Difficult Caval Filter Removal: *Tips and Tools*

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**Disclosure Statement of Financial Interest**

Within the past 12 months, I or my spouse/partner have had a financial interest/arrangement or affiliation with the organization(s) listed below.

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**Utilization of IVC Filters in the U.S.**

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<th>Year</th>
<th># Implanted</th>
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<td>1979</td>
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<tr>
<td>1999</td>
<td>19,000</td>
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<tr>
<td>2012</td>
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Advent of retrievable filters

**What's the risk of failing to retrieve filters within the IFU retrieval window?**

Retrieval rates of 18-22%

**Increased risk of recurrent DVT with indwelling filters**

*Circulation*

Recurrent DVT rate at 8 year follow-up:
- No filter: 27.5%
- Indwelling filter: 35.7% (p=0.042)

**Malposition with strut perforation**


**Erosion into adjacent structures**


**Retrieval success loosely related to dwell time**

**Chronically Embedded Filters**
Difficult IVC Filter Removal: Tips and Tools

What makes an IVC filter difficult to remove?

Two Main Issues

- Centering Issues
  - Leads to inability to snare retrieval hook
- Adherence Issues
  - Densely adherent filters
  - Strut perforation

Centering Techniques

Dissection Techniques

Guidewire Centering Technique

- IJ and Femoral Access
- Stiff guidewire (“body floss”)
  - Femoral vein opposite the side of the filter tilt
  - Angled catheter to direct wire around the tilted filter hook

Snare over Guidewire

- Snare catheter looped over wire and wire used to guide snare down to retrieval hook

Balloon Centering Technique

- Angioplasty balloon used to center retrieval hook
- Useful to free hook from intimal hyperplastic tissue

Snare Over Looped Guidewire Technique

- Omniflush catheter
- Terumo 0.035 Glidewire
- Loop snare

- Advantages:
  - Centering
  - Traction

Deformation of Retrieval Hook due to Excessive Traction
Difficult IVC Filter Removal: Tips and Tools

Co-Axial Telescoping Sheath Dissection

- 10/12Fr 55cm Cook Sheath / 14/16Fr 45cm Cook Performer Sheath
- Standard snare technique or Snare over lopped guidewire
- “To-and-fro” motion with gentle twisting of inner sheath
- Intermittent relaxation and full anticoagulation

Laser-Assisted Co-axial Sheath Dissection Technique

- Spectranetics 14Fr SLS II Laser Sheath Lead Extraction System
- 14F 45cm Cook Performer Sheath
- Calibrated at 60mJ/mm²
- 2-5 sec activation time

- Advantages:
  - Additional sheath rigidity
  - Photodestructive rx of intimal hyperplastic tissue
- Disadvantages:
  - Unclear safety profile

Dissection Techniques

- 25 patients underwent complex retrieval
- Decreased force from 7.2lbs to 5.5lbs
- Technical success in 24 (95%)
- One (4%) major complication
  - Acute thrombosis requiring lysis
- Three (12%) minor perforations
  - All self limited, no transfusions

Additional Considerations for Difficult Retrievals:

- Intermittent relaxation of filter
- Periodic venogram from femoral access to assess caval collapse vs intussusception
- Full anticoagulation for complex retrieval attempts
- Be prepared to control and repair perforation

Supplies

- Occlusion Balloons
- Endografts or covered stents
- Large Sheaths

Conclusions

- IVC filters should be removed as soon as the need for caval interruption has ended, thus decreasing the chance that a filter will be chronically embedded.
- High-risk retrieval techniques for chronically embedded filters can be utilized to increase the likelihood of successful retrieval.
- The unknown risk profile of these techniques mandate a thorough discussion regarding the risks and benefits with the patient before attempting retrieval of chronically embedded filters.