TECHNIQUE AND OUTCOMES FOR CHRONIC IVC AND ILIAC VEIN RECANALIZATION

Keith M. Sterling, M.D.
Director, Cardiovascular & Interventional Radiology
Inova Alexandria Hospital
Alexandria, VA
Associate Professor of Radiology
George Washington University School of Medicine
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ETIOLOGY OF ILIOCAVAL OCCLUSIONS

• Primary
  • Congenital absence/atresia

• Secondary
  • Thrombosis
  • Trauma
  • Extrinsic compression
  • Malignancy
  • Retroperitoneal fibrosis
  • Hypercoagulability
  • Iatrogenic (i.e. IVC filters)
• DVT incidence 1/1000
  • 33% involve iliofemoral veins
  • 4-15% involve the IVC
  • 33% recanalize completely
  • Between 66,000-74,000 patients with iliocaval occlusion/year
• Incidence of IVC thrombosis with IVC filters = 2-5%
  • Potentially-retrievable IVC filters may have increased rate of thrombosis due to micro-movements
ILIOCAVAL OCCLUSION PRESENTATION

- Asymptomatic
  - Well-developed collaterals
  - Atresia
- Acutely symptomatic
  - Acute thrombosis of IVC
  - Chronic occlusion with acute thrombosis of collaterals or iliac veins
- Chronically symptomatic (pain, swelling, exercise intolerance, varicose veins, ulcers)
- Pulmonary Embolism
INDICATIONS FOR ILIOCAVAL RECONSTRUCTION

• Acute lower extremity/pelvic symptoms
• Chronic post-thrombotic syndrome
TECHNIQUE FOR ILIICAVAL RECANALIZATION
ACUTE-SUBACUTE

- CDT or thrombectomy first
- Venous access determinants (CFV, popliteal, tibial, jugular)
  - What needs to be lysed/removed
  - Device size (caliber and length)
- May need multi-day thrombolytic infusion
- May need to consider larger suction thrombectomy devices
  - AngioVac®
  - ClotTrievr®/FlowTriever®
TECHNIQUE FOR Iliocaval Recanalization

Chronic
- PTA, Stenting, lysis
- Hybrid approach (Stenting + Endovenectomy)

Multiple venous accesses
- Jugular, CFV, Femoral, GSV
- Popliteal or tibial vein if need to treat femoropopliteal vein

Remove IVC filter if possible, otherwise jail the filter

Ideally re-establish inflow/outflow

Use IVUS for stent decisions
TECHNIQUE FOR ILIocoaVAL RECANALIZATION
CHRONIC SCENARIOS

- IVC/Iliac occlusion with Fem-pop open
  - CFV/Femoral/GSV
  - Possible jugular for target (snaring or sharp recanalization)
- IVC/Iliac occlusion with Fem-Pop occlusion
  - Depends on status of CFV
  - Can either recanalize IVC/Iliacs 1st or 2nd
- Always perform ultrasound yourself on day of the procedure
• Crossing the occlusion

  • Anticoagulation
    • Pre-procedure LMWH
    • UFH bolus after achieving access
  • Hydrophilic wire (typically 0.035” stiff GLIDEWIRE®) and 5 Fr catheter
  • Support catheters/sheaths (i.e. NaviCross®, Rubicon®, TriForce®)

• Back-end of wires
• Sharp recanalization (i.e. Colapinto®, Rosch-Uchida®, BRK/BRK-1 needles)
• PowerWire™ RF guidewire
• Snares/Through-and-Through access
• After crossing
  • Stiff working wires
  • Balloons (sequential dilatation)
  • Possible lysis at this point
  • Remove filter
  • Stents (Multiple self-expanding stents)
    • Go to normal IVC
    • Recreate the iliac vein confluence
    • Will go through the femoral to lesser trochanter if necessary

TECHNIQUE FOR ILIOCAVAL RECANALIZATION
ACCESS DECISIONS
CFV ACCESS (NORMAL VEIN)
CFV ACCESS
FOLLOW UP
FEMORAL VEIN ACCESS
RESUMING EXERCISE/TRAINING WITHOUT SXS
CFV ACCESS (ABNORMAL VEIN)
ADDED JUGULAR ACCESS FOR STENTING
POPLITEAL VEIN ACCESS
CASE EXAMPLE

• 72 y/o F with LLE DVT in 1982
• Günther Tulip® IVC filter placed preoperatively in 2003
• BLE DVT in 2018 placed on anticoagulation
• Severe PTS with BLE swelling and fluid weeping from BLE
• 54 y/o male with h/o neuromyelitis optica underwent Vena Tech® IVC filter placement 6 years ago for BLE calf vein DVT
• Subsequently treated with anticoagulation with warfarin since then
• Presents with flank and breast swelling, severe PTS LLE (including ulceration) and moderate PTS RLE
• Venous duplex: Extensive chronic LLE DVT and bilateral iliac occlusion
PLANNING CT
STENTING OF CHRONICALLY OCCLUDED IVC FILTERS

- Occlusive postthrombotic disease requiring recanalization: stenting across the filter (68%) > stenting below the filter (25%) > stenting without filter (15%) p=0.004

<table>
<thead>
<tr>
<th></th>
<th>w/IVC filter n=23</th>
<th>w/o IVC filter n=92</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1° patency</td>
<td>30%</td>
<td>35%</td>
<td>0.97</td>
</tr>
<tr>
<td>2° patency</td>
<td>71%</td>
<td>73%</td>
<td>0.93</td>
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Stenting across an obstructed IVC filter is safe. It appears that patency is not influenced by the fact that an IVC filter is crossed by a stent but is related to the severity of postthrombotic disease (occlusive or nonocclusive obstruction) and the associated recanalization procedure.

HYBRID APPROACH
ENDOVENECTOMY AND STENTING
ANTICOAGULATION

• Thrombotic
  • Unfractionated heparin
  • Low-molecular weight heparin
  • NOACs/DOACs
    • Dabigatran
    • Rivaroxaban
    • Apixaban
    • Edoxaban
  • Warfarin
ANTICOAGULATION – MY PREFERENCE

• Low-molecular weight heparin x 30 days (typically start 48 h prior to intervention)

• Transition to DOAC
  • Apixaban (BID dosing with $t_{1/2} = 9-14$ h) compared with Rivaroxaban (QD dosing with $t_{1/2} = 5-9$ h)
DURATION OF ANTICOAGULATION

• Minimum 6 months – 1 year
• Reassess yearly (clinical/venous duplex US to determine need for long-term therapy)
• If provoked DVT, lack of known significant hypercoagulable disease (i.e. APA), resolution of symptoms and imaging without disease then consider discontinuing
ANTICOAGULATION – SPECIAL CONSIDERATIONS

- If recurrent thrombosis after intervention will need to determine etiology
  - Untreated/undertreated lesion/s
    - Revascularize if clinically warranted
    - +/- change previous AC regimen
  - No obvious lesion
    - Revascularize if clinically warranted
    - Consider long-term LMWH or warfarin
    - Anti-factor Xa assay
ANTICOAGULATION

• Non-thrombotic (i.e. Extrinsic compression on iliac vein/May-Thurner lesion)
  • No AC for isolated iliac vein lesion
  • If synchronous with infrainguinal post-thrombotic disease then similar to thrombotic regimen
• Dual antiplatelet therapy
  • Aspirin 81 mg
  • Clopidogrel (loading on day of completion 300 mg followed by 75 mg daily)
• Combined with AC in thrombotic disease
• DAPT for non-thrombotic disease
DURATION OF ANTIPLATELET THERAPY

- Preference for lifelong therapy but depends on tolerance
- Reassess at one year
- Exact regimen depends on if still on AC
  - May discontinue one antiplatelet medication
ANTIPLATELET – SPECIAL CONSIDERATIONS

• If recurrent thrombosis after intervention will need to determine etiology
  • Untreated/undertreated lesion/s
    • Revascularize if clinically warranted
    • +/- change previous antiplatelet regimen

• No obvious lesion
  • Revascularize if clinically warranted
  • Consider pharmacogenomic testing (CYP2C19 poor metabolizers) and adjust antiplatelet regimen accordingly
    • Lack of response to Clopidogrel (Plavix®) not uncommon
    • Consider initiation of Prasugrel (Effient®) or Ticagrelor (Brilinta®)
159 patients/167 limbs

- Technical success = 139 of 167 limbs (83%) including patients with bilateral occlusions and 14 patients with inferior vena cava filters incorporated in the treated occlusion
- Cumulative secondary stent patency rate at 4 years was 66%
- Cumulative marked relief of pain and swelling at 3 years was 79% and 66%, respectively
- Cumulative healing of venous ulcer at 33 months was 56%

120 patients/123 filters

- Technical success = 100%
- 30 filters (24%) were retrieved
- 93 (76%) were excluded with stent placement across the indwelling filter
- 6 minor and 2 major complications occurred
- Clinical success = 115 patients (96%) at 6 months

- 6, 12 and 24-month primary iliocaval stent patency rates were 96.4%, 94.8%, and 87.2%, respectively
- 24-month primary-assisted and secondary patency rates were 90.3% and 94.2%, respectively

ARE WE ASKING THE RIGHT QUESTIONS?

- All treatments limb focused
- All outcomes focused on limb
- All grading/classification systems limb based
- Are there other outcomes to consider?
C-TRACT TRIAL

- **Chronic Venous Thrombosis: Relief with Adjunctive Catheter-Directed Therapy**
- 374 patients
- 20-40 sites
- Moderate – severe PTS post DVT > 3months
- Ipsilateral iliac vein obstruction > 50%
- Randomized
- Stenting + best medical therapy vs best medical therapy
- 2 year follow up
SUMMARY

- Surgical and endovascular options available for chronic iliocaval occlusion with post-thrombotic syndrome
- Pre-procedure imaging critical for access planning
- Location of occlusive disease and need for adjuvant therapy will influence venous access site/s
- Become comfortable with multiple options for access
- IVUS is critical for stenting decisions
- C-TRACT trial hopes to answer key questions about treatment of chronic DVT and PTS