES:

Brief Discussion:

- VTE
- Discuss Controversy & Literature About Treatment of Proximal DVT vs Distal DVT (Infra-Popliteal)
- Diagnostics Modalities of DVT
- Epidemiology of VTE
- Risk Factors For VTE
- Guideline for Dx and Treatment of DVT/ VTE
VTE—Venous Thromboembolism

- **VTE**—pathologic thrombosis that occurs within the venous circulation.

- Most common form of VTE is **DEEP VENOUS THROMBOSIS (DVT)** of the lower extremity.

- Most Life threatening manifestation is embolization of thrombus resulting in **Pulmonary Embolism**.

- VTE is often **SILENT** disease.

- Accurate assessment of **clinical symptoms**, **signs**, **risk factors**, and appropriate use of **objective diagnostic tests** is important in the accurate diagnosis, prevention and treatment of VTE.
Epidemiology of VTE

- DVT is a major USA clinical problem
- Incident 500k-2 million cases per year
- ICD-9 for DVT showed 250K admissions per year
- Estimated LOS 24 hours to 7 days.

- Major 3 complications:
  - Recurrent non-fatal VTE
  - Post-thrombotic Syndrome
  - Fatal Pulmonary Embolism
**GOAL** of therapy of DVT is Prevention Of:
- Thrombus propagation
- Thrombus embolization
- Early & Late thrombus recurrence

Proper Anticoagulation is the first critical step in effective treatment of DVT.
- Complications can develop soon after DVT detection which gives a narrow window of opportunity for safe and effective intervention
- Secondary stage of treatment involves maintenance of sufficient anticoagulation to prevent recurrence of DVT
ETIOLOGY- Risk Factors

Virchow’s Triad characterizes the development of thrombosis as a result of a combination of venous stasis, venous endothelial injury & hypercoagulability.

Understanding risks for developing VTE can help determine choice of prevention modalities, as well as diagnosing of VTE when patients present with symptoms & signs of thromboembolic disease.

Risk factors can be both acquired or inherited, & combinations of risk factors are often present.

- Common risk factors:
  1. History of VTE
  2. Immobility
  3. Hospitalization
  4. Surgery
  5. Maliginancy
  6. Infection
  7. Thrombophilia
Virchow’s Triad in 2013

STASIS
- Anesthesia
- Hospitalization
- Immobilization
- CHF/MI
- CVA
- Shock
- Pregnancy
- Obesity

VENOUS endothelial INJURY
- Surgery
- Trauma
- Prior DVT
- Burns
- Fracture

HYPERCOAGULABILITY
- Inherited Coagulopathy
- Acquired Coagulopathy
- Pregnancy/Parturition
- Hormonal Therapy
- Malignancy

Cleveland Clinic JM 1999;66:113-123
<table>
<thead>
<tr>
<th>Risk Factors</th>
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</thead>
<tbody>
<tr>
<td><strong>Immobility</strong></td>
</tr>
<tr>
<td>- Surgery</td>
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<tr>
<td>- Trauma</td>
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<tr>
<td>- Lower Extremity Paresis</td>
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<tr>
<td>- Sedentary LifeStyle</td>
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<td>- Long Distance Travel</td>
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<tr>
<td><strong>Medical Illness</strong></td>
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<tr>
<td>- CHF OSA Cancer Liver Disease</td>
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<tr>
<td>- Nephrotic Syndrome</td>
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<tr>
<td>- Previous Venous Thrombosis</td>
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<tr>
<td>- Obesity</td>
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<tr>
<td>- Autoimmune &amp; Inflammatory Disorder</td>
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<tr>
<td>- Hematologic &amp; Myeloproliferative Disorder</td>
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<tr>
<td>- Polycythemia Vera</td>
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<tr>
<td>- Paroxysmal Nocturnal Hemoglobinuria</td>
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<tr>
<td>- Inherited Or Acquired Thrombophilia</td>
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<tr>
<td>- Factor V leiden mutation</td>
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<tr>
<td>- Prothrombin gene Mutation</td>
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<tr>
<td>- Protein S &amp; C Deficiency</td>
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<td>- Antithrombin III Deficiency</td>
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<td>- HIT</td>
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<tr>
<td>- Aniphospholipid Antibody Syndrome</td>
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<tr>
<td><strong>External Compression Syndromes</strong></td>
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<td>- May-Thurner Syndrome</td>
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<td>- Paget-Schroetter Syndrome</td>
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<td>- Hematoma</td>
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<tr>
<td>- Tumor</td>
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<tr>
<td><strong>Endovascular Devices</strong></td>
</tr>
<tr>
<td>- Central Venous catheters</td>
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<tr>
<td>- Hemodialysis Catheters</td>
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<tr>
<td>- IVCF (risk for DVT)</td>
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<tr>
<td>- Pacemaker/Defibrillator Wires</td>
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<tr>
<td>- Extracorporeal membrane Oxygenation catheters</td>
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<tr>
<td><strong>Demographic/Behavioral</strong></td>
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<tr>
<td>- Age</td>
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<tr>
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<td>- Long distance travel</td>
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<tr>
<td>- Pregnancy</td>
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<tr>
<td><strong>Drug Induced</strong></td>
</tr>
<tr>
<td>- Chemotherapy</td>
</tr>
<tr>
<td>- Estrogen Containing Oral Contraceptives or HRT</td>
</tr>
<tr>
<td>- Selective Estrogen Modulators (eg. Tamoxifen)</td>
</tr>
</tbody>
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Gene-Environment Interactions in Thrombotic Disease

- Factor V Leiden
- Prothrombin Gene mutation
- High Factor VIII levels
- Hyperhomocysteinemia
- Antithrombin deficiency
- Protein C deficiency
- Protein S deficiency
- Dysfibrinogenemia

- Age
  - HRT/OCP
  - CHF/MI
  - Antiphospholipid Antibodies
  - Immobility
  - Cancer
  - Pregnancy
  - Surgery/Trauma
  - Air Travel

Venous Thromboembolism
LOS ANGELES – A spokesman for actress Zsa Zsa Gabor says the actress has been admitted to a Los Angeles hospital for treatment of painful swelling in her legs.

John Blanchette says Gabor was admitted to Ronald Reagan UCLA Hospital earlier today after a doctor visited her at home, and said she had massive blood clots in her legs, which could make her vulnerable to a heart attack.

The 93-year-old Gabor has been hospitalized several times this year, and asked for a priest to read her last rites in August.

Since summer, Gabor has undergone surgery to remove clots from her upper body and has had a hip replacement surgery.
Can u be any healthier?
Signs & Symptoms of DVT

- Majority Of Patients with DVT are **ASYMPTOMATIC**
- Edema
- Erythema
- Tenderness with dorsiflexion of foot (Homan’s sign)
- Calf pain on palpation (Pratt Sign)
  - Both signs have S&S <50%
- Bluish Discoloration
Diagnosis Of DVT (1)

• Traditional Clinical Criteria to diagnose PE and DVT for the lower extremity are neither S nor S and have poor positive predictive value.

• Highest diagnostic accuracy achieved when pretest clinical assessment tools (i.e. Wells criteria) are combined with objective biomarker and image testing in defined management strategies.
Diagnosis Of DVT

Wells Criteria (point system)

- Combining the Wells clinical predicted model with a single duplex us (DUS) is a management strategy that yields a significant improvement on the diagnostic accuracy: Positive pretest probability of venous thromboembolism of
  - 3% in Low risk
  - 16% in Moderate risk
  - 74.6% in High risk
- Patients with Negative US for DVT, frequency of thromboembolic events in 3 months is only 0.6%.
So, How Do You Make the Diagnosis?

Start With Clinical Suspicion

<table>
<thead>
<tr>
<th>Wells’ score for DVT(^4)</th>
<th>Wells’ score for PE(^5)</th>
<th>Revised Geneva score for PE(^12)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Items</strong></td>
<td><strong>Points</strong></td>
<td><strong>Items</strong></td>
</tr>
<tr>
<td>Cancer</td>
<td>+1</td>
<td>Previous PE or DVT</td>
</tr>
<tr>
<td>Paralysis or recent</td>
<td>+1</td>
<td>Heart rate &gt; 100/min</td>
</tr>
<tr>
<td>plaster cast</td>
<td></td>
<td>Previous DVT or PE</td>
</tr>
<tr>
<td>Bed rest &gt; 3 days or</td>
<td>+1</td>
<td>Recent surgery or immobilization</td>
</tr>
<tr>
<td>surgery &lt; 4 weeks</td>
<td></td>
<td>Clinical signs of DVT</td>
</tr>
<tr>
<td>Pain on palpation of</td>
<td></td>
<td>Age &gt; 65 years</td>
</tr>
<tr>
<td>deep veins</td>
<td></td>
<td>Previous DVT or PE</td>
</tr>
<tr>
<td>Swelling of entire leg</td>
<td>+1</td>
<td>Surgery (under general anaesthesia) or fracture (of the lower limbs) within 1 month</td>
</tr>
<tr>
<td>Diameter difference on</td>
<td></td>
<td>Active malignancy (solid or haematological malignancy, currently active or considered as cured since &lt; 1 year)</td>
</tr>
<tr>
<td>affected calf &gt; 3 cm</td>
<td>+1</td>
<td>Unilateral lower limb pain</td>
</tr>
<tr>
<td>Pitting oedema (affected</td>
<td></td>
<td>Haemoptysis</td>
</tr>
<tr>
<td>side only)</td>
<td>+1</td>
<td>Cancer</td>
</tr>
<tr>
<td>Dilated superficial veins</td>
<td></td>
<td>Heart rate 75–94 bpm</td>
</tr>
<tr>
<td>(affected side)</td>
<td>+1</td>
<td>Heart rate &gt; 95 bpm</td>
</tr>
<tr>
<td>Alternative diagnosis at</td>
<td></td>
<td>Pain on lower limb deep vein palpation and unilateral edema</td>
</tr>
<tr>
<td>least as probable as</td>
<td>−2</td>
<td></td>
</tr>
<tr>
<td>DVT</td>
<td></td>
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**Clinical probability**

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<th>Initial rule</th>
<th>Dichotomized rule</th>
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<tbody>
<tr>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Intermediate</td>
<td>1–2</td>
<td>4–10</td>
</tr>
<tr>
<td>High</td>
<td>≥ 3</td>
<td>≥ 11</td>
</tr>
</tbody>
</table>

Unlikely    ≤ 4
Likely      > 4
BLOOD WORK:
D Dimers,
D-Dimer

- Fibrin degradation product elevated in active thrombosis
- ELISA-Enzyme linked immunosorbent assay-most available & validated.
- Clinical value of D-dimer relies on its high negative predictive value.
- D-Dimer level <0.5 ng/dl or less in the setting of a low or intermediate pretest probability (eg Wells score <=2) confers a risk of PE or DVT of less than 1% in 3 months.
- Positive D-Dimer with a high pretest probability for PE or DVT, should prompt the clinician to proceed with imaging.
Duplex Ultrasound

- Reliable method for evaluating symptomatic proximal DVT. It is considered diagnostic for proximal DVT.
- Several criteria but **Non compressibility** is the most accurate diagnostic feature with >95% S&S when compared to venography.
- DUS is less reliable in diagnosis of isolated calf DVT, with S & S <70%.

Minimal compression of an enlarged right common femoral vein characteristic of an acute DVT.

Clot

Vein
Contrast Venography

- Reference standard
- Invasive so less favored
- Useful in areas where DUS shown poor diagnostic accuracy (IVC, Iliac Vein, Calf veins)
- Can cause nephropathy, Induced superficial thrombophlebitis, DVT, and can be used with dye limitation and limb limitation.
CTV : LEFT LEG DVT
CTV - computed Tomography Venography

- Used or preferred when DUS is non-diagnostic
- Similar to MRV in showing anatomy veins etc.
- NOT first line role diagnostic study for DVT
- Significant External Beam Radiation
- Preferred for lungs in PE (superior to V/Q scan)
- Contra-indicated in renal failure, DM, CHF
MRV : LEG DVT
MRV-Magnetic Resonance Venography

- Comparable to angiography in S&S
- Used where DUS is not preferred or less sensitive
- MRV allow simultaneous leg imaging
- Provides accurate venous flow information i.e. Iliac veins, IVC (central venous anatomy)
- Aids to differentiate Acute from remote DVT.
- 10% of patients can not have it due to metals in body or claustrophobia.
Selective d-Dimer Testing for Diagnosis of a First Suspected Episode of Deep Venous Thrombosis
A Randomized Trial

Lori-Ann Linkins, MD; Shannon M. Bates, MDCM; Eddy Lang, MDCM; Susan R. Kahn, MD; James D. Douketis, MD; Jim Julian, MMath; Sameer Parpila, PhD; Peter Gross, MD; Jeffrey I. Weitz, MD; Frederick A. Spencer, MD; Agnes Y.Y. Lee, MD; Martin J. O’Donnell, PhD; Mark A. Crowther, MD; Howard H. Chan, MD; Wendy Lim, MD; Sam Schulman, MD; Jeffrey S. Ginsberg, MD; and Clive Kearon, MD

Background: d-Dimer testing is sensitive but not specific for diagnosing deep venous thrombosis (DVT). Changing the use of testing and the threshold level for a positive test result on the basis of risk for DVT might improve the tradeoff between sensitivity and specificity and reduce the need for testing.

Objective: To determine whether using a selective d-dimer testing strategy based on clinical pretest probability (C-PTP) for DVT is safe and reduces diagnostic testing compared with using a single d-dimer threshold for all patients.

Design: Randomized, multicenter, controlled trial. Patients were allocated using a central automated system. Ultrasonographers and study adjudicators but not other study personnel were blinded to trial allocation. (ClinicalTrials.gov: NCT00157677)

Setting: 5 Canadian hospitals.

Patients: Consecutive symptomatic patients with a first episode of suspected DVT.

Intervention: Selective testing (n = 860), defined as d-dimer testing for outpatients with low or moderate C-PTP (DVT excluded at d-dimer levels <1.0 μg/mL [low C-PTP] or <0.5 μg/mL [moderate C-PTP]) and venous ultrasonography without d-dimer testing for outpatients with high C-PTP and inpatients, or uniform testing (n = 863), defined as d-dimer testing for all participants at d-dimer levels <0.5 μg/mL.

Measurements: The proportion of patients not diagnosed with DVT during initial testing who had symptomatic venous thromboembolism during 3-month follow-up and the proportion of patients undergoing d-dimer testing and ultrasonography.

Results: The incidence of symptomatic venous thromboembolism at 3 months was 0.5% in both study groups (difference, 0.0 percentage point [95% CI, −0.8 to 0.8 percentage points]). Selective testing reduced the proportion of patients who required d-dimer testing by 21.8 percentage points (CI, 19.1 to 24.8 percentage points). It reduced the proportion who required ultrasonography by 7.6 percentage points (CI, 2.9 to 12.2 percentage points) overall and by 21.0 percentage points (CI, 14.2 to 27.6 percentage points) in outpatients with low C-PTP.

Limitation: Results may not be generalizable to all d-dimer assays or patients with previous DVT, study personnel were not blinded, and the trial was stopped prematurely.

Conclusion: A selective d-dimer testing strategy seems as safe as and more efficient than having everyone undergo d-dimer testing when diagnosing a first episode of suspected DVT.

Primary Funding Source: Heart and Stroke Foundation of Ontario.
DVT: proximal vs Distal

- **PROXIMAL:** located in the popliteal, femoral, or iliac veins.

- **DISTAL:** Isolated distal DVT encompasses those located below the knee in the calf veins. (popliteal vein is not involved). Most calf DVT are located in the posterior Tibial and peroneal veins while AT vein and muscular vein DVTs are uncommon.
INFRAPOPLITEAL DVT (distal), DOES IT EVEN MATTER AND SHOULD WE TREAT IT ???
Infra-Popliteal DVT

In a patient with a below knee venous thrombosis, is oral anticoagulation necessary to prevent a pulmonary embolus?
We All Know and agree, DVT is a common problem among hospitalized & Recently discharged patients.

Proximal DVT requires therapy due to prohibitive risk of propagation with just surveillance.

Indication to anticoagulate for proximal DVT is stronger than proximal because risk of complications is higher, especially embolization and death. 90% of acute PE arise from proximal veins.

OPTIMEDV Study showed mortality rate for proximal DVT is higher than for distal DVT (8 vs 4).

Lancet 1974; 1:258
Acta Chir Scand Supp 1977;478: 1
Thromb Haemost 2009; 102: 493
Anticoagulation of acute DVT resulted in dramatic reduction in recurrence and mortality benefit.

Meta-analysis of 13 prospective cohort studies and 56 randomized clinical trials reported recurrent VTE and fatal VTE during first three months of anticoagulant therapy as 3.4 vs 0.4 %.
Distal or Infrapopliteal DVT

- What about calf DVT? Why Should we even care?
- Many Vascular Laboratories or hospitals do NOT perform tibial vein duplex ultrasound as part of the imaging protocol.
- Literature here is NOT as clear cut
- Need to differentiate symptomatic from asymptomatic
- **Symptomatic** Distal DVT
  - Most clinicians agree that anticoagulation is indicated in isolated DVT provided risk of bleeding is **low**.
    - Chest 2012; 141: e419S.
    - Blood 2014; 124: 196
    - Chest 2014; 146: 1468
Distal DVT: Indication for anticoagulation (both 1)

Asymptomatic distal DVT

- DVT extension into or toward the proximal vein during surveillance
- Patient considered by clinician to be at risk for extension to the proximal veins which includes:
  - Unprovoked DVT
  - D-Dimer >500 mg/ml
  - Extensive thrombosis involving multiple veins (>5cm length and >7mm in diameter)
  - Thrombosis close to the proximal veins.

Symptomatic distal DVT who opted for surveillance

- (Continue)
  - Inpatient status
  - Prolonged immobility
  - Prior DVT or Pulmonary Embolism
  - Persistent/Irreversible Risk factors such as active cancer.

- Chest 2012; 141: e419S.
Distal DVT - indications to anticoagulation (both 2)

- Support for above anticoagulation is based on risk of extension into proximal veins where anticoagulation has stronger indication due to higher risk for embolization and proven efficacy in this population in reducing clot extension.

- Natural History suggest that when left untreated, 1/3 with **symptomatic** isolated distal DVT will develop extension into proximal veins, most often within first two weeks after diagnosis.
  - Circulation 2003;107:122
# 6 Randomized Controlled Trials for Calf DVT

<table>
<thead>
<tr>
<th>Author</th>
<th>Type of study</th>
<th>Aim</th>
<th>Endpoint</th>
<th>Findings/comments:</th>
<th>% Major bleeding</th>
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<tbody>
<tr>
<td>Hull (1979)</td>
<td>RCT</td>
<td>Compared warfarin with low-dose heparin subcutaneous for 6 weeks; all preceded by heparin IV for 14 days.</td>
<td>Recurrence</td>
<td>Subgroup analysis of C-DVT patients showed no difference between either therapy.</td>
<td>NR</td>
</tr>
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<td>Bently (1980)</td>
<td>RCT</td>
<td>Compared heparin IV vs subcutaneous for 7 days, measuring safety and efficacy</td>
<td>Proximal extension, PE during surveillance, bleeding</td>
<td>Subcutaneous heparin resulted in lower propagation rates than IV heparin. No difference found with PE rates.</td>
<td>6/100 (6%)</td>
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<td>Lagerstedt (1985)</td>
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<td>All received heparin IV for 5 days, then compared warfarin vs no warfarin</td>
<td>Recurrence</td>
<td>Recurrences within 90 days was lower in group receiving warfarin for at least 3 months, as opposed to no warfarin.</td>
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<td>In low-risk population, did not show superiority of LMWH over compression therapy in calf muscle DVT.</td>
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C-DVT: Calf deep vein thrombosis; DVT, deep vein thrombosis; IV, intravenous; LMWH, low-molecular-weight heparin; NR, not reported; PE, pulmonary emboli; RCT, randomized controlled trial.
Meta-analysis of 2 R & 6 non-R trials

- Patients with isolated distal DVT
- Compared those who were followed with serial DUS
- Anticoagulated patients were less likely to have proximal DVT propagation (odd ratio 0.29, 95% CI).
- However, methodologic quality of most studies was poor and the number of outcome events that occurred (death, PE, proximal DVT extension, bleeding) was small, which limited the analysis.

GUIDELINES of Infrapopliteal tx

- Isolated calf DVT can be managed with serial duplex US surveillance or anticoagulated??
  - TRUE
  - FALSE
2.3.1. In patients with acute isolated distal DVT of the leg and without severe symptoms or risk factors for extension, we suggest serial imaging of the deep veins for 2 weeks over initial anticoagulation (Grade 2C).

2.3.2. In patients with acute isolated distal DVT of the leg and severe symptoms or risk factors for extension (see text), we suggest initial anticoagulation over serial imaging of the deep veins (Grade 2C).
Current Management of DVT

Diagnosis of DVT

- IVC Filter:
  - Contraind. to Anticoag.
  - Protection during Lysis

Anticoagulation

Distal (Calf Vein)
- Serial DUS to Exclude Propagation

Iliac/CFV
- Pharmacologic Lysis (no contraind.)
- Mechanical Thrombectomy
  - (± Lysis)
- Iliac Stent (if residual stenosis)
- Surgical Thrombectomy
  - Failed Lysis
  - Contraind. to Lysis
  - Failed Thrombectomy
Anticoagulation VS Surveillance

**Anticoagulation**
- Reduce risk of propagation/embolization
- No Need for Multiple return visits for DUS
- ? Reduction in long term symptoms of venous insufficiency

**Surveillance**
- NO risk of anticoagulant induced hemorrhage
- Able to keep close tabs on the patient/symptoms
- Risk of propagation/embolization is low.
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*C-DVT*: calf deep vein thrombosis; *IV*: intravenous; *LMMH*: low-molecular-weight heparin; *NR*: not reported; *PE*: pulmonary emboli; *RCT*: randomized controlled trial.
Level of propagation with no anticoagulation. DVT, Deep vein thrombosis; PE, pulmonary embolism. *Calf DVT propagated within the axial calf veins or muscular veins.
Etiology (risk assessment 3)

- ACCP 2008 Guidelines for prevention of VTE advocate for a group specific approach to VTE risk assessment by assigning risk according to the type of surgery, mobility, & individual risk factors (see table of risk factors).

- Caprini Risk Assessment Model
  - Validated via general & urological surgical populations
    - Semin Thromb Hemost 1991;17(suppl 3):304-312

- Rogers Score For Surgical Patients.
  - Cumbersome risk assessment tool & has not been validated.
Risk Stratification for VTE

- **LOW risk**
  - Mobile patient, having minor surgery
  - Medical patient who is fully ambulatory
  - <10% without thrombophylaxis

- **MODERATE**
  - Patients undergoing general, open gynecologic or urologic surgery
  - Medically Ill patients with =>2 risk factors
  - 10-40% risk of VTE without thrombophylaxis.

- **HIGH**
  - Patient with hip, knee replacement, fractured hip surgery
  - Major Trauma, acute spinal cord injury, major cancer surgery
  - 40-80% risk for VTE without thrombophylaxis
WHO Might get surveillance or Anticoagulation?

- **Surveillance**
  - Recent Surgery & risk of bleeding
  - Inherent Contraindication to anticoagulation
  - Medication compliance issues or questioned
  - Patient preference.

- **Anticoagulation**
  - Remote location to vascular laboratory
  - No direct contraindication
  - Significant Limb pain/swelling
  - Prior History of VTE/known thrombophilia
  - Patient preference
Evaluation of Surveillance Bias and the Validity of the Venous Thromboembolism Quality Measure

Karl Y. Bilimoria, MD, MS; Jeanette Chung, PhD; Mila H. Ju, MD; Elliott R. Haut, MD; David J. Bentrem, MD, MS; Clifford Y. Ko, MD, MS; David W. Baker, MD, MPH

From: Evaluation of Surveillance Bias and the Validity of the Venous Thromboembolism Quality Measure


Figure Legend:

Mean Risk-Adjusted Event Rates by Imaging Use Rate Quartile: VTE indicates venous thromboembolism; DVT, deep vein thrombosis; and PE, pulmonary embolism. For all panels, P<0.001 by trend and pairwise for comparison of differences in rates for quartile 4 (highest) compared with each other quartile. Numbers in parentheses under the x-axes represent number of hospitals. Error bars indicate 95% CIs around the interquartile means.

Date of download: 1/11/2015

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Better Quality Duplex US studies, More DVT found, better patient care but quality of hospital care or rating for finding more DVT may suffer!!!!
Medicare CMS considers this DVT a preventable event and can eventually penalize u payment wise.

DO Hospitals that are more aggressive with surveillance penalized for higher DVT event rates?
DVT: Surveillance with DUS

• The optimal frequency, duration and method of surveillance are unknown

• Patients may have surveillance:
  • High risk for bleeding or those with preference

• Support for surveillance comes from studies that suggest that the risk for embolization of isolated distal DVT is low and approximately half of that of proximal DVT.
  • BMJ :2011; 342: d3036
DVT: Surveillance with DUS 1( support for surveillance)

- Prospective observational and retrospective studies reported that limited thrombosis muscular veins compared with extensive thrombosis of multiple calf veins has low risk of extension without therapy (3 vs 15%). Also, if extension does not occur within two weeks, it is unlikely to occur.
  - J Vasc Surg 2010;52 :1246 & 1251
  - J Vasc Sur 2003; 37: 523
Outpatient Surveillance Protocol of Isolated Calf Deep-Vein Thrombosis

Samantha Cox, DO; John A. Moawad, MD; Lee A. Marshall, BSN, RN; Drazen Petrinec, MD; Joseph McShannic, MD; John A. Fink, MD

- Retrospective review of a prospective DUS surveillance program for C-DVT
- 168 patients
- Surveillance program—3 DUS exams
  - 1st: 3 days
  - 2nd: 10 days
  - 3rd: 30 days

Indications for duplex ultrasound (n = 168)

<table>
<thead>
<tr>
<th>Indication</th>
<th>n</th>
</tr>
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<tbody>
<tr>
<td>Pain and edema</td>
<td>64</td>
</tr>
<tr>
<td>Pain</td>
<td>62</td>
</tr>
<tr>
<td>Edema</td>
<td>35</td>
</tr>
<tr>
<td>Discoloration</td>
<td>1</td>
</tr>
<tr>
<td>Unknown</td>
<td>6</td>
</tr>
</tbody>
</table>

Location of isolated calf deep-vein thrombosis

<table>
<thead>
<tr>
<th>Location</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soleal</td>
<td>77 (45)</td>
</tr>
<tr>
<td>Peroneal</td>
<td>67 (39)</td>
</tr>
<tr>
<td>Gastrocnemius</td>
<td>49 (29)</td>
</tr>
<tr>
<td>Posterior tibial</td>
<td>40 (23)</td>
</tr>
</tbody>
</table>

There is No standard protocol
Outpatient Surveillance Protocol of Isolated Calf Deep-Vein Thrombosis

Samantha Cox, DO; John A. Moawad, MD; Lee A. Marshall, BSN, RN; Drazen Petrinic, MD; Joseph McShannic, MD; John A. Fink, MD

- Mean age 63 years/41% male/88% Caucasian
- Risk factors
  - Recent surgery
  - Malignancy
  - Travel
Outpatient Surveillance Protocol of Isolated Calf Deep-Vein Thrombosis

Samantha Cox, DO; John A. Moawad, MD; Lee A. Marshall, BSN, RN; Drazen Petrinec, MD; Joseph McShannic, MD; John A. Fink, MD

<table>
<thead>
<tr>
<th>Analysis</th>
<th>n (%)</th>
<th>Day 2–15</th>
<th>Day 16–30</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticoagulated</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New thrombus formation</td>
<td>38 (23)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Propagation</td>
<td>2 (1.19)</td>
<td></td>
<td>1.2%</td>
<td>0.60%</td>
</tr>
<tr>
<td>Embolization</td>
<td>3 (1.79)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not anticoagulated</td>
<td>130 (77)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New thrombus formation</td>
<td>21 (12.50)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Propagation</td>
<td></td>
<td>14 (8.33)</td>
<td>7.1%</td>
<td>1.2%</td>
</tr>
<tr>
<td>Embolization</td>
<td></td>
<td>1 (0.60)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

New thrombus formation 130 (77)  0.1471
Propagation 130 (77) 0.8328
Embolization 130 (77) 0.0537
Treatment

- Unfractionated heparin
- LMWH & Fondaparinux
- Warfarin (coumadin)
- Catheter Directed Thrombolysis
- IVCF
- Mechanical Thrombectomy (Angiojet, Trellous, Angiovac etc)
- Ambulation (early)
- Chronic DVT (Compression therapy) - to avoid Post Phlebetic Syndrome
- New Oral Antithrombotic Agents
  - Dabigatran
  - Rivaroxaban
  - Apixaban
  - Savysa