Recanalization of Occluded Central Veins When Conventional Methods Failed: Is It Too Risky? Did We Give Up Too Easily?

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Conventional Methods of Recanalization

Directional 0.035” and 0.018” Guidewires (front and back ends)
Directional Catheters
Long stabilizing catheters/sheaths
Antegrade and Retrograde Approaches
Sequential balloon dilation
Stent placement
Failure of recanalization 10% - 22%

Recanalization Techniques: Sharp Needle Recanalization

Antegrade and retrograde access established
Targets used
14-21 g sharp needle stylet advanced toward target across occlusion

Needle across occlusion
Aspirate blood
Inject contrast
Pass wire

Recanalization Techniques: Sharp Needle Recanalization

Place catheter and confirm position
260cm stiff wire for through and through access
Sequential balloon dilation
Angiographic evaluation for leakage
Place stent

Sharp Needle Recanalization: Commercially available TIPS sets

Colapinto transjugular set (16-gauge Colapinto puncture needle, Cook, Bloomington, IN)
Rosch-Uchida transjugular liver access set (14-gauge needle with a trocar, Cook)
Angiodynamics TIPS set (Angiodynamics, Queensbury, NY)
Ring transjugular intrahepatic access set (Cook)
Haskal Transjugular Intrahepatic Portal Access Set (Cook)
Sharp Needle Recanalization
Rösch-Uchida Transjugular Liver Access Set (Cook Medical)
14 g, 62.5 cm, 0.038 trocar stylet for access and wire placement
51.5 cm stiffening cannula for support
10 Fr, 40 cm Introducer sheath with radiopaque band to mark end

43F with B/L Breast CA, s/p chemotherapy, surgery, radiation, now with SVC Syndrome

Sharp Recanalization of SVC Using 21 g Stylet from Inferior Approach with Superior Target

Through and Through Access for Dilation and Stenting

Sharp Needle Recanalization Using Proximal Balloon Target Punctured with sheathed distal needle to cross occlusion

Sharp Recanalization from Superior Approach


Courtesy of Elvira Lang, MD
Anatomy
Subclavian vein anterior to subclavian artery.

Brachial plexus cephalic and posterior to subclavian artery.

No critical organ anterior to subclavian vein.

Sharp Needle Recanalization Complications
Hematoma
Hemothorax
Pneumothorax
Dissection
Extravasation
Arterial Injury
Nerve Injury
Death

Recanalization Techniques: Dissection with Re-Entry into Lumen
If true lumen re-entered past occlusion, subintimal crossing and recanalization acceptable.

Re-entry of true lumen confirmed by contrast injection.

Recanalization Techniques: Cordis Corp. “Chronic Total Occlusion Technologies”

Enables re-entry of guidewire from subintimal space back into true lumen of vessel

Recanalization Using Outback LTD Re-Entry Catheter

Right subclavian vein occlusion.

Outback LTD re-entry catheter positioned proximal to occlusion. "Headhunter" catheter from "A" guidewire in the brachiocephalic vein as target.

PowerWire Radiofrequency (RF) Guidewire
(Baylis Medical Company, Inc., Montreal, Canada)

RF Guidewire uses alternating electrical current to produce thermal energy that destroys cells and can facilitate recanalization of fibrotic occlusion
Recanalization Using PowerWire Radiofrequency Guidewire

Fractured stents preventing wire passage due to power shut-off

Failure to cross occlusion

Angulation of vessels preventing safe wire passage

Hemothorax

Pneumothorax

Hemopericardium

Death

Failures/Complications of PowerWire Radiofrequency Guidewire

Fractured stents preventing wire passage due to power shut-off

Failure to cross occlusion

Angulation of vessels preventing safe wire passage

Hemothorax

Pneumothorax

Hemopericardium

Death

Recanalization Techniques: Bailout Equipment

Covered Stents
Large balloons for tamponade
Large sheaths
Drainage catheters
Support team on alert if transfer for emergency thoracotomy needed

Central Vein Recanalization

<table>
<thead>
<tr>
<th>Author</th>
<th>Patients</th>
<th>Intervention</th>
<th>Success</th>
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</thead>
<tbody>
<tr>
<td>Gupta 1998</td>
<td>1</td>
<td>Sharp needle, 5-mm needle crossed by parent balloon from subclavian artery</td>
<td>100%</td>
</tr>
<tr>
<td>Farrell 1999</td>
<td>4</td>
<td>Sharp needle, 7-French needle crossed by parent balloon from subclavian</td>
<td>87%</td>
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<tr>
<td>Cameron 2002</td>
<td>1</td>
<td>Sharp needle, 12-French needle crossed by parent balloon from subclavian</td>
<td>100%</td>
</tr>
<tr>
<td>Brandt 2005</td>
<td>1</td>
<td>Sharp needle, 7-French needle crossed by parent balloon from subclavian</td>
<td>100%</td>
</tr>
<tr>
<td>Lang 2005</td>
<td>1</td>
<td>Sharp needle, 12-French needle crossed by parent balloon from subclavian</td>
<td>88%</td>
</tr>
<tr>
<td>Riebecker 2006</td>
<td>1</td>
<td>RF Guidewire through subclavian sheath</td>
<td>100%</td>
</tr>
<tr>
<td>McGucken 2007</td>
<td>14</td>
<td>RF Guidewire after failing conventional methods: CVC, balloons, precut sheaths</td>
<td>100%</td>
</tr>
<tr>
<td>Goo 2010</td>
<td>33</td>
<td>Sharp needle, catheter from femoral access for target</td>
<td>94%</td>
</tr>
<tr>
<td>Brountzos 2010</td>
<td>2</td>
<td>Outback LTD re-entry catheter</td>
<td>100%</td>
</tr>
<tr>
<td>Lang 2005</td>
<td>12</td>
<td>Sharp needle; 1 sepsis; 1 immediate stent occlusion; 1 hemothorax; 1 death;</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 hemopericardium; 1 cardiac tamponade; 1 repaired in OR</td>
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Surgical Options

Ligation of Access

Surgical venous-venous bypass:
High morbidity rates related to deep location of vessels
High (31%) mortality rate

Is It Too Risky?
Did We Give Up Too Easily?

Evaluate all patient options
Caution to avoid perforation/potential death
Inpatient center preferable
Is It Too Risky?
Did We Give Up Too Easily?

Cannot answer the question

“Life is a long lesson in humility”

James Barrie 1860-1937

Summary

Antegrade and Retrograde Access

Use Target

Through and through access facilitates passage of balloons/stent

Bailout on Standby