The therapeutic benefit of effective debulking in arteries and veins

How do I use mechanical debulking for the treatment of acute occlusions of the proximal veins?

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Disclosure

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I have the following potential conflicts of interest to report:

☒ Consulting: Abbott, ab medica, Biotronik, BTG, Endoscout, Medtronic, Straub
The target for invasive treatment of proximal vein occlusion

- **Iliofemoral DVT**
  - includes iliac and femoral veins
  - Descending; originates in iliac veins
  - 20 – 25% of symptomatic DVTs
    - 95% develop valve insufficiency
    - 86% develop venous ulcer
    - 50% develop venous claudication

- **Upper extremity thrombosis**
  - Tumor associated: tumor compression of SVC
  - Iatrogenic: pace maker / defi probes, ports, etc.
  - Thoracic inlet syndrome: venous compression
Available Treatment options for proximal vein occlusion

• Conservative: LMWH, followed by long term anticoagulation
  – Avoids PE, death, (recurrence)
  – High rate of PTS in case of DVT
• Catheter-directed thrombolysis (CDT)
  – Simple CDT: multi-hole catheter in thrombus
• Pharmaco-mechanical thrombolysis (PMT):
  – E.g. ultrasound assisted (EKOS™)
  – E.g. rheolytic: AngioJet™, etc.
• Isolated mechanical thrombectomy (MT)
  – Aspirex™, etc.
Rationale for invasive treatment of proximal vein occlusion

• Fast thrombus removal allows for:
  – Fast relief of acute symptoms
  – Salvage of valve function
  – Prevention of PTS

• Benefits of MT:
  – Immediate restoration of flow
  – No systemic complications like bleeding
  – Expert tool
  – Short treatment length
  – In case of failure thrombolysis necessary anyway

• Drawbacks of MT:
  – Blood loss
  – In case of failure thrombolysis necessary anyway

• Benefits of CDT and PMT:
  – Can manage older thrombi
  – Easy to use, no expert tool

• Drawbacks of CDT and PMT:
  – ICU stay: cost-intensive, blocks ICU beds
  – Bleeding risk
Rotational thrombectomy: Aspirex™ and Rotarex™

• Mechanical thrombectomy devices for removal of
  – Fresh thrombi up to 2 weeks old: Aspirex™
  – Chronic / organized occlusions > 2 weeks < 6 months: Rotarex™

• 2 major effects:
Rotarex™ and Aspirex™: indications and tips for usage

• Rotarex™: sharp device that can handle even older thrombi:
  – Can damage vein valves and lead to rupture of thin vein walls (Minko et al. Cardiovasc Intervent Radiol (2014))
  – Predominantly used in the arterial system

• Aspirex™: soft device that handles especially fresh thrombi
  – Device of choice in the venous system

• Keep in mind during run of catheter:
  – System is cooled by blood flow; warming of catheter indicates insufficient blood flow / cooling
    • Consider sodium chloride infusion in occluded venous segments
  – High aspiration capacity
    • Cave blood loss; keep an eye on collection bag
  – Flush catheter after usage
Male, 39yrs

- successful recanalization of iliofemoral DVT 8mths ago
- acute stent thrombosis after dose reduction of oral anti-coagulation
- onset of symptoms 2 days ago

Intervention

- prone patient position
- popliteal 11F sheath
- Aspirex™ 10 F thrombectomy 6 passages
- Accompanied by trans-popliteal infusion of sodium chloride / contrast mixture
Male, 24yrs

- successful recanalization of iliofemoral DVT 8mths ago
- acute stent thrombosis caused by stent fracture

**Intervention**

- prone patient position
- popliteal 11F sheath
- Aspirex™ 10F thrombectomy 4 passages
- re-stenting of stent fracture
- Aspirex™ thrombectomy 2 passages
Male, 16yrs

- Acute abdominal pain and swelling of left leg for 10 days
- No thrombophilia known

Mechanical Thrombectomy (Aspirex™ 10F)

- Good result in fem-pop vein
- Large residual thrombus in common iliac vein

EKOS™ lysis for 24hrs

- 30mg / 24hrs
- Good thrombus reduction
- Restoration of flow after additional stenting
Female, 52yrs
- Bronchial carcinoma, palliative situation
- superior vena cava syndrome with severe venous congestion
- caused by acute thrombosis of SVC

Aspirex™ thrombectomy
- 10F sheath right groin
- Aspirex™ 10F
  - 8 passages
- After 8 passages still residual thrombus
- but: orthograde flow to the heart, no collateral flow to the azygos vein
- symptoms significantly reduced
- patient died 8 weeks later
Aspirex™ in proximal vein occlusion: own experience

- 37 patients with iliofemoral or upper extremity DVT
  - With involvement of caval vein: 3 (2 filtered)
  - PE during treatment: none
- Passages: 5 ± 3
- Technical success: 81%
  - In 7 cases switch to PMT due to thrombus age
- Complications: none
- Primary patency after ø 8M follow-up: 89.2%
  - > 90% reduction of thrombus: 21
  - 50 – 90% reduction of thrombus: 9
  - < 50% reduction of thrombus: 5
  - No success: 2
Aspirex™: Tips and tricks

- Cooling the system in completely thrombosed segments:
  - Use high-pressure infusion system connected to side port of sheath:
    - Produces continuous flow
      - If a mixture with contrast is used:
        - Depiction of thrombectomy success is possible

- How to reach eccentric thrombus:
  - Use long angled sheath 10F / 12F to increase action radius of catheter
When is the optimal moment to treat proximal vein occlusions

• Goal: safe valve function
• Best results achieved with really fresh thrombus
  – 10 days: National Venous Registry
  – 14 days: ATTRACT Trial
  – 21 days: CaVenT Trial

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<thead>
<tr>
<th></th>
<th>Acute (&lt; 2 weeks)</th>
<th>Subacute</th>
<th>Chronic (&gt; 6 months)</th>
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<tbody>
<tr>
<td><strong>Result</strong></td>
<td>Very successful thrombus removal in majority of cases</td>
<td>Organized thrombus prohibits stent expansion</td>
<td>Acceptable results, stent patency depends on technique</td>
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<tr>
<td><strong>Goal</strong></td>
<td>Complete thrombus removal</td>
<td></td>
<td>Stenting of chronic lesions</td>
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Possible treatment algorithm proximal vein occlusions

**Iliofemoral DVT**

- **Contraindications for thrombolysis**
  - **Yes**
  - **No**

  **Mechanical thrombectomy** *(Aspirex™)*

  - **Success?**
    - **Yes**
    - **No**

  **Open thrombectomy + AV fistula / bypass**

  **Oral anticoagulation**

  **Age unclear / long lesions:** Pharmacomechanical thrombolysis *(EKOS™)*

  **Short lesions / short onset:** Mechanical thrombectomy *(Aspirex™)*

  **Plus stenting of underlying obstruction!**

Adapted from Grommes / Wittens
Summary and conclusions

• Mechanical thrombectomy of proximal vein occlusions is safe and feasible
• Especially valuable in patients with contraindications for thrombolysis
• Age of thrombus key to success
  – < 14 days is optimal
• Aspirex™ is the system of choice for the venous system
  – Keep blood loss and cooling of the system in mind
Thank you very much for your attention!

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