Techniques For Recanalizing Difficult CVO Occlusions: Avoiding Complications

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Chronic Venous Recanalization with Angioplasty balloon

Successful Recanalization of Bile Duct Occlusion with a Radiofrequency Puncture Wire Technique

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A radiofrequency (RF) wire puncture technique was used in the recanalization of biliary anastomotic occlusions in five patients. The technical success of recanalization, which was defined as successful puncture and crossing of the stricture, followed by balloon angioplasty and internal-external biliary drainage without evidence of biliary leakage, was 100%. The average follow-up was 11 months (range, 6-16 months). For biliary occlusion recanalization, RF wire puncture and RF ablation was used for patients with only limited medical comorbidities in whom open surgical intervention would otherwise have been deemed high risk.

2. Worrall D. “R to radiotherapy”
Understanding the technology...
Radio-frequency wire

- Generator: RF energy = perforation
- No trauma to adjacent tissues
- Display:
  - Max Potency: up to 25 W
  - Impedance
  - Time (sec.)
- Grounding pad
- Activated by a pedal or pushing the yellow button

Grounding pad

Development process of a new technique

- Experience in bile ducts
- Animal study (swine)

IRB approval

Development of a protocol
When to use this technology in central venous occlusion?

Patient’s selection criteria:
1 - After failed attempt to recanalize with standard technique
2A - Symptomatic patients
2B - Malfunctional dialysis access (AFV/AVG) due to central venous occlusion

Evaluation - VIR clinic

- What type of symptoms?
- Heart: tolerate increase in the pre-load?
- Risk of complications
- Anesthesia risk: Pre-op clinic eval
- Coagulation status/creatinine

Evaluation in the VIR clinic
Anticipating potential complications

- Hemothorax
- Pericardium tamponade
- Accidental AV fistula
- Death
- Infection
- Access-related bleeding

DETAILED INFORMED CONSENT

Plan ahead of the game...
Understand the anatomy

Procedure planning
Variations of the anatomy? Adjacent organs?
Plan ahead of the game... Anticipating potential complications

- Can we treat the complications or need another physician’s help?
- Do we have devices at hand to treat the complications?

Plan ahead of the game... Anticipating potential complications

- CT surgery/cardiology immediately available?
- What’s the action plan in case we can not fix the complication?
- Blood type and cross
- Blood reservation

First attempt

- Always conventional recanalization techniques

Central venogram:
- Collaterals
- Length of the occlusion
- Diameter of the venous stumps

Simultaneous central venograms through the brachial and femoral accesses - DEFINE THE CENTRAL VENOUS OCCLUSION

Central venograms
- Multiple views
- Venous stumps - same plane?

Unstable Access
- Guiding catheter/Long introducer sheath
• Reduce the length of occlusion with conventional technique
• Minimize the occlusion length to be crossed by the RF wire

Caudal-cranial direction
(+): Lower risk of cardiac tamponade
(-): Unstable: heart beats

Cranio-caudal direction
(+): Stable access
(+): Larger target area
(-): > risk of cardiac tamponade

Make sure
Catheter and pigtail / snare (target) alignment with a 3 views are fundamental: AP, 30° RAO, 30° LAO

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Stents: 10-12mm (not always bigger is better...)
- Balloon expandable (always covered stent if possible)
- SVC, Brachiocephalic V.
- Self-expandable:
  - Subclavian V.
  - AVOID STENTS: Brachiocephalic-subclavian transition

Long distance
Careful stent placement

Case 1

Fellow says at this point:
“It looks good, I think we’re ready to fire the RF wire...”
Central venogram:
- Collaterals
- Length of the occlusion
- Diameter of the venous stumps

Case 2
Case 4

Case 5

Major adverse event > 30 cases...

- Cardiac tamponade...
- Drain placement
- 1 day in ICU, 3 day discharged home
• How can we improve the technique?
• How can we make it safer?

- Cases performed only at ART building
- All under general anesthesia
- Subxiphoid window marked. Prep and draped

Planning ahead of the game...
Pericardium access

- Subxiphoid window marked. Prep and draped

- Adequate US: cardiac probe, ready to be used
- Pericardium drainage tray handy
- Chest drain ready
- Communication with Cardiology/CT surgeon
Anticipate risks & complications
Communicate clearly
Delegate
Set expectations
Team is ready to take action effectively?

People management or medicine?
Congenital Absence of IVC?

- 65 yo Female
- Morbid obesity
- Diabetes
- Bilateral nonhealing ulcers for months
- Prior attempted Venogram- “unsuccessful”

Physical Exam
No infra-renal IVC.
Ovarian veins, collaterals...

No Common Iliac veins

Left Femoral vein access
Right Femoral vein access

5-Fr Tegtmeyer catheter + 0.035” Hydrophilic glide wire

Left sided catheter just below the hepatic IVC
Reference for the advancement of the right sided catheter
Alignment checked in 3 views

Right IJ access

10 mm snare at the level of the renal veins

RF wire used a re-entry device
Alignment checked in 3 views

First RF wire snared out

Simultaneous Venograms to define the stumps and occlusion length
2 Viatorr stents 10 mm x 10 cm

Viatorr rings

2 long 10-Fr introduce sheaths

2 Viatorr stents 10 mm x 10 cm

2 Viatorr rings

2 Viabahn stents 10 mm x 15 cm

R external Iliac stent (7 mm)

Control Venogram

Completion Venogram
Non-contrasted CT immediately post procedure

Non-contrasted CT immediately post procedure

Non-contrasted CT immediately post procedure

Non-contrasted CT immediately post procedure

Post procedure care

• Start Lovenox STAT, bridge it to Coumadin
  Target: INR 2-3

• Clinical and F/U CTA in 4 weeks

Follow Up 8/28
Results

Complications: 2/100 patients

- Small hemothorax, discharged in 2 days.
- Cardiac tamponade (10 → 12 mm PTA), pericardium drainage, Atrium covered- stent, discharged in 3 days

Key points

- RF wire: only symptomatic patients
- Patient’s selection per Chest CTA
- Get prepared to manage severe complications
- Use general anesthesia whenever possible
- Avoid heparin

Key points

- Identify the correct venous stumps
- Check multiple projections (PA, RPO, LPO): RF wire and snare alignment
- RF wire advancement: slowly, small millimeters each time, check 3 projections, then advance again, check 3 projections again…. Slowly but surely
- Consider covered stents in the SVC segment, but don’t jail out venous confluences
Conclusion

RF wire is a good alternative in the recanalization of chronic venous occlusions when the standard techniques have failed.