Technical Considerations and Emerging Technology for Chronic Venous Occlusions

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Disclosures

In the last 12 months I have served as a consultant, speaker, proctor or served on an advisory board for the following companies:

- Abbott Vascular
- Boston Scientific
- Cook Medical
- Medtronic

Chronic Venous Occlusions: Increased Recognition of the Problem

- Impact of DVT on Venous Patency:
  - Up to 100,000 inpatient DVT diagnoses / yr
  - <50% result in complete lysis with anticoagulation alone
  - Many patients not offered lytic therapy and are left with chronic occlusions

Chronic Venous Occlusions: Surgical Management

- Venography with Intravascular Ultrasound
- Percutaneous venous recanalization with angioplasty and stenting

Chronic Venous Occlusions: Interventional Management

- Technical Considerations:
  - Imaging
  - Access
  - Basic concepts
  - Controversial Issues

- Emerging Technology:
  - Optimal stent design and current products
  - Crossing Tools
  - Novel devices
**Chronic Venous Occlusions**

**Technical Considerations: Imaging**

- **Duplex Ultrasound**
  - Mainstay of preop imaging
  - B-mode: patency, chronic mural changes
  - Waveform analysis: upstream occlusions
  - Highly accurate and sensitive for infra-inguinal venous findings

- **Axial Imaging with MRV and CTV**
  - External compression syndromes
  - Iliocaval occlusions: identifies reconstitution point
  - Infrainguinal: mapping of PFV vs FV access
  - Identification of congenital anomalies

**Respiratory Phasicity**
- Continuous flow pattern

**Chronic Venous Occlusions**

**Technical Considerations: Access**

- **Access:**
  - Guided by preop / on-table duplex imaging
  - Access in area of good inflow (ie. mid FV)
  - Dual access (IJ, femoral, bifemoral)

**Access:**
- IJ Access
- CFV Access

**Chronic Venous Occlusions**

**Technical Considerations during Treatment**

- **Basic Concepts:**
  - Correct all significant disease
  - Good inflow to good outflow is essential
  - Stents are required for recanalized lesions; angioplasty alone is insufficient.
  - IVC filters should be removed
**Presence of IVC Filters**

- Increased risk of recurrent DVT

Recurrent DVT rate at 8 year follow-up:
- No filter: 27.5%
- Indwelling filter: 35.7%

(p=0.042)

**Laser-Assisted Co-axial Sheath Dissection Technique**

- Spectranetics 14Fr SLS II Laser Sheath Lead Extraction System
- 14F 45cm Cook Performer Sheath

- Advantages:
  - Additional sheath rigidity
  - Photoablative rx of intimal hyperplastic tissue

**Chronic Venous Occlusions**

Technical Consideration during Treatment

- Controversial Issues:
  - Stenting the CFV (across the inguinal ligament)
  - Stenting of femoral and popliteal veins
  - Anticoagulation / antiplatelet management

**Stenting across Inguinal Ligament**

- Stent fractures and restenosis is not the same in the CFV as it is in the CFA
- Stenting across the inguinal ligament is less of a concern than leaving untreated stenotic disease

**Stenting Infrainguinal Femoral and Popliteal Veins**

- DVT 3 months ago with occlusion of femoral and popliteal veins
- Wire traversing femoral vein
- Axialization of flow to profunda
- After 24 hrs of EKOS assisted lysis and balloon angioplasty

54 month Secondary Patency

Non-thrombotic pts = 100%
Thrombotic pts = 84%
Stenting Infrainguinal Femoral and Popliteal Veins

Healthy “inflow” segment of popliteal vein

Patient now > 3 years s/p intervention and remains patent and free from venous symptoms

Chronic Venous Occlusions: Emerging Technology: Stent Design

What are the Characteristics of the Ideal Stent?

- Lacking radial force, especially at ends
- Rigid design with poor conformability

Ideal Venous Stent Properties

- High crush resistance
- Uniform crush resistance
- Low Profile
- Conformability
- Wide range of lengths/diameters
- Large diameters

Wallstent

- 14-24mm Diameter
- 60-120mm length
- 10Fr
- Braided stainless steel

Wallstent (Boston Scientific)

- 12-18mm Diameter
- 60-150mm length
- 10Fr
- Laser-cut Nitinol

Sinus-Venous (Optimed)

- 14-16mm Diameter
- 60-140mm length
- 7Fr
- Laser-cut Nitinol

Vici Venous (Veniti)

- 12-18mm Diameter
- 60-150mm length
- 10Fr
- Laser-cut Nitinol

Zilver Vena (Cook)

- 14-16mm Diameter
- 60-140mm length
- 7Fr
- Laser-cut Nitinol

Potential for increased radial force (including at ends), better conformability, with lower profile device delivery system in diameters appropriate for venous applications

Chronic Venous Occlusions: Emerging Technology: Crossing Tools

Basic Tools:

- Stiff wires (0.035, 0.018)
- Support catheters
- Long sheaths (coaxial use w/ support cath)
- Long balloons

Technique: Escalating strategy of increasingly supportive wire platforms and coaxial sheath / support catheters, followed by sequential dilatation and stenting.
Chronic Venous Occlusions: 
*Emerging Technology: Crossing Tools*

**Cook TriForce Peripheral Crossing System**
- Co-axial support sheath/catheter
- Curved / Straight catheter & sheath
- 55cm and 90cm lengths in 0.035in

**Right IJ and bilateral common femoral vein approach**
- Confirmation of true lumen re-entry

**Conclusions**

- Adherence to a few basic principles can result in effective percutaneous recanalization of patients with venous occlusive lesions

- The tools and techniques for venous intervention continue to evolve and allow increasing numbers of patients to be effectively treated.