Treatment of Extensive Iliofemoral DVT: Treatment Options & Review of Evidence

Brian G. DeRubertis, M.D.
Associate Professor of Surgery
Division of Vascular Surgery
University of California Los Angeles
Deep Venous Thrombosis: A Common Problem

- Approximately 500,000 cases per year\(^1\)
- Mortality estimates: 50,000-100,000 / year
  - Likely underestimates the incidence
  - Autopsy series: 39-50% of pts diagnosed ante-mortem
- Leading cause of preventable in-hospital death
- U.S. Cost is $1.2-2.4 billion annually\(^2\)

\(^1\) National Inpatient Sample Data

Deep Venous Thrombosis: Current Treatment Algorithm

Diagnose VTE With Non-Invasive Imaging: Duplex, CT

Anti-coagulate with Heparin (Fractionated Vs Unfractionated) Followed by Coumadin

Anti-coagulate for 3-6 months

Monitor INRs
Benefits of Anti-coagulation for DVT

- Prevents clot propagation and PE
- Decreases the incidence of recurrent DVT and PE depending on the length of anti-coagulation.
- May decrease the incidence of PTS if INRs are very tightly controlled
Deep Venous Thrombosis: Current Treatment Algorithm

Limitations of Anti-coagulation for DVT

- Not all VTEs have the same biologic behavior
  - Calf vein, gastrocnemius, ilio-femoral

- Anti-coagulation does not:
  - Lyse or accelerate clot dissolution
  - Decrease symptoms of pain and swelling
  - Prevent vein wall damage or the development of reflux or obstruction
  - Prevent the development of post-thrombotic syndrome
Sequelae of Deep Venous Thrombosis

Established Risk-Factors for Post-thrombotic Syndrome

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Relative Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recurrent Ipsilateral DVT</td>
<td>5-10</td>
</tr>
<tr>
<td>Proximal DVT (iliofemoral veins)</td>
<td>2-6</td>
</tr>
<tr>
<td>Obesity (BMI &gt; 30kg/m²)</td>
<td>2</td>
</tr>
</tbody>
</table>

Numerous large studies with consistently shown associations

Rabinovich A, Kahn SR. Systematic Review of Predictors of PTS. Pol Arch Med 2014
### Possible Risk-Factors for Post-thrombotic Syndrome

<table>
<thead>
<tr>
<th>Risk Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Older age</td>
</tr>
<tr>
<td>Female sex</td>
</tr>
<tr>
<td>Residual DVT symptoms &gt; 1 mo post-DVT diagnosis</td>
</tr>
<tr>
<td>Presence of Varicose veins prior to DVT</td>
</tr>
<tr>
<td>Residual thrombosis or valvular reflux</td>
</tr>
<tr>
<td>Sub-therapeutic INR; Vit K antagonists (vs LMWK)</td>
</tr>
<tr>
<td>Persistently elevated D-dimers</td>
</tr>
</tbody>
</table>

*Fewer studies, small studies, and inconsistent associations*

Rabinovich A, Kahn SR. Systematic Review of Predictors of PTS. *Pol Arch Med* 2014
Sequelaes of Deep Venous Thrombosis

<table>
<thead>
<tr>
<th>Follow up</th>
<th>Incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Year</td>
<td>17.3%</td>
</tr>
<tr>
<td>2 Years</td>
<td>23%</td>
</tr>
<tr>
<td>5 Years</td>
<td>28%</td>
</tr>
<tr>
<td>8 Years</td>
<td>29%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Follow up</th>
<th>Incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 years</td>
<td>47%</td>
</tr>
</tbody>
</table>

Risk of developing PTS increases as time from diagnosis increases
Sequelae of Deep Venous Thrombosis

Can Post-thrombotic Syndrome be Prevented???

Rationale for strategy of aggressive thrombus removal:

- Reduce incidence of post-thrombotic venous occlusive disease
- Prevent valvular damage and chronic venous insufficiency

**Outcomes**: (Treatment vs. Control)
- Complete Clot Lysis (6 studies): RR 0.24 (early f/u); 0.37 (late f/u)
- Venous Patency (7 studies): RR 0.44
- **Post-Thrombotic Syndrome** (2 studies): RR 0.66
- Bleeding Complication (12 studies): RR 1.73

**Conclusion**:
- Thrombolysis reduces PTS and helps maintain venous patency

**Problems**:
- Increased risk of bleeding complications
- Only 1 study with local (catheter-directed) thrombolysis
Technique:
- Percutaneous access: popliteal approach/duplex guidance
- Embed catheter in thrombus
- Initiation of ongoing lysis (0.5mg-2mg/hr continuous gtt)
- ICU monitoring
  - CBC, PT/PTT, fibrinogen
- Repeat lysis checks

Aggressive Thrombus Removal

Catheter-directed Thrombolysis

EKOS Ultrasound-Accelerated Thrombolysis
Aggressive Thrombus Removal

*Catheter-directed Thrombolysis*

AbuRahma et al, 2001 *Ann Surg*

- Nonrandomized retrospective study
- Anticoagulation (33pts) vs Lysis+/-stenting (18pts)
- 12-mo Iliofemoral Patency Rates: 24% vs 83%

- Nonrandomized retrospective study
- HRQOL survey post-anticoagulation (30pts) or post-CDT (68pts)
- CDT patients had significantly improved:
  - Overall physical functioning (p=0.046)
  - Less venous stigma (p=0.033)
  - Decreased health distress (p=0.022)
  - Fewer post-thrombotic symptoms (p=0.006)
### Table. Review of 20 studies of catheter-directed thrombolysis for acute DVT

<table>
<thead>
<tr>
<th>Author, year</th>
<th>Patients (limbs)</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semba (1996)</td>
<td>32 (41)</td>
<td>CDT with UK, angio/stenting</td>
</tr>
<tr>
<td>Bjarnason (1997)</td>
<td>77 (87)</td>
<td>CDT with UK, angio/stenting, thrombectomy,</td>
</tr>
<tr>
<td>Mewissen (1999)</td>
<td>287 (312)</td>
<td>CDT with UK, stenting, systemic lysis</td>
</tr>
<tr>
<td>Comerota (2000)</td>
<td>54</td>
<td>CDT with UK, rt-PA, thrombectomy</td>
</tr>
<tr>
<td>AbuRahma (2001)</td>
<td>51</td>
<td>13 51 CDT w/ UK, rt-PA, stenting</td>
</tr>
<tr>
<td>Elsharawy (2002)</td>
<td>35</td>
<td>CDT w/ streptokinase, angio/stenting</td>
</tr>
<tr>
<td>Grunwald (2004)</td>
<td>74 (82)</td>
<td>CDT with UK, tPA, rPA, angio/stenting</td>
</tr>
<tr>
<td>Laiho (2004)</td>
<td>32</td>
<td>CDT with rt-PA or systemic lysis with rt-PA</td>
</tr>
<tr>
<td>Sillesen (2005)</td>
<td>45</td>
<td>CDT with rt-PA, angio/stenting</td>
</tr>
<tr>
<td>Jackson (2005)</td>
<td>28</td>
<td>CDT with UK or rPA, stenting</td>
</tr>
<tr>
<td>Kim (2006)</td>
<td>37 (45)</td>
<td>CDT with UK or CDT PMT</td>
</tr>
<tr>
<td>Lin (2006)</td>
<td>93 (98)</td>
<td>CDT with rPA, rt-PA, or UK, angio/stenting or PMT with rPA, rt-PA, orUK, angio/stenting</td>
</tr>
<tr>
<td>Protack (2007)</td>
<td>69</td>
<td>CDT with UK, tPA, Retavase, PMT, stenting</td>
</tr>
<tr>
<td>Arko (2007)</td>
<td>30</td>
<td>PMT with tenecteplase</td>
</tr>
<tr>
<td>Martinez (2008)</td>
<td>52</td>
<td>CDT with rt-PA, or ISPMT with rt-PA</td>
</tr>
<tr>
<td>Parikh (2008)</td>
<td>47 (53)</td>
<td>CDT, US-accelerated catheter with UK, rPA, tPA, tenecteplase, stenting, AVF</td>
</tr>
<tr>
<td>Rao (2009)</td>
<td>43</td>
<td>PMT in patients with contraindication to lysis</td>
</tr>
<tr>
<td>Baekgaard (2009)</td>
<td>101 (103)</td>
<td>CDT with rt-PA, stenting, stockings, anticoagulation</td>
</tr>
<tr>
<td>Enden (2009)</td>
<td>50</td>
<td>CDT, angio/stenting</td>
</tr>
</tbody>
</table>
Multicenter randomized trial funded by NIH National Heart, Lung, and Blood Institute

Acute Venous Thrombosis: Thrombus Removal with Adjunctive Catheter-Directed Thrombolysis

28 U.S. Centers will enroll 692 patients

Pharmacomechanical Catheter Directed Thrombolysis (Alteplase) vs. standard DVT treatment

Enrollment ongoing in U.S., results not yet available

CaVenT Study

- **Catheter-directed Venous Thrombolysis** in Acute Iliofemoral Vein Thrombosis

- Study Design:
  - Multicenter: 200 pts @ 24 Norway Hospitals
  - Randomized controlled clinical trial
  - Conventional therapy alone (anticoagulation) vs. catheter-directed therapy + conventional Rx

<table>
<thead>
<tr>
<th></th>
<th>CDT</th>
<th>Anticoagulation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Iliofemoral patency (6m)</td>
<td>58</td>
<td>65.9%</td>
</tr>
<tr>
<td>PTS (6m)</td>
<td>27</td>
<td>30.3%</td>
</tr>
<tr>
<td>PTS (24m)</td>
<td>37</td>
<td>41.1%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Patency Rates (from RCTs)</th>
<th>Lysis</th>
<th>Anticoag</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elsharawy et al</td>
<td>72%</td>
<td>12%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Eur J Vasc Endovasc Surg 2002; 24:209 (N=35) (6 month)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enden et al</td>
<td>64%</td>
<td>36%</td>
<td>0.004</td>
</tr>
<tr>
<td>Plate et al</td>
<td>83%</td>
<td>41%</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Eur J Vasc Endovasc Surg 1997; 14:367 (N=30) (10 Years)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enden et al.(CaVenT Trialists)</td>
<td>65.9</td>
<td>47.4%</td>
<td>&lt;0.012</td>
</tr>
</tbody>
</table>
Aggressive Thrombus Removal
Catheter-directed Thrombolysis

<table>
<thead>
<tr>
<th>Normal Valve Function at 6mo (from RCTs)</th>
<th>Lysis</th>
<th>Anticoag</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elsharawy et al Eur J Vasc Endovasc Surg 2002; 24:209 (N=35)</td>
<td>89%</td>
<td>59%</td>
<td>0.041</td>
</tr>
<tr>
<td>Enden et al J Thromb Haemost 2009; 7:1268 (N=103)</td>
<td>40%</td>
<td>34%</td>
<td>0.53</td>
</tr>
</tbody>
</table>
Saline jets travel backwards at half the speed of sound (150 m/s) to create a low pressure zone. Thrombus is drawn into the catheter where it is fragmented by the jets and evacuated from the body.
Aggressive Thrombus Removal
Pharmacomechanical Thrombectomy

Trellis Peripheral Infusion System

6/8Fr Multi-Lumen Catheter
Inflation/Infusion Ports
Oscillation Drive Unit
Aspiration Port
Speed control (500 - 3,000 rpm)
Isolated Treatment Zone
Pre-shaped sinusoidal wave assists in dispersion of drug
Percutaneous AngioJet Thrombectomy in the Management of Extensive Deep Venous Thrombosis
Kasirajan et al, J Vasc Interv Radiol 2001

- 17 patients (14 women; mean age, 41yr.)
- 35% had contraindications to lytic therapy
- >90% thrombus removal 24%
- 50%–90% thrombus removal 35%
- <50% thrombus removal 41%

Symptomatic improvement: 82%
# Aggressive Thrombus Remover

## Pharmacomechanical Thrombectomy

**Catheter-Direct Thrombolysis versus Pharmacomechanical Thrombectomy for Treatment of Symptomatic Lower Extremity Deep Venous Thrombosis**


<table>
<thead>
<tr>
<th></th>
<th>PMT therapy</th>
<th>CDT therapy</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of patients</td>
<td>49</td>
<td>44</td>
<td>n/a</td>
</tr>
<tr>
<td>No. of treated limbs</td>
<td>52</td>
<td>46</td>
<td>n/a</td>
</tr>
<tr>
<td>Mean age (yr)</td>
<td>45 ± 12</td>
<td>49 ± 10</td>
<td>NS</td>
</tr>
<tr>
<td>Male (%)</td>
<td>22 (45%)</td>
<td>19 (43%)</td>
<td>NS</td>
</tr>
<tr>
<td>Mean thrombus age (day)</td>
<td>13 ± 3.2</td>
<td>15 ± 2.4</td>
<td>NS</td>
</tr>
<tr>
<td>Complete treatment success</td>
<td>39 (75%)</td>
<td>32 (70%)</td>
<td>NS</td>
</tr>
<tr>
<td>Partial treatment success</td>
<td>13 (25%)</td>
<td>14 (30%)</td>
<td>NS</td>
</tr>
<tr>
<td>Clinical improvement</td>
<td>42 (81%)</td>
<td>33 (72%)</td>
<td>NS</td>
</tr>
<tr>
<td>Adjuvant venous PTA/stent</td>
<td>43 (82%)</td>
<td>36 (78%)</td>
<td>NS</td>
</tr>
</tbody>
</table>
Catheter-Direct Thrombolysis versus Pharmacomechanical Thrombectomy for Treatment of Symptomatic Lower Extremity Deep Venous Thrombosis


<table>
<thead>
<tr>
<th></th>
<th>PMT therapy</th>
<th>CDT therapy</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean ICU stay (day)</td>
<td>0.6 ± 0.3</td>
<td>2.4 ± 1.2</td>
<td>&lt; 0.04</td>
</tr>
<tr>
<td>Overall hospital length of stay (day)</td>
<td>4.6 ± 1.3</td>
<td>8.4 ± 2.3</td>
<td>&lt; 0.02</td>
</tr>
<tr>
<td>Hemorrhagic complication</td>
<td>2 (4%)</td>
<td>3 (6%)</td>
<td>NS</td>
</tr>
<tr>
<td>PRBC transfusion (u)</td>
<td>0.2 ± 0.3</td>
<td>1.2 ± 0.7</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Author</td>
<td>Pts</td>
<td>Technique</td>
<td>Duration</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----</td>
<td>-----------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>Kasirajan (2001)</td>
<td>17</td>
<td>Angiojet + CDT</td>
<td>20 h</td>
</tr>
<tr>
<td>Vendanathan (2002)</td>
<td>20</td>
<td>Amplatz, Angiojet, Teratola + CDT</td>
<td>23 h</td>
</tr>
<tr>
<td>Vendanathan (2004)</td>
<td>18</td>
<td>Helix + CDT</td>
<td>25 h</td>
</tr>
<tr>
<td>Kim (2006)</td>
<td>27</td>
<td>Angiojet + CDT</td>
<td>26 h</td>
</tr>
<tr>
<td>Cynamon (2006)</td>
<td>24</td>
<td>Angiojet (Power pulse)</td>
<td>3.25 h</td>
</tr>
<tr>
<td>Lin (2006)</td>
<td>49</td>
<td>Angiojet (Power pulse)</td>
<td>76 min</td>
</tr>
<tr>
<td>O’ Sullivan (2007)</td>
<td>19</td>
<td>Trellis-8</td>
<td>91 min</td>
</tr>
<tr>
<td>Arko (2007)</td>
<td>30</td>
<td>Trellis-8, Angiojet (Power pulse)</td>
<td>145 min</td>
</tr>
</tbody>
</table>
Conclusions

- While medical therapy is appropriate treatment for patients with DVT, anticoagulation alone results in high rates of post-thrombotic syndrome and permanent disability.
- High quality evidence for catheter directed thrombolysis and pharmacomechanical thrombectomy is limited but improving, and suggests that these techniques can decrease the sequelae of extensive iliofemoral DVT.
- Young, active patients with acute proximal iliofemoral DVT should be considered for an aggressive strategy of thrombus removal.
Thank You
Deep Venous Thrombosis

- Virchow’s Triad (1856)
  - Vessel wall injury
  - Hypercoagulability
  - Stasis

Thrombus Formation
- Initiation
- Propagation
- Termination
<table>
<thead>
<tr>
<th>Treatment Algorithm</th>
<th>Dose and Administration</th>
</tr>
</thead>
</table>
| **Unfractionated Heparin** | - 80 units/kg IV bolus  
- 18 units/kg IV gtt  
- Adjusted to aPTT 60-80 sec |
| **Low Molecular Weight Heparin** | - Enoxaparin 1 mg/kg SQ daily  
- Dalteparin 200 units/kg SQ daily  
- Predictable bioavailability, no monitoring required |
| **Heparin analog (Fundaparinux)** | - <50 kg: 5 mg SQ daily  
- 50-100 kg: 7.5 mg SQ daily  
- >100 kg: 10 mg SQ daily |
| **Vitamin K antagonist (Warfarin)** | - Dose daily for INR 2.0-3.0  
--------------------  
- Factor Xa inhibitor  
  - (Xarelto [Rivaroxaban])  
- Direct Thrombin inhibitor  
  - (Pradaxa [Dabigatran]) |
Sequelae of Deep Venous Thrombosis

Post-thrombotic Syndrome

Most common complication following iliofemoral DVT
Complete clot clearance in <50% with anticoagulation

Incidence:
- Symptomatic DVT: 25-50%
- Asymptomatic DVT: up to 30%
- 5-8% of DVT pts will develop ulcers/LDS

Mechanism:
- Acute thrombotic occlusion → Inflammatory destruction of valves
- Post-thrombotic stenoses and occlusions

→ Venous insufficiency / Venous hypertension
Sequelae of Deep Venous Thrombosis

**Post-thrombotic Syndrome**

<table>
<thead>
<tr>
<th>Leg symptoms</th>
<th>Signs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heaviness</td>
<td>Oedema</td>
</tr>
<tr>
<td>Pain</td>
<td>Peri-malleolar</td>
</tr>
<tr>
<td>Swelling</td>
<td>telangiectasiae</td>
</tr>
<tr>
<td>Itching</td>
<td>Venous ectasia</td>
</tr>
<tr>
<td>Cramps</td>
<td>Hyperpigmentation</td>
</tr>
<tr>
<td>Paresthesia</td>
<td>Redness</td>
</tr>
<tr>
<td>Bursting pain</td>
<td>Dependent cyanosis</td>
</tr>
<tr>
<td></td>
<td>Lipodermatosclerosis</td>
</tr>
<tr>
<td></td>
<td>Healed ulcer</td>
</tr>
<tr>
<td></td>
<td>Open ulcer</td>
</tr>
</tbody>
</table>

**Symptom pattern**
- Worse with activity, standing, walking
- Better with rest, recumbency

Significant impact on quality of life and significant societal costs
- ~$200 million yearly, $8000/pt with venous ulcers

Kahn SR, Br J Haematology, 2006
Aggressive Thrombus Removal: Catheter-directed Thrombolysis

EKOS Ultrasound-Accelerated Thrombolysis

Catheter directed lytic therapy
6 F catheter system with multiple treatment zone lengths
Guidewire exchanged for ultrasonic wire
Infusion port for TPA gtt
Coolant port for heparinized saline
Aggressive Thrombus Removal: 
Catheter-directed Thrombolysis

Elsharawy M et al. 2002 Eur J Vasc Endovasc Surg

- Randomized prospective trial
- 35 patients randomized
- At 6 months, patients treated with catheter-directed thrombolysis had...
  - Improved patency rates (72% vs 12%, p<0.001)
  - Lower venous reflux rates (11% vs 41%, p<0.05)
Aggressive Thrombus Removal: Catheter-directed Thrombolysis

**Advantages**
- Percutaneous therapy
- Removes clot from inaccessible branch vessels or collaterals
- Identifies underlying lesions
- Improved venous patency rates
- Potential improved venous insufficiency rates

**Disadvantages**
- Infusion times: 2-4 days
- High acuity ICU care required
- Multiple angios/Cath lab availability
- Contrast and radiation exposure
- Multiple contraindications
- Risk of major hemorrhagic complications

**ULTRASOUND-ACCELERATED CDT**

**PERCUTANEOUS MECHANICAL THROMBECTOMY**

**COMPLICATIONS** increases proportionally to drip times

- Solution???
Aggressive Thrombus Removal: *Catheter-directed Thrombolysis*

**EKOS Ultrasound-Accelerated Thrombolysis**

http://www.ekoscorp.com
EKOS Ultrasound-Accelerated Thrombolysis

**Benefits:**

- Increased dispersion of TPA into thrombus
- Improved clot clearance behind venous valves
- Decreased lysis times (50-75% reduction in Rx time)
- Reduced lytic dose

Aggressive Thrombus Removal: Catheter-directed Thrombolysis
Microfragmentation as an adjunct to thrombolysis
- Hydrodynamic forces (Angiojet)
- Mechanical forces (Trellis)

- Improved delivery and mixing of thrombolytic agents
- Isolated delivery of thrombolytic agents to treatment region
- Aspiration of thrombus to prevent distal embolization
- Reduced clot lysis time, ICU stay, and cost
- Reduction in hemorrhagic complications

**Goal:** Single setting thrombolysis
Aggressive Thrombus Removal: Pharmacomechanical Thrombectomy

AngioJet Ultra Thrombectomy System

4Fr XMI, Spiroflex

6Fr Expedior, AVX, DVX

4F (0.014)
2-5mm vessel

5F (0.014)
3-8mm vessel

6F (0.035)
3-12mm vessel
Trellis 8/6 Peripheral Infusion System (Covidien)

- Designed for single-setting thrombolysis
- Targeted delivery of thrombolytic agents
- Treatment area isolated within occluding balloons
- Mechanical dispersion of infused thrombolytic agents
- Aspiration following treatment
- Applicability to Venous and Arterial systems
### Trellis Peripheral Infusion System

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balloon Diameters</td>
<td>5 – 16 mm</td>
</tr>
<tr>
<td>Catheter Working Lengths</td>
<td>80, 120 cm</td>
</tr>
<tr>
<td>Min. Sheath Size</td>
<td>8 Fr/6 Fr</td>
</tr>
<tr>
<td>Guide Wire</td>
<td>0.035”</td>
</tr>
</tbody>
</table>

**Two Treatment Zone Lengths:**
- 15 cm
- 30 cm

- Drug infusion holes
- Aspiration Window
- Tip Marker
- Distal Balloon with 2 markers
- Proximal Balloon with 2 markers
Catheter-Directed Thrombolysis recommended:

- Extensive acute proximal DVT (iliofemoral, symptoms <14 days)
- Selected Patients: Good functional status, life expectancy > 1 year, low risk of bleeding
- Angioplasty +/- stent if underlying venous lesion
- Pharmacomechanical thrombolysis preferred over catheter-directed
- CDT preferred over systemic thrombolysis or open venous thrombectomy
Aggressive Thrombus Removal: Pharmacomechanical Thrombectomy

Iliofemoral DVT

Immediate Anticoagulation → Rapid CT Scan with Contrast
- Leg elevation
- Long leg compression

Rapid CT Scan with Contrast
- Chest
- Abdomen
- Pelvis

Patient Physically Active
- No
- Yes

Anticoagulation* plus Compression
- No
- Yes

Strategy of Thrombus Removal*
- Contraindication to Thrombolysis

PM Thrombolysis and/or CD Thrombolysis

Venous Thrombectomy
- or – Segmental PM Thrombolysis (Trellis ® Catheter)

Correct Underlying Venous Lesions

* Vena caval filter for free-floating vena cava thrombus

Comerota AJ. Iliofemoral venous thrombosis. JVS. 2007. 46(5): 1065-76
Sequelae of Deep Venous Thrombosis

**Post-thrombotic Syndrome**

Symptoms include:
- Mild: pain, swelling, edema, venous ectasia
- Severe: dermatitis, hyperpigmentation, chronic venous ulcerations

Significant impact on quality of life

Significant costs are associated with PTS
- ~$200 million yearly, $8000/pt with venous ulcers
Is anticoagulation alone appropriate in all patients?

Functional status and comorbidities

Presentation:

- Time course from onset of symptoms
- Limited clot burden, mild symptoms
- Extensive iliofemoral clot burden, severe symptoms
Evolution of DVT Treatment Options

- **Anticoagulation Therapy**
- **Systemic Thrombolysis**
- **Catheter Directed Thrombolysis**
- **Pharmaco-mechanical Thrombolysis**

- **1950**: Anticoagulation Therapy
- **1980**: Systemic Thrombolysis
- **1990**: Catheter Directed Thrombolysis
- **2000**: Pharmaco-mechanical Thrombolysis
- **TODAY**: Isolated Pharmaco-mechanical Thrombolysis
2.9. In patients with acute proximal DVT of the leg, we suggest anticoagulant therapy alone over catheter-directed thrombolysis (CDT) (Grade 2C).

Remarks: Patients who are most likely to benefit from CDT (see text), who attach a high value to prevention of post-thrombotic syndrome (PTS), and a lower value to the initial complexity, cost, and risk of bleeding with CDT, are likely to choose CDT over anticoagulation alone.