The impact of new devices and strategies on how we perform arterial thrombectomy

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Disclosure

Speaker name:
Sabine Steiner

I have the following potential conflicts of interest to report:

☐ Consulting
☐ Employment in industry
☐ Stockholder of a healthcare company
☐ Owner of a healthcare company
☐ Other(s)

☒ I do not have any potential conflict of interest
More EVT performed in ALI

Trends in surgery and EVT for the treatment of ALI in the U.S. Medicare population from 1998 to 2009

Contemporary outcome data support EVT

Propensity score matched analysis from the Swedish Vascular Registry (Swedvasc)

Grip O et al. BJS 2018; 105: 1598–1606
- Aspiration
- Selective Thrombolysis
- Thrombectomy-catheter

- AngioJet
- Rotarex
- Indigo
- Jeti
Local Bleeding after 12 Hours Catheter directed Thrombolysis

Percutaneous thrombectomy devices

- Significantly reduce bleeding-complications
- Improve patient-comfort, reduce thrombolysis-time
Comparative Study on Endovascular Treatment of (Sub)acute Critical Limb Ischemia: Mechanical Thrombectomy vs. Thrombolysis

From 2006 – 2015 202 patients underwent either Rotarex, thrombolysis or a combination-therapy

<table>
<thead>
<tr>
<th></th>
<th>Thrombolysis</th>
<th>Rotarex</th>
<th>Rotarex + Lysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>28</td>
<td>146</td>
<td>28</td>
</tr>
<tr>
<td>Major bleeding</td>
<td>22.2 %</td>
<td>3.6 %</td>
<td>0</td>
</tr>
<tr>
<td>Stay at hospital (days)</td>
<td>4.6±3</td>
<td>1.4±0.9</td>
<td>4.4±1.8</td>
</tr>
</tbody>
</table>

Potential benefits with thrombus removal

- Quick restoration of flow
- Improved vessel and target lesion visualization
- Decreased risk of distal embolization and resulting complications
- Option of pharmacomechanical combination therapy
- The ability to treat thrombus of various age
AngioJet (BSCI)
AngioJet™ Catheter Design utilizes the Bernoulli-Effect

Jet Tube presses saline with 700 bar backwards

**Bernoulli Effect**

\[ P + \frac{1}{2} \rho v^2 + \rho gh = [\text{constant}] \]

Jet hole compared to a human hair
AngioJet™ Catheter Design

- Saline escapes from the outflow window of the catheter and acts to loosen thrombus and draw it toward the inflow windows.

- The thrombus is then captured through the inflow windows, fragmented within the AngioJet catheter and evacuated through the catheter.

AngioJet thrombectomy is isovolumetric – unchanging volumes.
# AngioJet™ Catheter Selection

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Solent PROXI/Omni</th>
<th>Solent DISTA</th>
<th>Zelante DVT (only venous)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vessel Diameter</td>
<td>&gt; 3mm</td>
<td>&gt; 1.5 mm</td>
<td>&gt; 6mm</td>
</tr>
<tr>
<td>Working Length</td>
<td>90/120 cm</td>
<td>145 cm</td>
<td>105 cm</td>
</tr>
<tr>
<td>Shaft Diameter</td>
<td>6F</td>
<td>4F</td>
<td>8F</td>
</tr>
<tr>
<td>OTW</td>
<td>0.035” *</td>
<td>0.014” *</td>
<td>0.035” *</td>
</tr>
<tr>
<td>Maximum run time</td>
<td>8 min</td>
<td>10 min</td>
<td>8 min</td>
</tr>
<tr>
<td>Max run time with blood flow:</td>
<td>4 min</td>
<td>5 min</td>
<td>4 min</td>
</tr>
<tr>
<td>Flow Rate</td>
<td>60 ml/min</td>
<td>23 ml/min</td>
<td>60 ml/min</td>
</tr>
</tbody>
</table>
AngioJet™ + Thrombolytics = PMT  
(Pharmacomechanical Thrombectomy)

For more organized thrombus, two different techniques can be utilized:

- Power Pulse Delivery (PPD)  
  (switch from PPD to thrombectomy after 15-20 minutes)

- Rapid Lysis (RL)  
  uses physician specified fluid instead of saline for thrombectomy
The Penumbra / Indigo System

- The Penumbra/Indigo vacuum assisted aspiration system designed for thrombi and emboli retrieval in peripheral vessels.

<table>
<thead>
<tr>
<th>Catheter</th>
<th>Aspiration-Volume ml / time s</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAT 3</td>
<td>14 / 20</td>
</tr>
<tr>
<td>CAT 4</td>
<td>56 / 20</td>
</tr>
<tr>
<td>CAT 6</td>
<td>90 / 20</td>
</tr>
<tr>
<td>CAT 8</td>
<td>160 / 20</td>
</tr>
<tr>
<td>8 Straight</td>
<td>160 / 20</td>
</tr>
<tr>
<td>8 Torq</td>
<td>160 / 20</td>
</tr>
<tr>
<td>8 XTorq</td>
<td>160 / 20</td>
</tr>
</tbody>
</table>

Catheter with separator-wire
Jet power, without hemolysis

Simple Aspiration

Compatible, any guide wire

Size, 8 Fr 100cm

Acustic feed-back when thrombus is caught

(helps to regulate aspiration-force)

350 ml / min max. aspiration-volume
JETi Hyper-Pulse-Modus (Penetrating Lytic Infusion)

- Designed to soften sub-acute thrombus
- Locally penetrate clot
- Concentrated thrombolytic dose
- Forward facing
Rotarex-Catheter (Straub-Medical)

Mechanical detachment – Aspiration - Fragmentation – Removal

40 000 rpm
# Aspirex for Acute Thrombotic Occlusions

Venous >> Arterial

<table>
<thead>
<tr>
<th>Catheter</th>
<th>Artery diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>6F Aspirex / Rotarex</td>
<td>3 – 5 mm</td>
</tr>
<tr>
<td>8F Aspirex / Rotarex</td>
<td>5 – 8 mm</td>
</tr>
<tr>
<td>10F Aspirex / Rotarex</td>
<td>8 – 12 mm</td>
</tr>
</tbody>
</table>
Popliteal Occlusion by cardiac embolus

6 Fr. Rotarex, 3 passages after local thrombolysis for 15 minutes
Popliteal Occlusion by cardiac embolus

Result after additional thrombolysis for 4 hours
Rotarex of chronic Bypass-Reocclusions

- Fem-pop Bypass right
- Iliaco-femoral bypass right
- Re-occlusion since 6 months
Rotarex of Bypass-Reocclusions

Aspirations-force

Leads to collapse of the bypass

„stop and go“ technique !!
Rotarex of Bypass-Reocclusions
Rotarex for thrombotic/embolic occlusions easy to access surgically

82Y patient, severe acute limb-ischemia (re > li)

2 passages Rotarex 8F activation-time 45 sec.
Rotarex for thrombotic / embolic occlusions easy to access surgically

After Proglide-closure left groin, access to the right groin

2 passages Rotarex 8F short activation-time
Conclusion

- Percutaneous thrombectomy-devices can be extremely helpful to increase recanalization-success, reduce the procedure-time and complication-rate in acute limb-ischemia.

- Currently no data to prefer one over the other.

- Rotarex is also successful in subacute and more chronic disease.
  - AngioJet, Indigo, Jeti are safer below-the-knee

- Aspiration-thrombectomy-techniques/devices are still essential
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