Tools and Rationale For Overnight Treatment

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Thrombectomy Options

- Catheter Directed Thrombolysis
- Angiojet
  - Aspiration or Power Pulse Spray
- Trellis Device
- EKOS
- Continuous Aspiration Thrombectomy (CAT) and Others
- Angiovac

Venous Registry

- Iliofemoral or femoral DVT
- Rx'd by Catheter Directed Thrombolysis
- 63 sites
- 473 patients
- Jan. ’95 - Dec. ’96
- Duplex F/U @ discharge, 4-6 wks, 3, 6, and 12 months post lysis


Conclusions based on Venous Registry

- Relatively safe
- Initial lytic success is a strong predictor of patency at follow up
- Iliofemoral results are better than femoropopliteal
- Stent Iliac lesions to achieve long term patency
- Typical case 36-72 hours
- Mean drip time 48 h

CaVenT trial

- Randomized prospective trial
- Technique: CDT + AC vs AC alone
- Patients: 101 vs 108
- 24 m data: 90 vs 99
- PTS @ 2 y: 41% vs 56% (p=.047)
- Mean Drip time 57.6 h

Enden et al Lancet 2012;379;31-38
Haig et al JVR 2013;24:17-24

To accelerate venous lysis

Power Pulse Spray using Angiojet

A new method for aggressive management of deep vein thrombosis: retrospective study of the power pulse technique.
Cynamon J, Stein EG, Dym RJ, Jagoutz MB, Binkert CA, Baum RA
JVR 2006 Jan 1(3):1047-49
Power Pulse Retrospective Study

Results of 24 patients

- Materials and methods
  - Retrospective, multicenter study (6 institutions)
  - Charts and venograms reviewed for all patients with iliofemoral and/or IVC thrombosis treated with Power Pulse technique
  - 24 patients met criteria and were included

A new method for aggressive management of deep vein thrombosis: retrospective study of the power pulse technique.
Cynamon J, Stein EG, Dym RJ, Jagust MB, Binkert CA, Baum RA
JVIR 2006 Jun;17(6):1043-49

Results

- All 24 patients showed some improvement
  - Complete (50%) (>90% removal of thrombus)
  - Substantial (29%) (50-90% clot removal)
  - Partial (21%) (<50% clot removal)
- Adjunctive catheter-directed thrombolysis (<24 hrs) used in 8 patients (33%) to improve outcome
- 15 patients (63%) had angioplasty for underlying lesions
  - 9 also had stents placed
- Mean procedure time - 3 hours 15 min
  (range 1 hr 45 min – 6 hr 30 min)

Trellis Device

Continuous Aspiration Thrombectomy (CAT)

Treatment Approach | Incidence | Mean Procedure Time-h
--- | --- | ---
RT Alone | 13 (4%) | 1.4
RT w t-PA | 115 (35%) | 2
CDT + RT | 29 (9%) | 22
CDT + RT w t-PA + RT | 172 (52%) | 41

Cases completed < 24h – 73% (27% > 24 h)
Cases completed < 6h – 36% (64% > 6 h)
No more than 2 trips to angio – 86%

Alternatively start with CDT using EKOS

Complementary Modes of Action

#1 Ultrasound separates Fibrin Strands without Producing Fragmentation Emboli
#2 “Acoustic Streaming” Ultrasound Drives Drug into Clot along the Vessel Wall

DVT Clinical Results

Remove the clot burden...even behind the valves

EKOS Lysus® Peripheral Catheter System

Components
• Drug Delivery Catheter (DDC)
• Ultrasound Core (USC)

S/P 2mg/h t-PA for 12 h
DVT Clinical Site Results

Same Day vs Overnight Treatment

• Same Day Advantages
  – No overnight stay in ICU or Step-down
  – Potential d/c to home same day

• However
  – Scheduling issues
  – More time consuming/ labor intensive
  – Potentially lysable clot may be left behind
  – Getting a monitored bed if needed may be difficult
• 51 yo F
• Acute left lower extremity swelling
• Known history of fibroids

S/P 1 mg t-PA/h for 15 h
Fibroids need to be addressed.

3 Months F/U

- 52 yo F
- Subarachnoid hemorrhage
- Anterior communicating artery aneurysm
- Coil embolization
- 3 weeks later developed bilateral lower extremity swelling left greater than right
Review of Current Treatment Strategies


Review article of various DVT treatment strategies
Baylor experience N=178
• Acute (<14 days) + chronic (>14 days) clots
• EKOS compared with (pharmaco-)mechanical therapy (AngioJet or Trellis)

### ACUTE DVT

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Using AngioJet</th>
<th>Using Trellis</th>
<th>Using Thrombolysis</th>
<th>Using DEBS</th>
<th>Using Thrombolysis and DEBS</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of patients with acute DVT (%)</td>
<td>46 (26.5)</td>
<td>38 (22.3)</td>
<td>30 (17.8)</td>
<td>9 (5.3)</td>
<td>18 (10.6)</td>
</tr>
<tr>
<td>Mean thrombus age (days)</td>
<td>9.4±3.2</td>
<td>11.0±2.2</td>
<td>10.4±2.4</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Complete treatment success (male DVT)</td>
<td>38 (86%)</td>
<td>31 (81%)</td>
<td>29 (90%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Complete treatment success (female DVT)</td>
<td>4 (10%)</td>
<td>7 (40%)</td>
<td>4 (13%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mean clinical improvement (male DVT)</td>
<td>42 (96%)</td>
<td>34 (90%)</td>
<td>34 (90%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mean clinical improvement (female DVT)</td>
<td>4 (100%)</td>
<td>7 (40%)</td>
<td>7 (40%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Minor (0 or 1)</td>
<td>40 (87%)</td>
<td>31 (82%)</td>
<td>37 (94%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Major complications</td>
<td>4 (8%)</td>
<td>4 (10%)</td>
<td>4 (10%)</td>
<td>0</td>
<td>0</td>
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</tbody>
</table>

### CHRONIC DVT

<table>
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<tr>
<th>Procedure</th>
<th>Using AngioJet</th>
<th>Using Trellis</th>
<th>Using Thrombolysis</th>
<th>Using DEBS</th>
<th>Using Thrombolysis and DEBS</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of patients with chronic DVT (%)</td>
<td>37 (14%)</td>
<td>36 (14%)</td>
<td>24 (14%)</td>
<td>12 (14%)</td>
<td>5 (14%)</td>
</tr>
<tr>
<td>Mean thrombus age (days)</td>
<td>37±24</td>
<td>36±24</td>
<td>24±24</td>
<td>12±24</td>
<td>5±24</td>
</tr>
<tr>
<td>Complete treatment success (male DVT)</td>
<td>2 (5%)</td>
<td>9 (25%)</td>
<td>8 (28%)</td>
<td>4 (25%)</td>
<td>2 (5%)</td>
</tr>
<tr>
<td>Complete treatment success (female DVT)</td>
<td>5 (28%)</td>
<td>5 (28%)</td>
<td>5 (28%)</td>
<td>3 (28%)</td>
<td>3 (28%)</td>
</tr>
<tr>
<td>Mean clinical improvement (male DVT)</td>
<td>3 (15%)</td>
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<td>3 (15%)</td>
</tr>
<tr>
<td>Mean clinical improvement (female DVT)</td>
<td>7 (40%)</td>
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<td>7 (40%)</td>
</tr>
<tr>
<td>Minor (0 or 1)</td>
<td>14 (10%)</td>
<td>14 (10%)</td>
<td>13 (10%)</td>
<td>15 (10%)</td>
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</tbody>
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Note: DVT = deep vein thrombosis; PMT = pharmacomechanical thrombectomy; DEBS = DCbs Embolic System.

1 month later
Conclusions

- Acute DVT Lysis/Thrombectomy Works, Prevents PTS
- Same Day/ Overnight- Both Effective
- EKOS Accelerates Lysis
- Technique- Site specific
- Know/ Use Both (Same Day/ Overnight)
- Repair any underlying pathology obstructing venous flow

• 51 yo F
• 2 days post abdominoplasty
• Acute markedly swollen left lower ext.
• Could not lie on her stomach

1 mg t-PA/h for 15 h
Lysis was complete in 17% of the patients treated with Trellis with and without CDT for the treatment of iliofemoral DVT.
Contraindications to Thrombolysis

- Recent head trauma
- CNS Neoplasm (primary or metastatic)
- Recent CVA (within 2 months)
- Recent major surgery (within 10 days)
- History of CNS AVM
- Active Bleeding
- Pregnancy or recent delivery

Degree of Lysis Effects Long-term Results

- Grade 3 clearing at 0 months predicts 79% patency at one year*
- Grade 2 clearing at 0 months predicts 58% patency at one year*
- Grade 1 clearing at 0 months predicts 32% patency at one year*
