Local drug delivery for acute occlusions in the peripheral arteries

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Arterial thrombolysis and percutaneous transluminal angioplasty are now alternatives to surgical embolectomy for the management of acute arterial occlusions.

*Thrombolysis in the management of lower limb peripheral arterial occlusion— a consensus document.*


*van den Berg JC. Thrombolysis for acute arterial occlusion.*

Thrombolysis benefits

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### Table 1. Summary of major outcome of the 3 large randomized trials²,³

<table>
<thead>
<tr>
<th>Trial</th>
<th>Limb salvage at 6 mon, %</th>
<th>Limb salvage at 12 mon, %</th>
<th>Survival at 6 mon, %</th>
<th>Survival at 12 mon, %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Surgical</td>
<td>Endo</td>
<td>P value</td>
<td>Surgical</td>
</tr>
<tr>
<td>Rochester trial</td>
<td>NA</td>
<td>NA</td>
<td>...</td>
<td>82</td>
</tr>
<tr>
<td>STILE²</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALI &lt;14 d</td>
<td>70</td>
<td>88.9</td>
<td>.02</td>
<td>NA</td>
</tr>
<tr>
<td>Ischemia &gt;14 d</td>
<td>97</td>
<td>87</td>
<td>.01</td>
<td>NA</td>
</tr>
<tr>
<td>STILE subanalysis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occluded bypass</td>
<td>NA</td>
<td>NA</td>
<td>...</td>
<td>70</td>
</tr>
<tr>
<td>Native artery occlusion</td>
<td>100</td>
<td>93.3</td>
<td>&lt;.05</td>
<td>100</td>
</tr>
<tr>
<td>TOPAS²</td>
<td>74.8</td>
<td>71.8</td>
<td>.43</td>
<td>69.9</td>
</tr>
</tbody>
</table>

NA, Not available; NSS, not statistically significant; STILE, surgery vs thrombolysis for ischemic lower extremity; TOPAS, Thrombolysis or Peripheral Arterial Surgery.

²In STILE results: survival column corresponds to composite end point (trial stopped).
³In TOPAS results: limb salvage column corresponds to amputation-free survival.

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van den Berg; J Vasc Surg 2010;52:512-5
Protocols of in situ thrombolysis:

- Expose the patients to the risk of major bleeding complications
  - 4% (after 8h)
  - 34% (after 36h)

Table III. Complications related to thrombolytic therapy

<table>
<thead>
<tr>
<th>Complication</th>
<th>Overall</th>
<th>Urokinase</th>
<th>rt-PA*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemorrhagic stroke</td>
<td>1-2.3</td>
<td>0.6</td>
<td>2.8</td>
</tr>
<tr>
<td>Major hemorrhage</td>
<td>&lt;5.1</td>
<td>6.2</td>
<td>8.4</td>
</tr>
<tr>
<td>Minor hemorrhage</td>
<td>14.8</td>
<td>21.9</td>
<td>43.8</td>
</tr>
<tr>
<td>Mortality</td>
<td>&lt;1</td>
<td>3</td>
<td>5.6</td>
</tr>
<tr>
<td>Pericatheter thrombosis</td>
<td>3-16.7</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Catheter-related trauma</td>
<td>1.2-1.4</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Compartment syndrome</td>
<td>2</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Distal embolization</td>
<td>&lt;1</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

NA, Not available; rt-PA, recombinant tissue plasminogen activator.

*Ouriel.4,18

Dissection and false aneurysm.
Continuous thrombolysis for acute occlusions in the peripheral arteries

- Require a stay in an intermediate care or intensive care unit
Admission of high risk patients in intermediate care unit becomes a real challenge especially very old patients!
Alternative therapy

• Fast Track thrombolysis with new in situ method using a micro-porous balloon catheter

• Objectives:
  – Reduction of thrombolytic agent
  – No need of intermediate care unit stay
ClearWay™ catheter (MAQUET)

Low-pressure micro-porous polytetrafluoroethylene balloon catheter
ClearWay™ catheter

- Low pression balloon - for distorsion of the thrombus

- Porous - for local delivery of the fibrinolytic agent at a high local concentration in a large diffusion surface

- Efficient in coronary arteries fibrinolysis (COCTAIL II study, INFUSE-AMI study)
Method of revascularization

- **Thrombolysis:**
  infusion of urokinase at 2-4 atm with physio and iode until complete flow restoration on angiography
Assessment of efficacy

Acute Peripheral Arterial Occlusion: Prospective Study Evaluating Intra-Arterial Thrombolysis With a Micro-Porous Balloon Catheter

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Journal of Endovascular Therapy: June 2013 (20): 422-426

Evaluation of Balloon Catheter-Guided Intra-Arterial Thrombolysis for Acute Peripheral Arterial Occlusion

Bassel Dakhil, Pierre Lacal, Ali Ben Abdesselam, Jean Claude Couffinhal, Alen Gordienco, Patrick Bagan

Etiology of occlusion

- **Embolism (60%)**
  - Atrial fibrillation with an ineffective oral anticoagulant therapy 40%
  - Mean age: **80.2** years (45-92)
  - Thrombus in the aortic arch
  - Mitral valve disease
  - Patent foramen ovale
In situ stent thrombosis 20%

Thrombosis of popliteal aneurysm 5%

Paraneoplastic thrombosis (10%)

Atherosclerotic plaque (5%)
Results

With ClearWay catheter reduction of:

- Urokinase dose needed
  
  \(82,000\) vs. \(260,000\) IU/cm of thrombus) \(p = 5.10^{-6}\)

- Infusion time

- ICU hospital stay: \(1.1\ [0-1]\) vs \(3.9\ [0-5]\) \(p = 0.049\)
  
  - \(4000\) euros (ICU=1418 euros/day)
Case report 1

- Patient 65 years
- Acute ischemia 3 days after lung bilobectomy for adenocarcinoma
- Atrial fibrillation
- Left Popliteal thrombosis
• Sheath 7F
• ClearWay RX 4x50mm
• Infusion of 1500000 UI Actosolv
• Blood flow restoration of 2 arteries
• No blood loss in chest tube
Case report 2

- Patient 79 years
- Right Critical limb ischemia
- Femoro popliteal bypass with reversed saphena vein
- Acute pain 9 days following surgery
- US: acute thrombotic occlusion
Illustration

Cross over, 7F Destination sheath, bypass recanalization
Fibrinolysis:
ClearWay RX 5x60mm
Inflation 100 000 units urokinase x 6
Control after thrombolysis: graft stenosis
Final angiogram after thrombolysis and angioplasty
Conclusion

Thrombolysis with ClearWay™ local drug delivery

• Reduction of:
  – Thrombolytic agent
  – Infusion time

• Preferred method in high-risk situation
  – Elderly patients
  – Post operative thrombosis

• No need of ICU stay
• Short learning curve
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THANK YOU

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