2022 MID-ATLANTIC CONFERENCE

10th ANNUAL CURRENT CONCEPTS IN

VASCULAR THERAPIES

2022

Hilton Virginia Beach Oceanfront
Virginia Beach, Virginia

APRIL 28-30

Sentara Vascular Specialists

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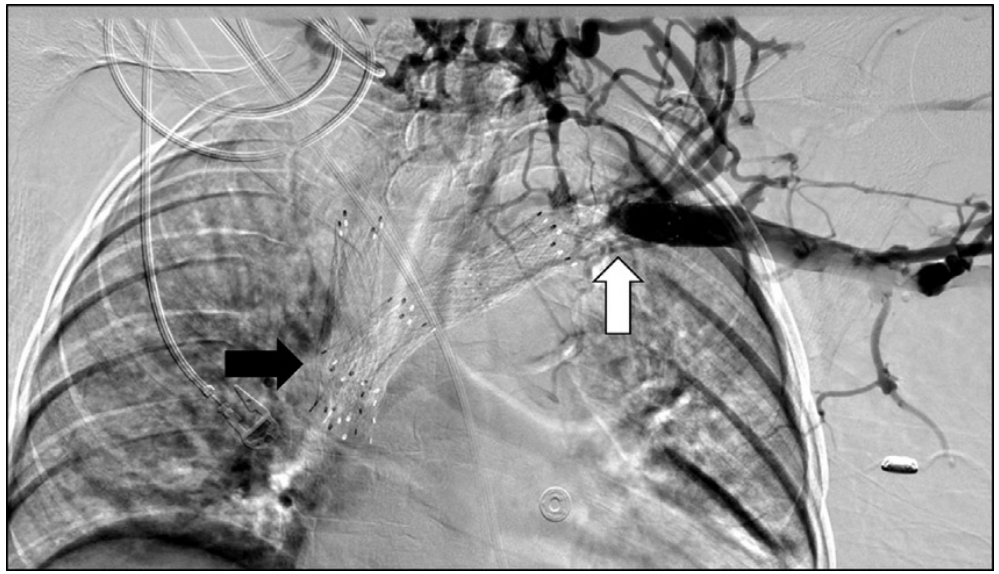
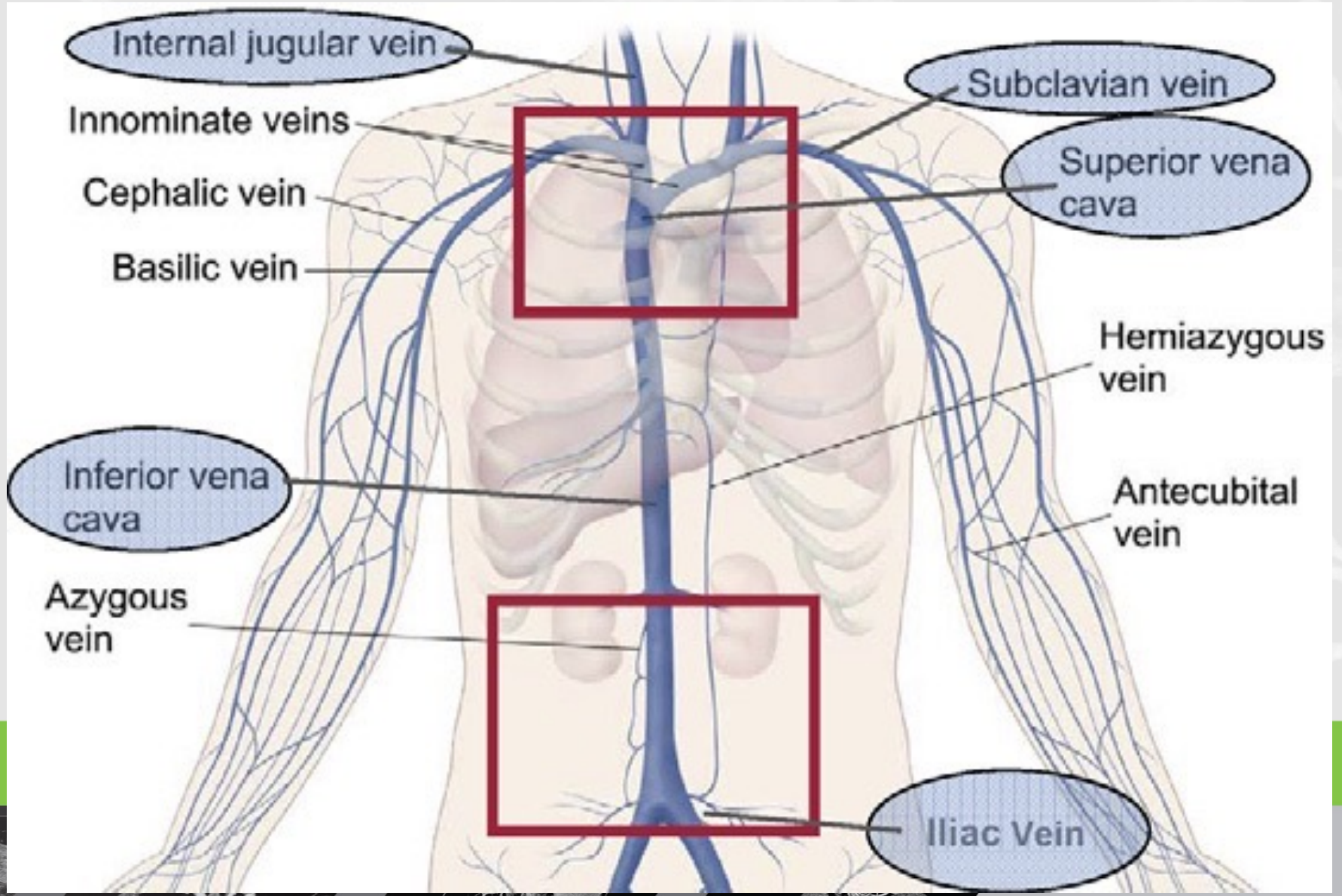
Central Venous Obstructions: Surgical and Endovascular Options for Care



Disclosures

- None

Central Veins



Central Venous Obstruction

- Time Frame: Acute vs Chronic
- Etiology: Intrinsic venous factors vs extrinsic compression
- Symptomatic vs Asymptomatic
- Upper extremity vs Lower extremity CVO

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Ilio-caval Venous Obstruction

- The commonest cause is DVT (PTS)
- Other causes are non-thrombotic (NIVL)
  - Trauma
  - Irradiation
  - Congenital anomalies (aplasia or hypoplasia, e.g. Klippel-Trenaunay syndrome)
  - Extrinsic compression (e.g. May-Thurner Syndrome, Large fibroids, Malignant tumors, etc)

Diagnosis

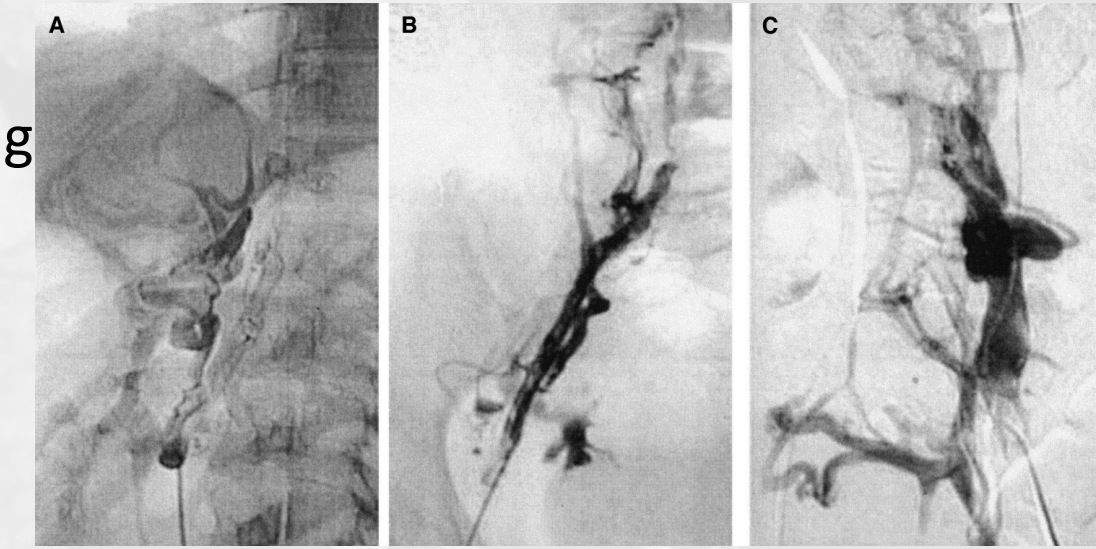
- Clinically
- Venous duplex
- CT venogram
- Ascending venography
- IVUS

Ilio-caval CVO Management

- Endovascular therapy is the primary modality of therapy
- Open surgical reconstruction when endo fails or inappropriate
- Hybrid repair may be needed in certain cases to improve venous inflow

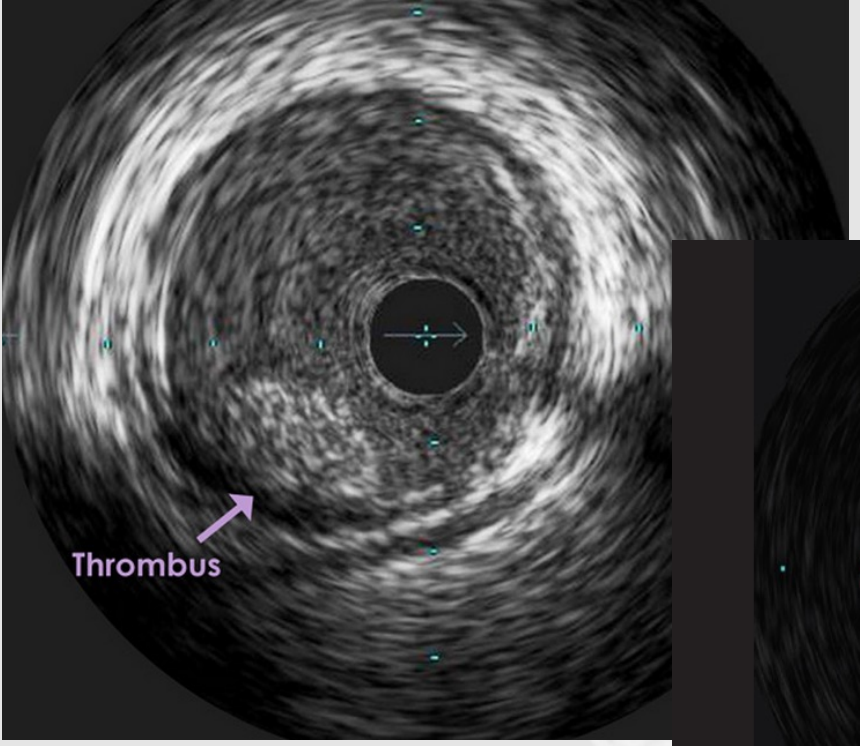
Endovascular Therapy

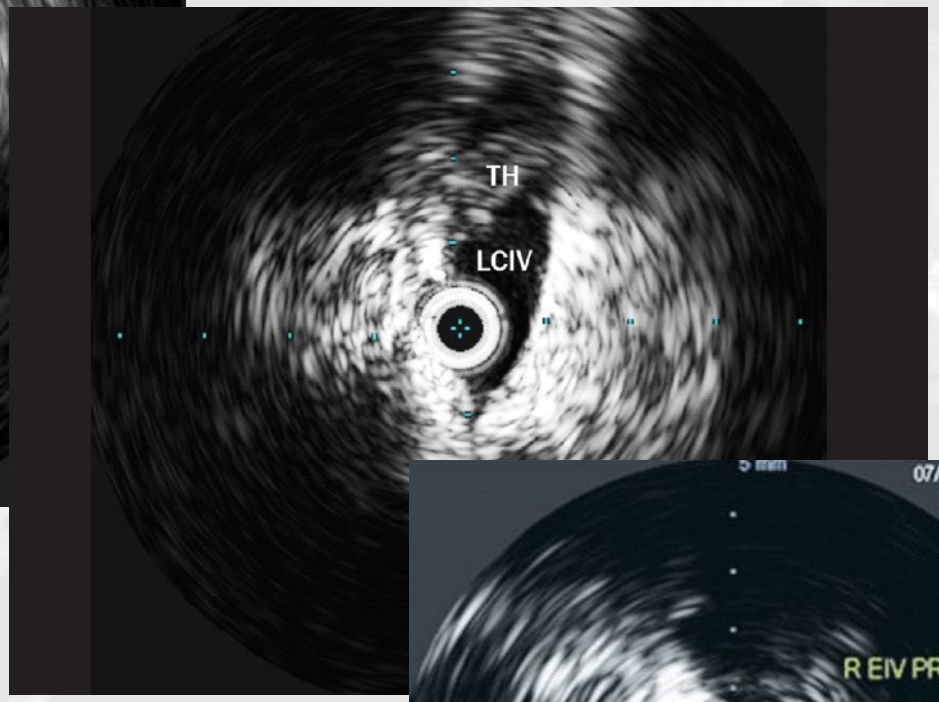
- Access (Femoral vein in mid-thigh, Popliteal vein, IJV)
- Venography
- Wire crossing. Use the tip rather than a loop.
- Long sheath, stiff catheters to assist with crossing
- Through and through access may be needed
- Can be pretty aggressive with the wire.
- Beware of accessing the spinal canal
  - Large retroperitoneal collaterals
  - Going towards the midline is a clue
  - Use multiple views



Endovascular Therapy

- IVUS after crossing
  - Evaluate possibility of thrombotic component (may add thrombolysis/thrombectomy component to therapy)
  - Exactly evaluate the proximal and distal ends of the lesion for adequate treatment (commonest cause of early stent thrombosis is inadequate lesion coverage)
  - Evaluate the exact degree of stenosis (much more sensitive than venography)
  - Evaluate the size of the normal vessel for adequate sizing


Thrombus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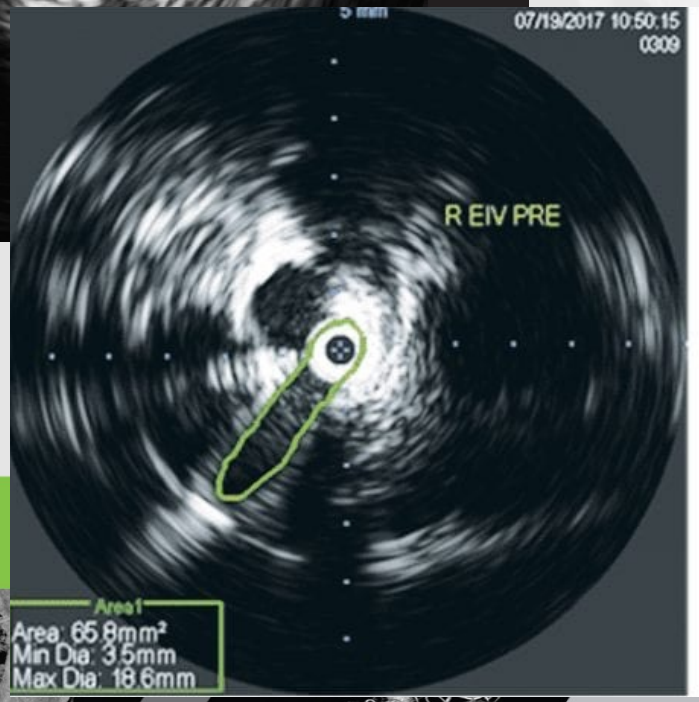
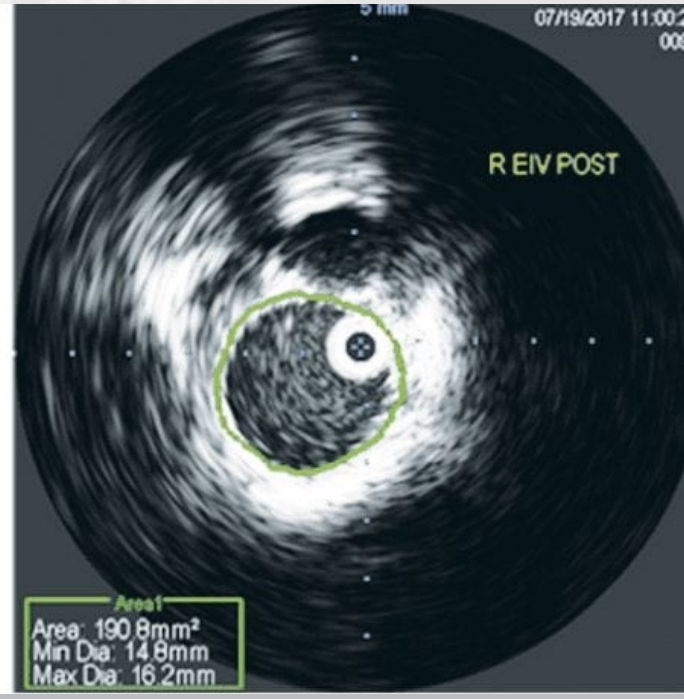
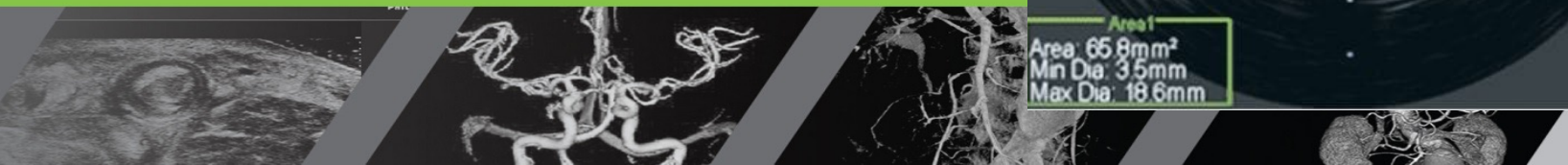
LCIV


07/19/2017 10:50:15
0309
R EIV PRE
Area1
Area: 65.8mm²
Min Dia: 3.5mm
Max Dia: 18.6mm

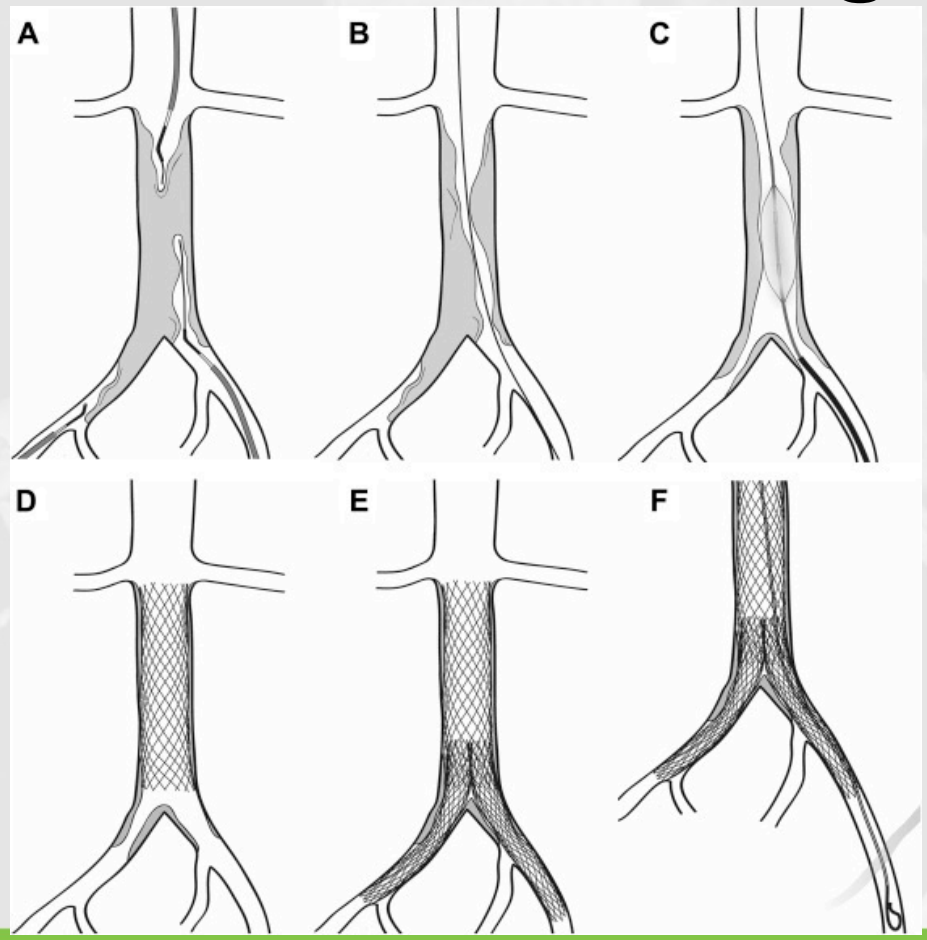

R EIV POST
Area1
Area: 190.8mm²
Min Dia: 14.8mm
Max Dia: 16.2mm



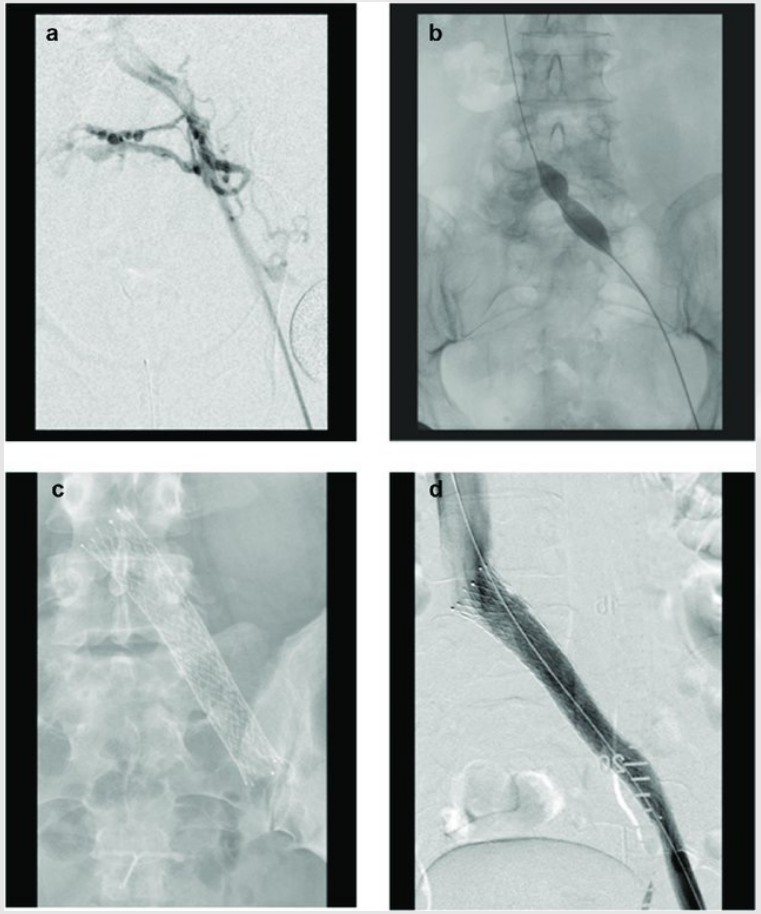
Endovascular Therapy

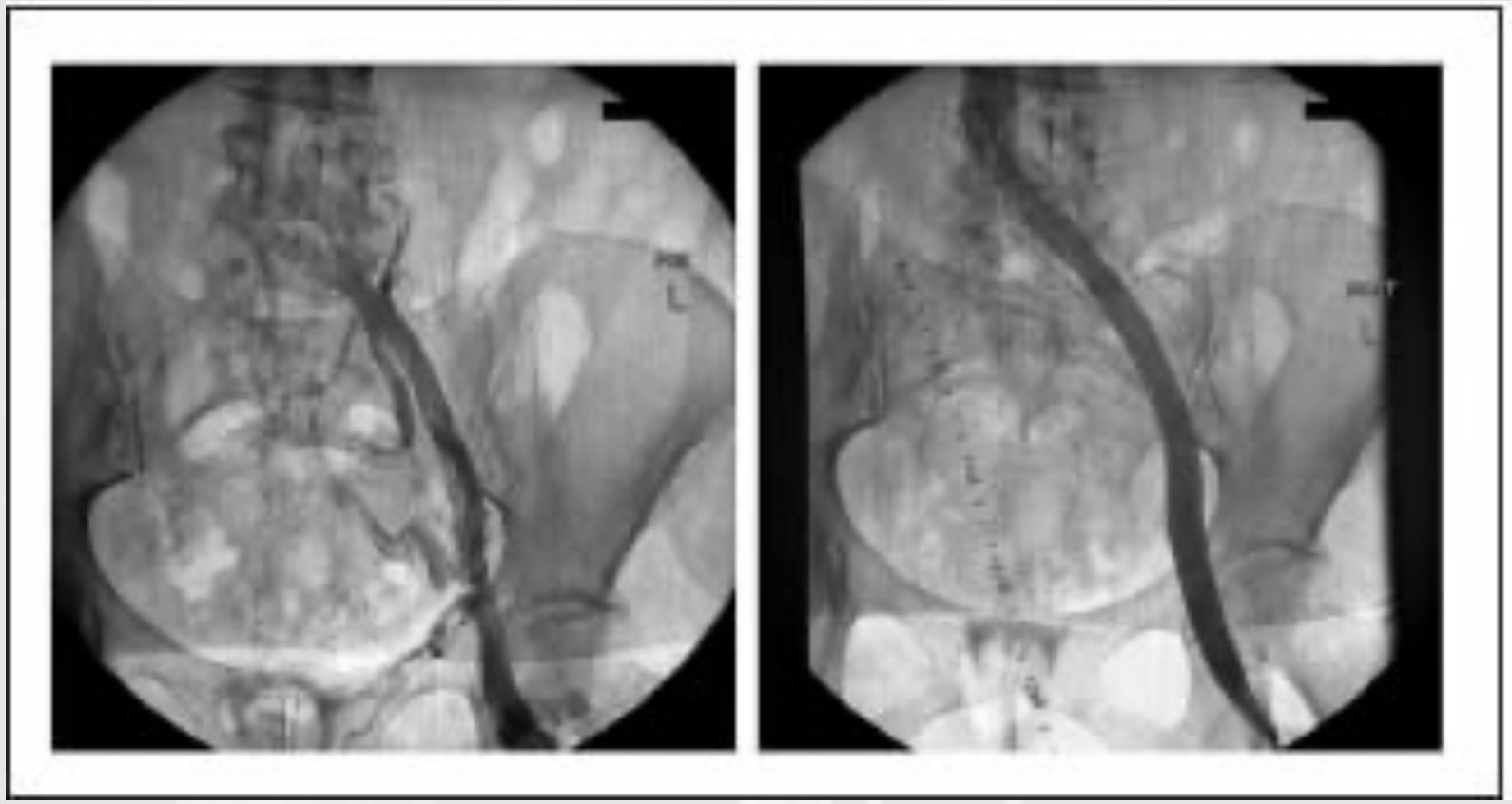
- Angioplasty alone is not enough.
- Adequate PTA (IVC 20-24 mm, CIV 16-18 mm, EIV 14-16 mm)
- Large sized stents (Corresponding sized stents)
- Again the lesion has to be completely covered
- The stent needs to protrude well into the IVC
- Completion venogram and IVUS to ensure adequate flow and stent wall apposition

Ilio-caval stenting

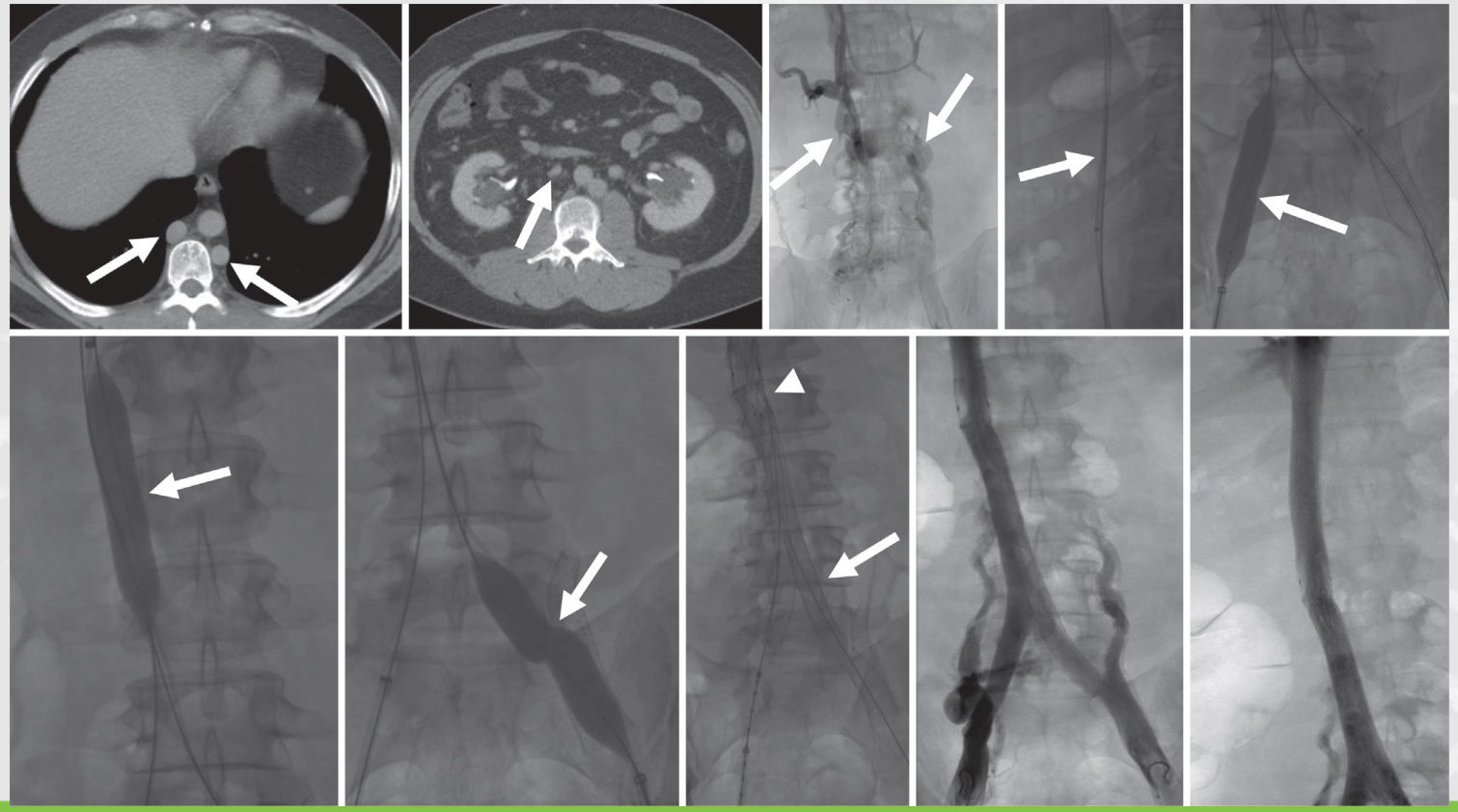


Iliac Vein Stenting

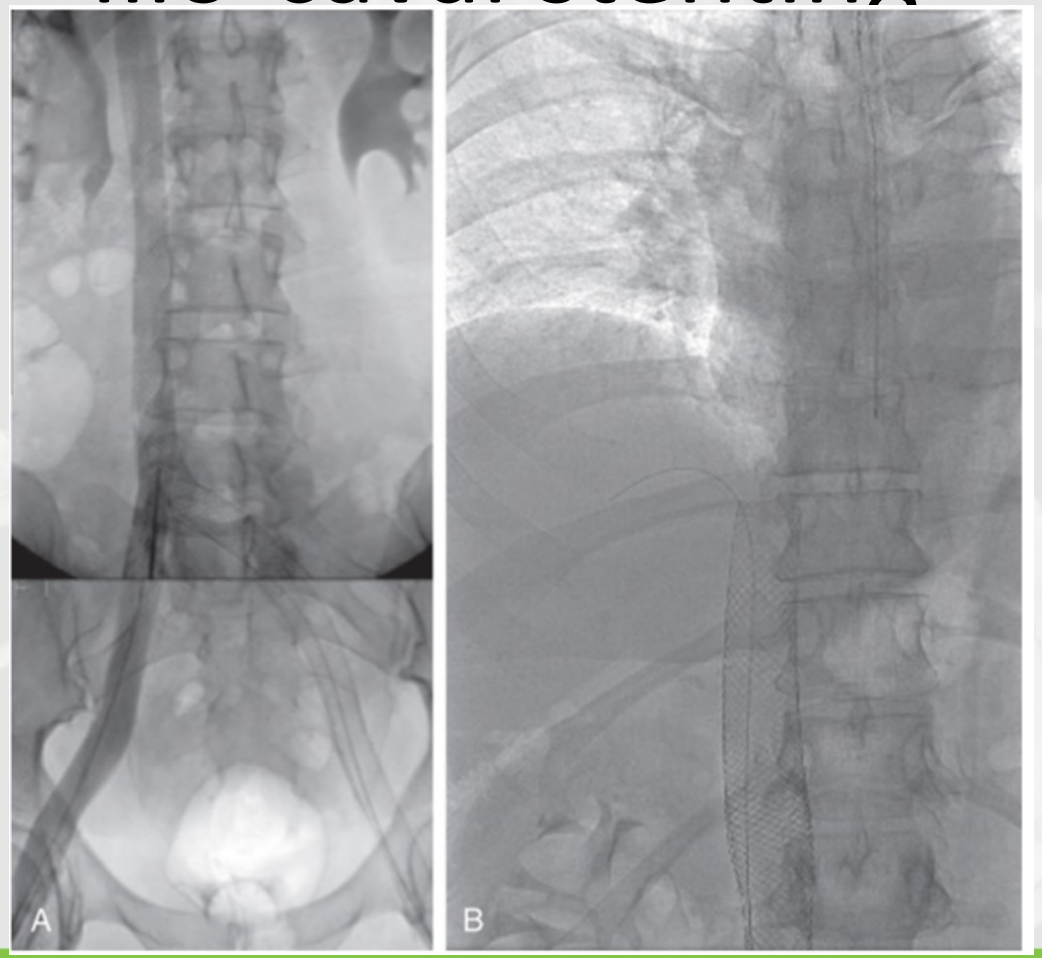




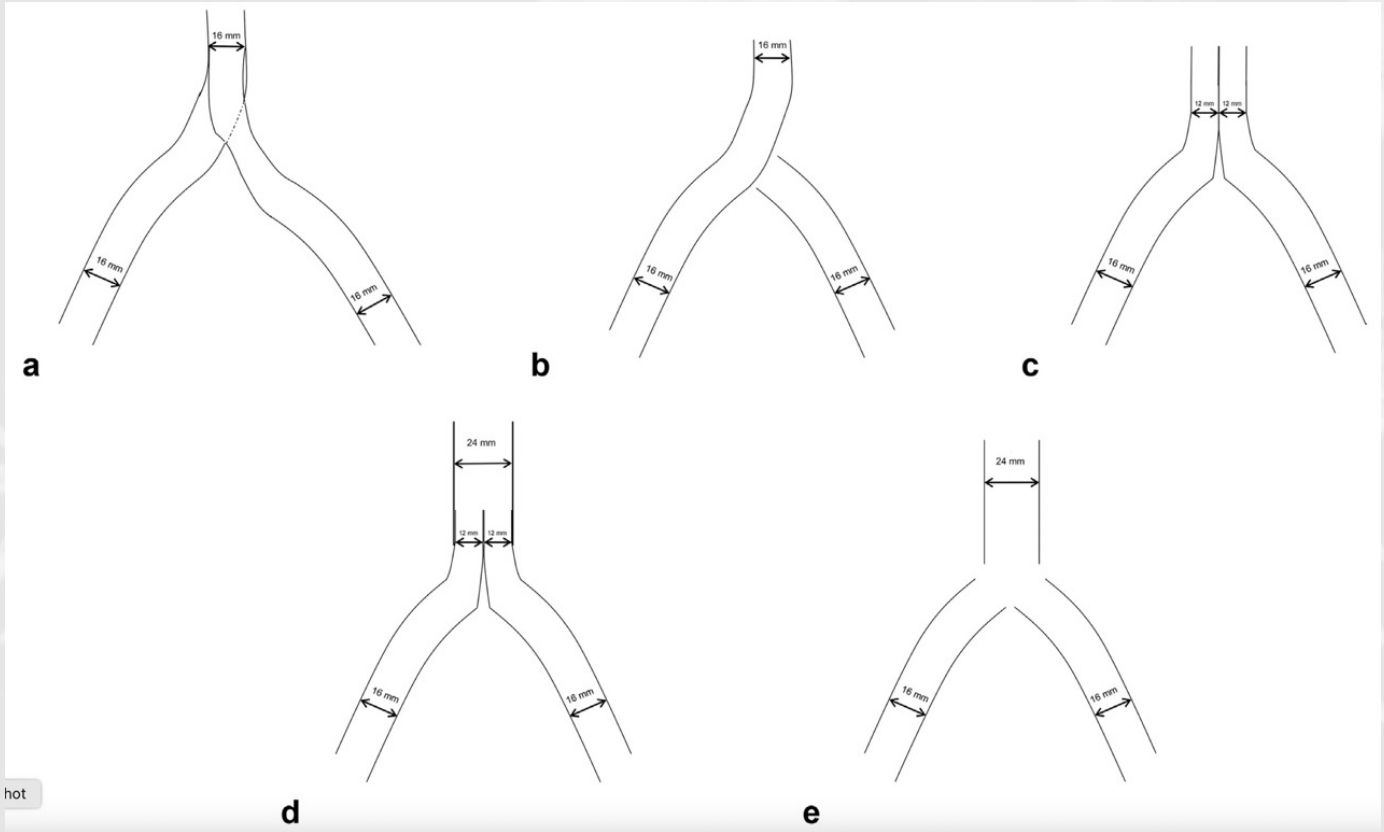
Ilio-caval stenting



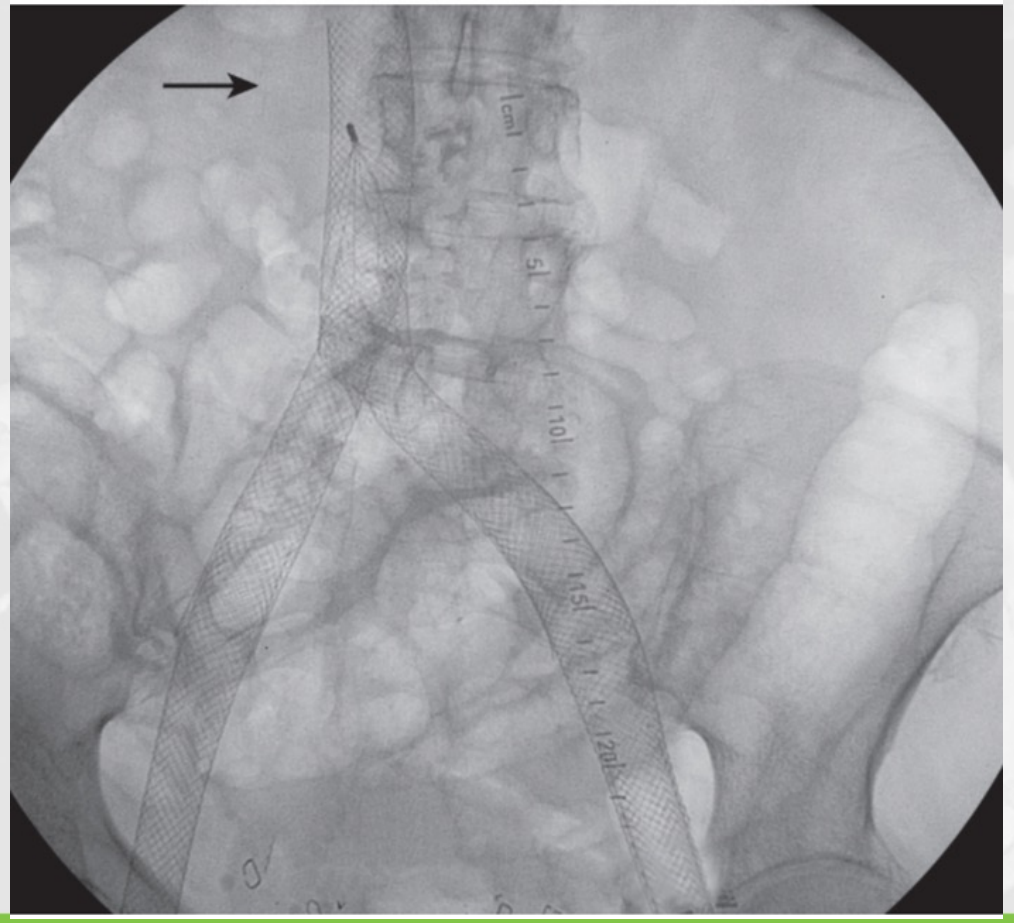
Ilio-caval stenting



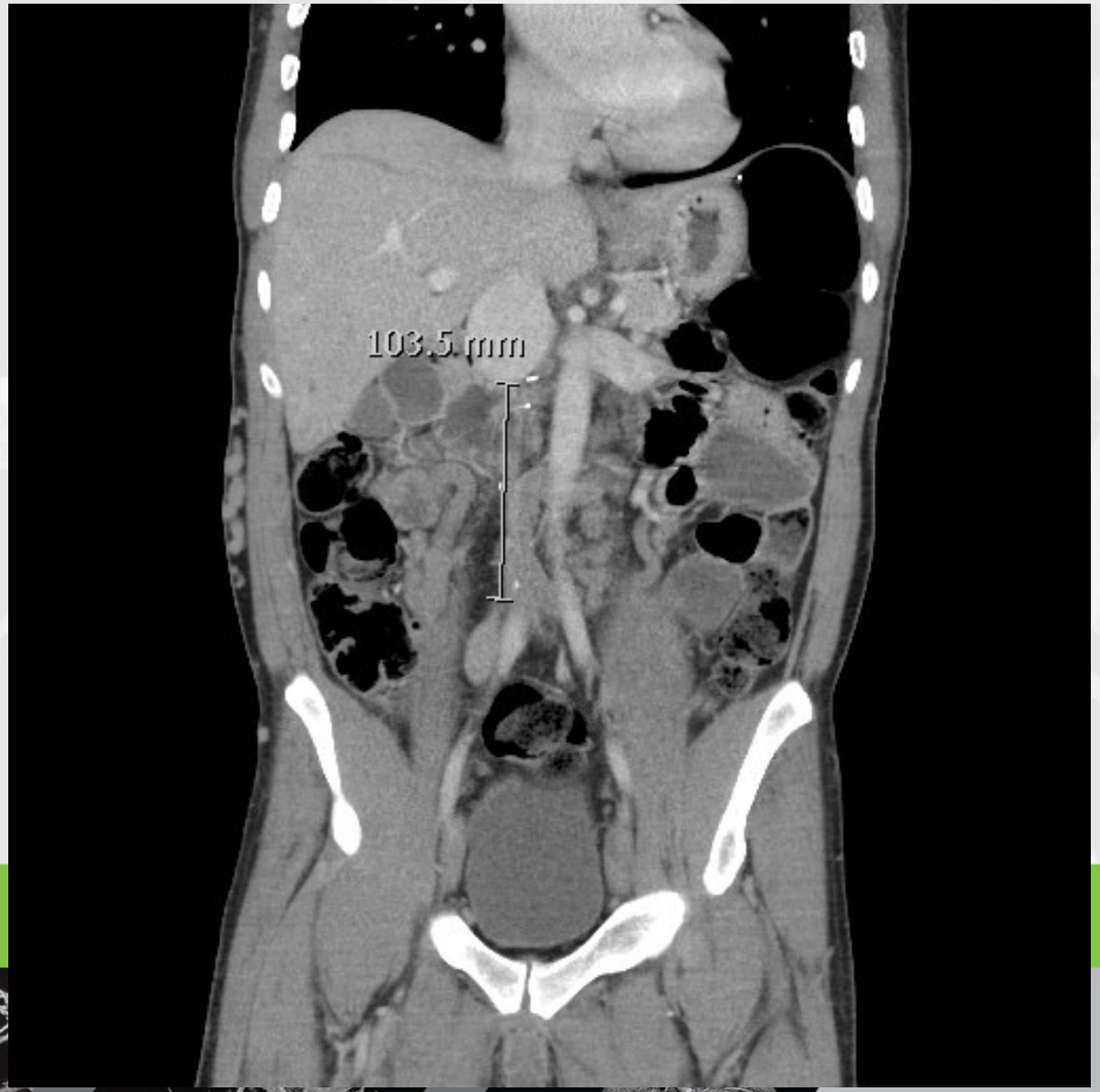
Ilio-caval Stenting



IVC filters with CVO



Sometimes Routine Methods don’t work

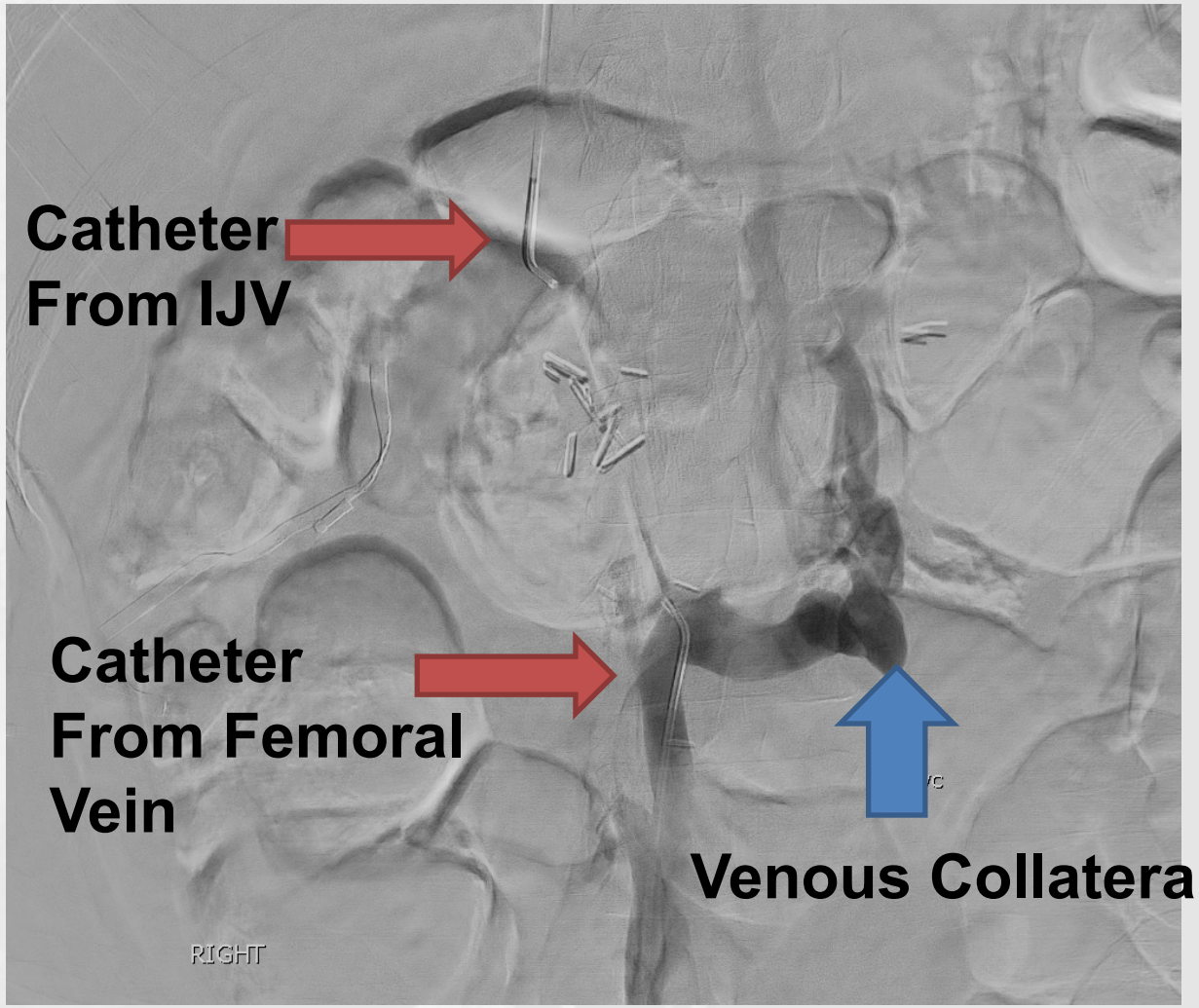


PROCEDURE

- Right internal jugular venous access was obtained, and a catheter was advanced to the infra-renal IVC stump.

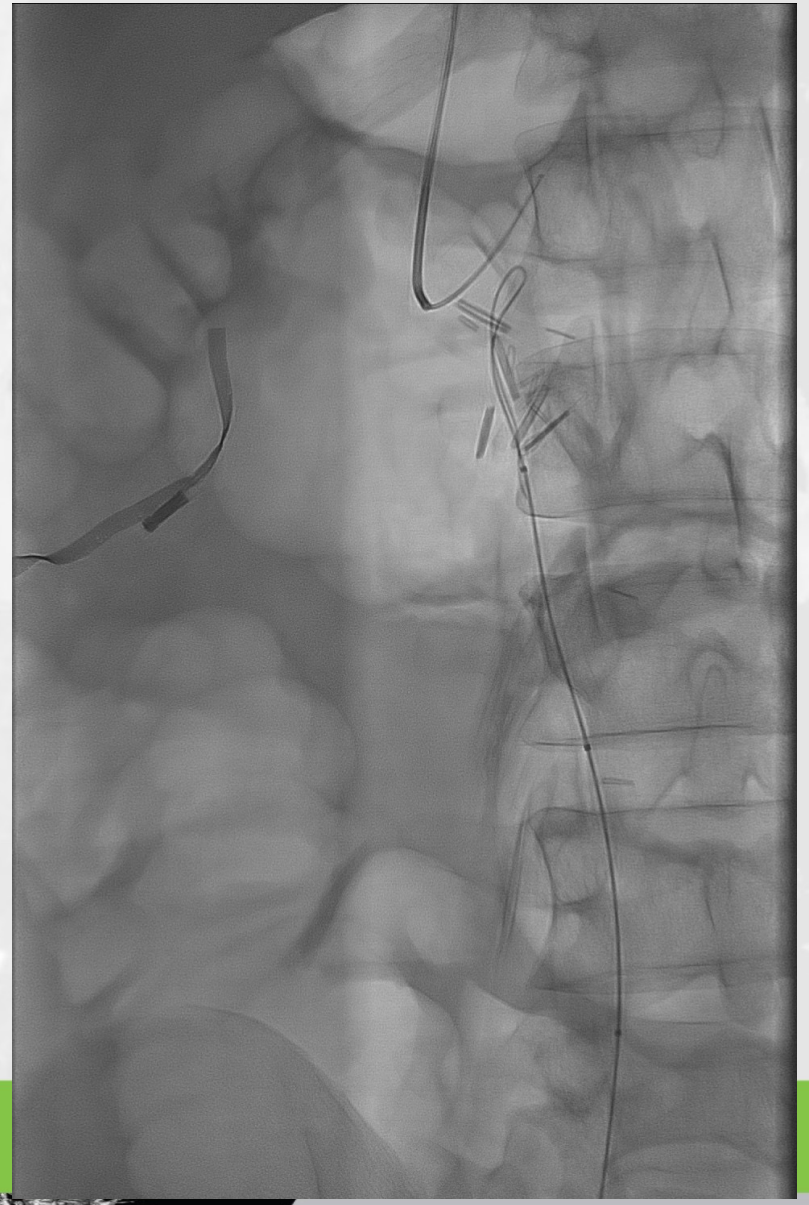
PROCEDURE

- Right common femoral vein access was also obtained, and an 8-Fr was advanced to the inferior site of ligation.
- Large collateral veins were identified and avoided.



PROCEDURE

- Crossing catheter and hydrophilic wire was used to select a channel but could not connect the dots.
- Ended up in the retroperitoneum from below



PROCEDURE

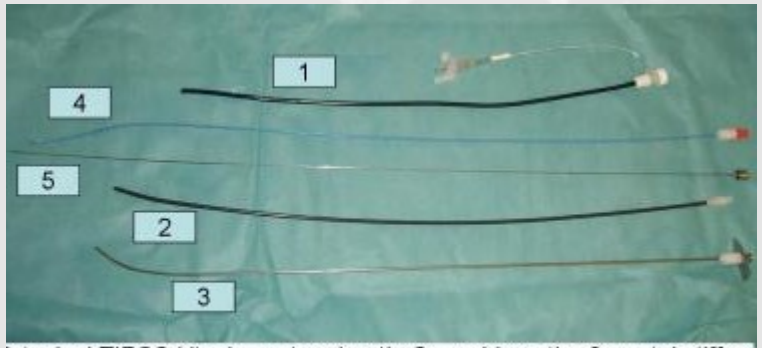
- Perforation into the retroperitoneum deliberately
- Confirm not in a venous collaterals
- Confirm no other injury

PROCEDURE

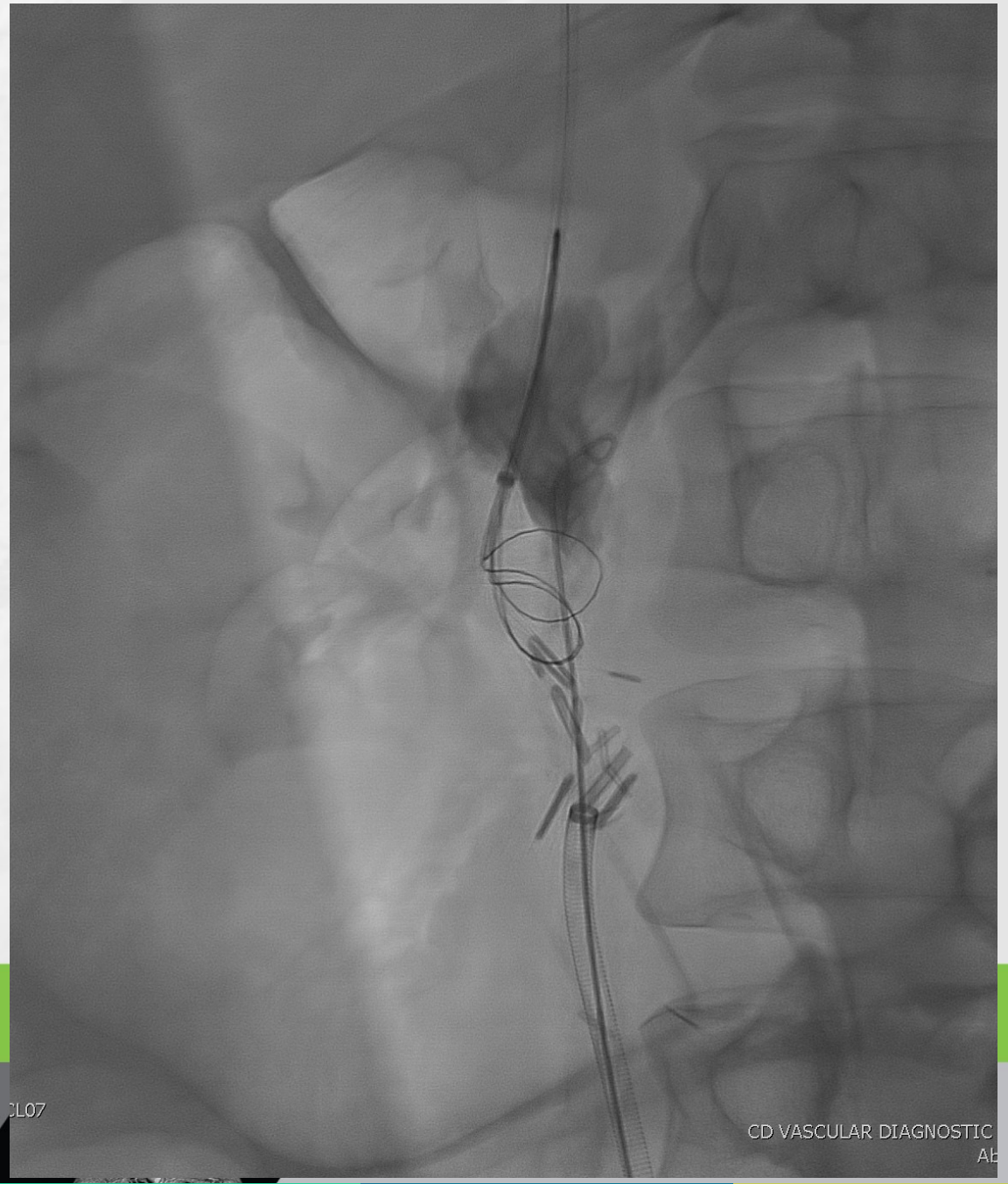
- Rotational Angiography to align the top and bottom catheters

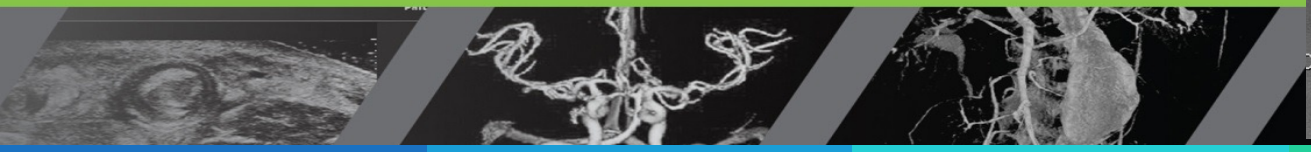
PROCEDURE

- TIPS set was used from femoral access
- 12 Fr sheath



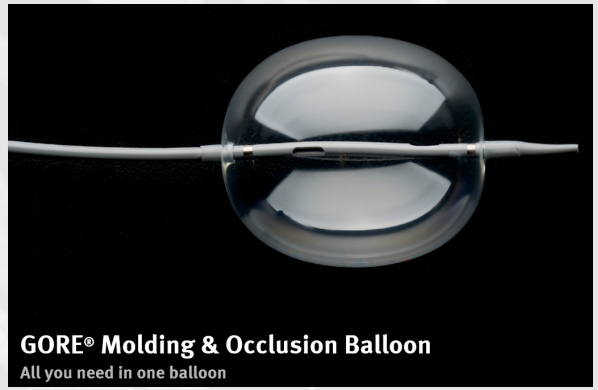
A typical TIPSS kit : 1 – outer sheath, 2 – guide cath , 3- metal stiffner
4 - catheter for needle , 5 – TIPSS needle.





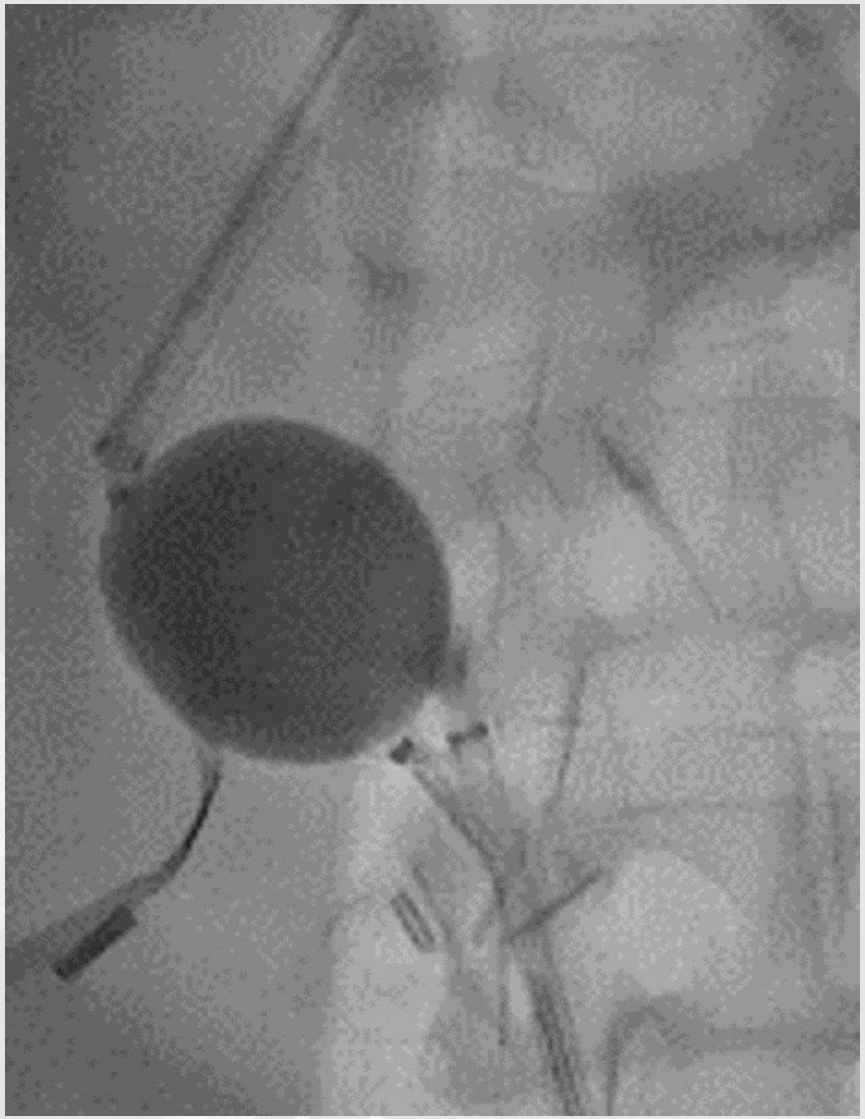
PROCEDURE

- A aortic occlusion balloon was then advanced from IJ access
- Femoral sheath/TIPS catheter were directed towards the balloon
- Catheter and needle were advanced.
- Multiple views were taken to ensure we were in a safe plane



PROCEDURE

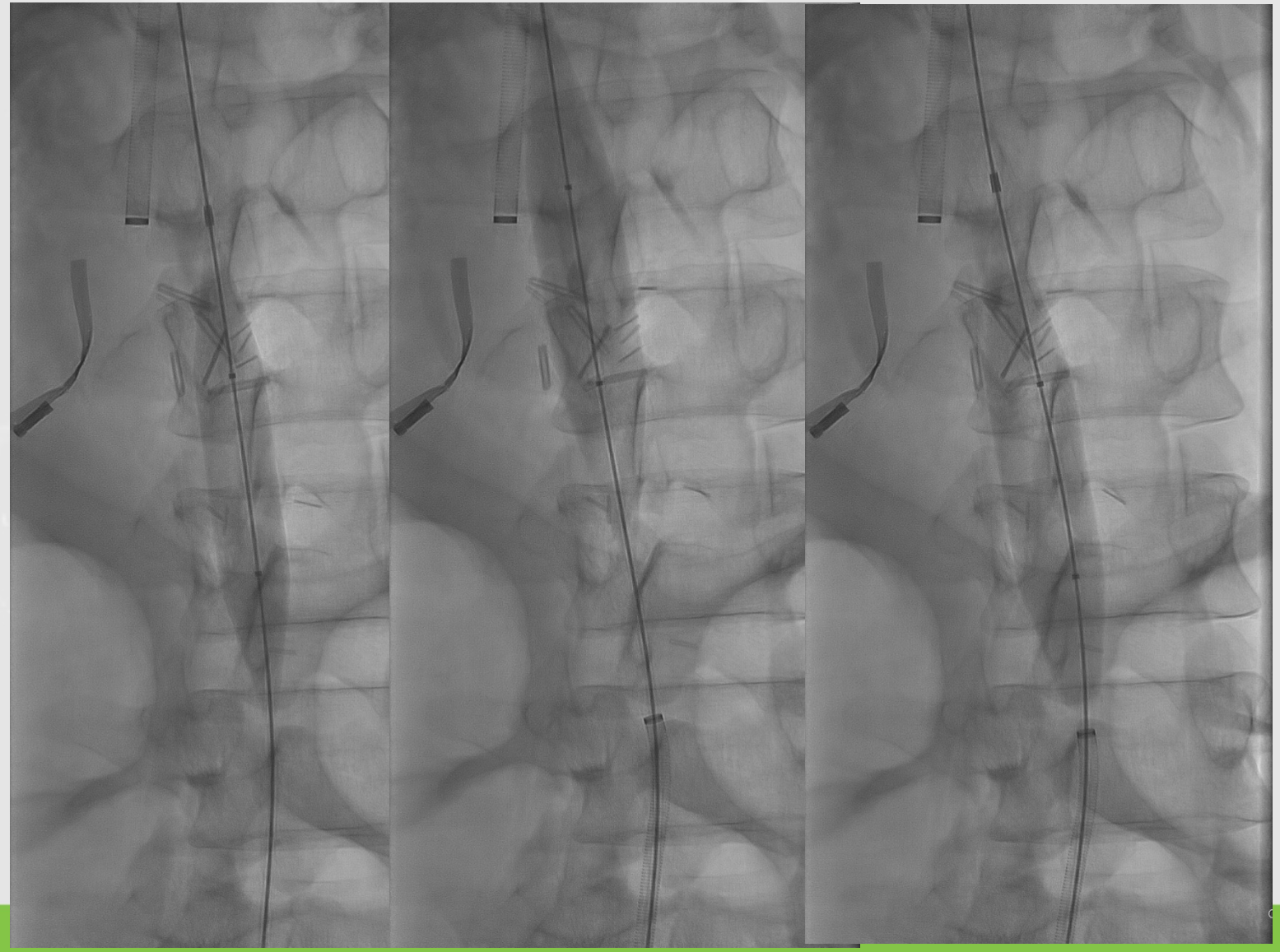
- A sheath was placed in the suprarenal IVC to support the balloon
- Multiple angles were taken to align the TIPS system to the aortic occlusion balloon
- The needle was advanced and the aortic occlusion balloon perforated.

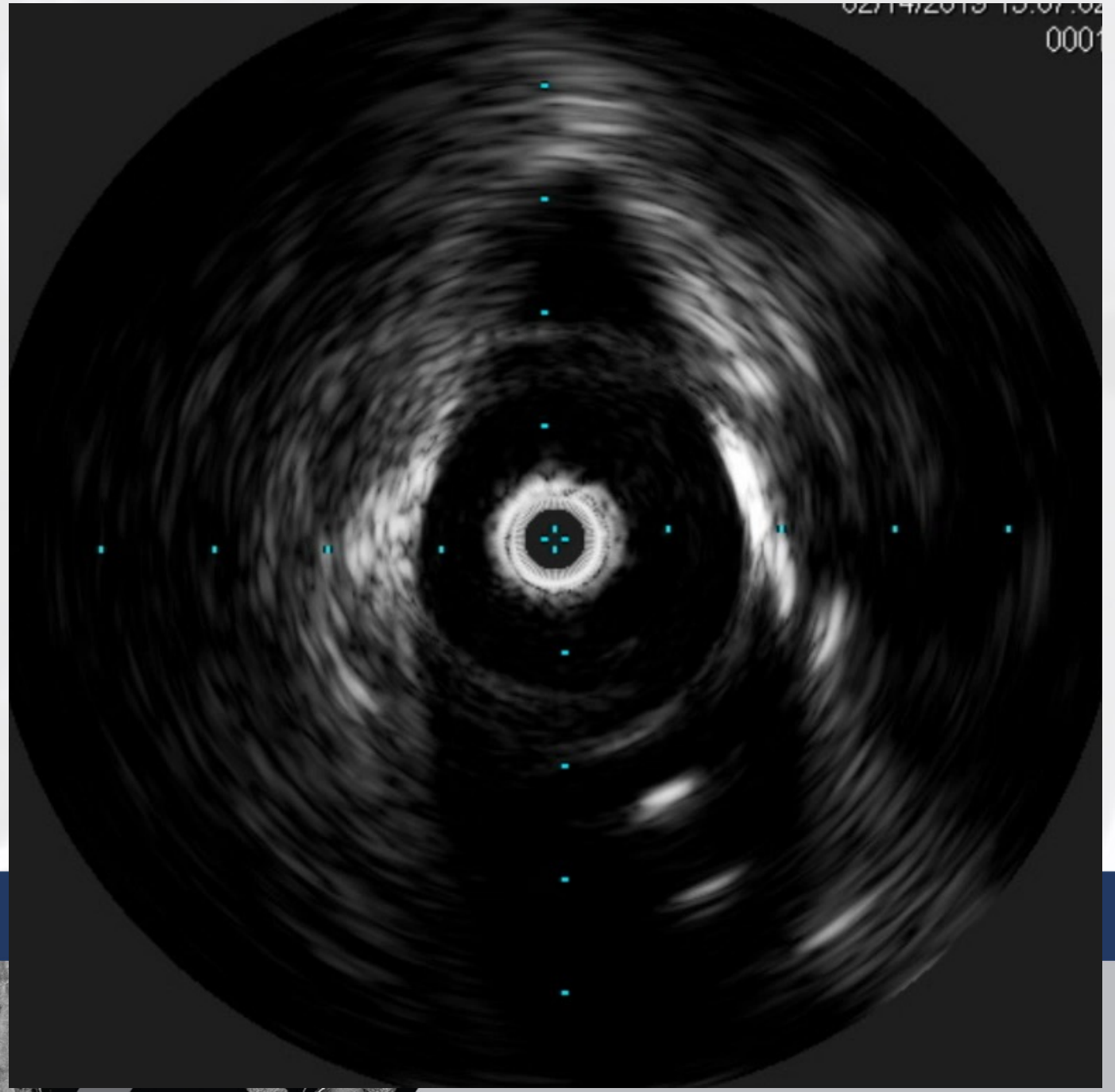


PROCEDURE

- Cavagram through the TIPS needle confirms the position within the IVC
- Stiff wire was placed

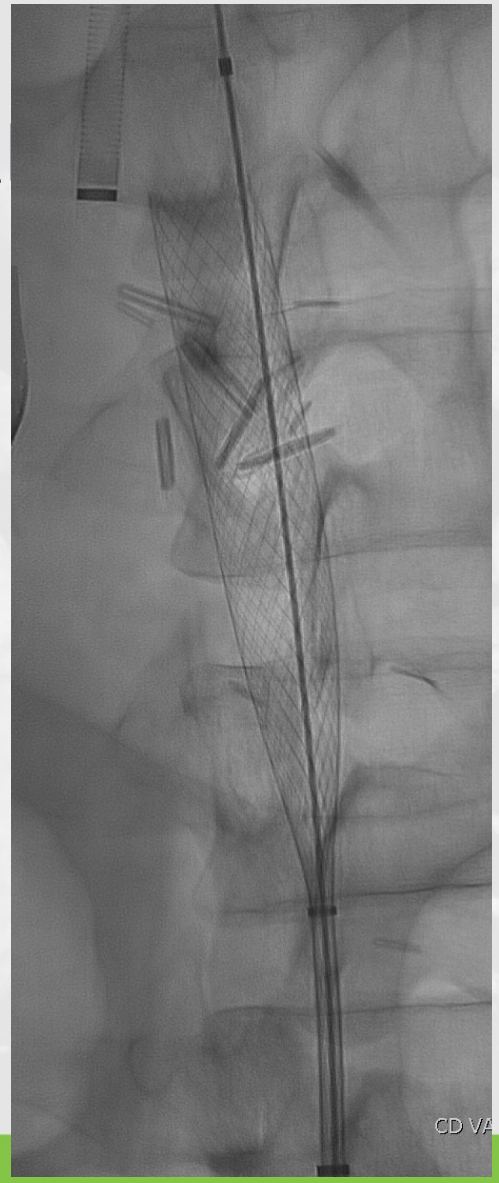
- Sequential angioplasty of the retro-peritoneal track to 18mm was performed to prepare the track for stenting.
- IVUS was then utilized to confirm correct anatomy and determine the length of stent needed.

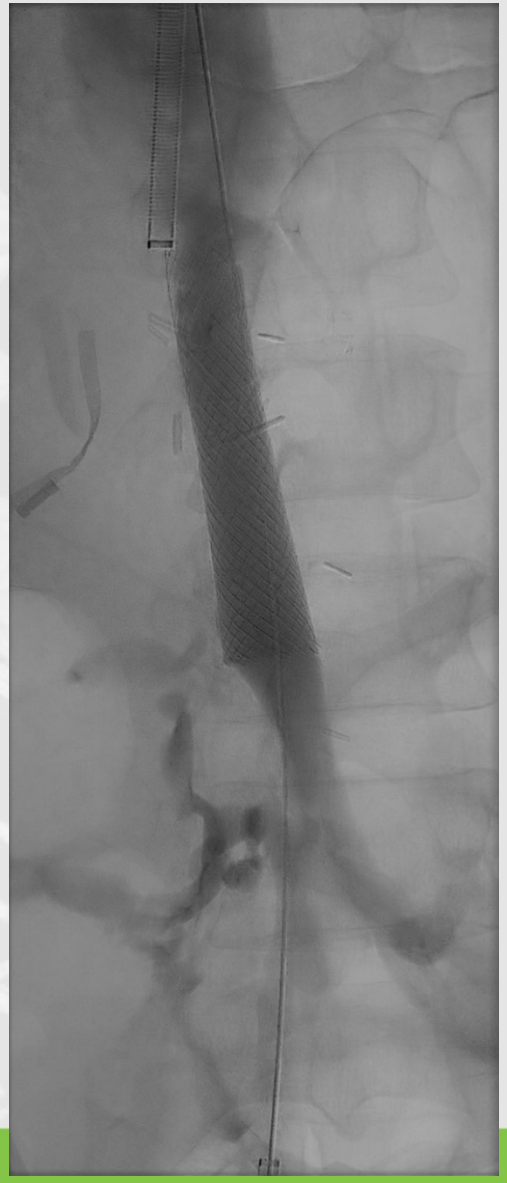




PROCEDUR

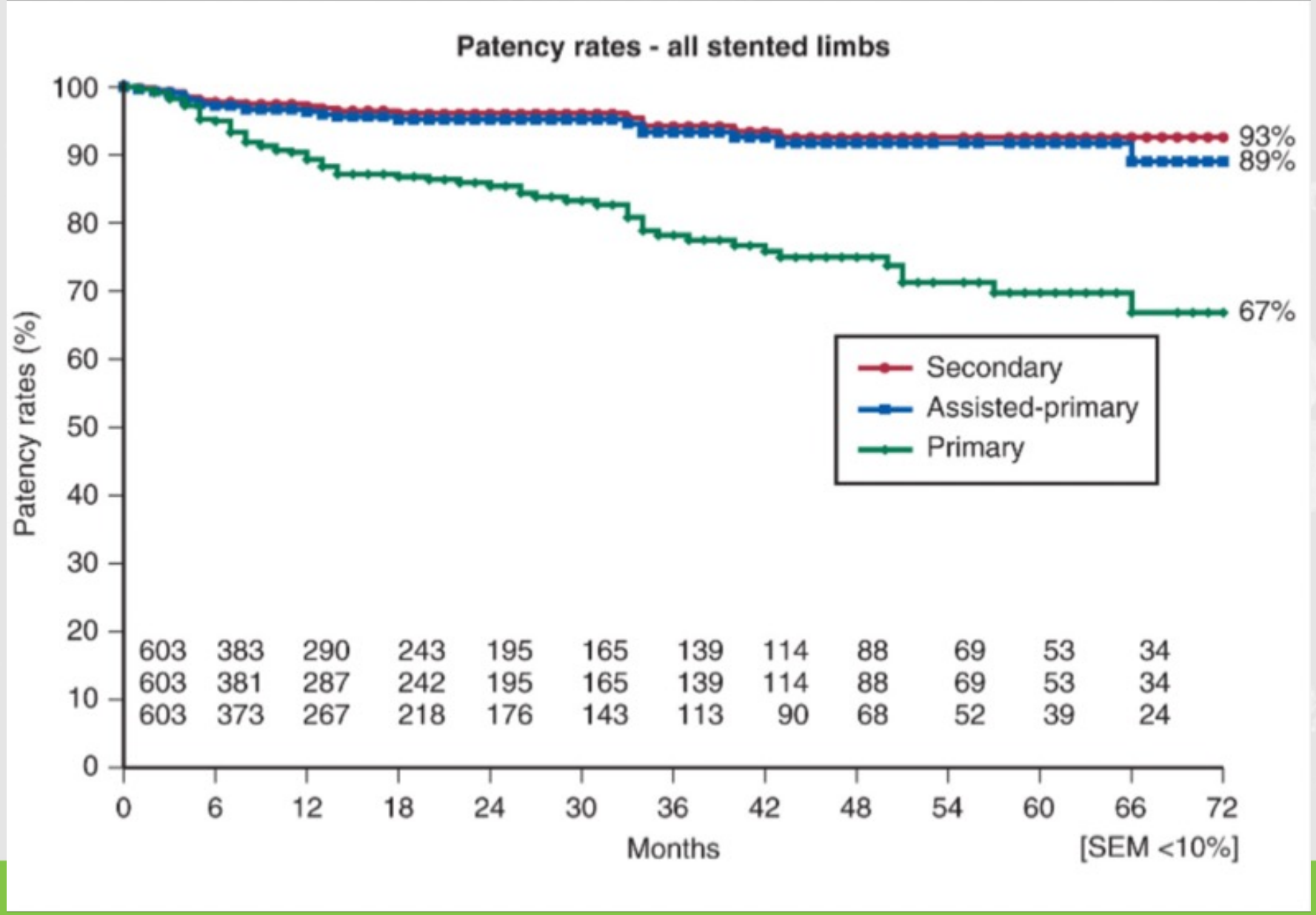
- A 20x55 Wallstent was placed and post-dilated to 18mm
- Started on Plavix and Xarelto
- 1 night in hospital and discharged to home





Outcomes

- Minimal morbidity: 0.4% in a large series *(Neglen, et al, JVS, 2007)*
- Mortality: almost none
- Excellent patency rates for the ilio-caval stents


Patency rates - all stented limbs
Patency rates (%)
100
90
80
70
60
50
40
30
20
10
0
93%
89%
67%
Secondary
Assisted-primary
Primary
603 383 290 243 195 165 139 114 88 69 53 34
603 381 287 242 195 165 139 114 88 69 53 34
603 373 267 218 176 143 113 90 68 52 39 24
0 6 12 18 24 30 36 42 48 54 60 66 72
Months
[SEM <10%]

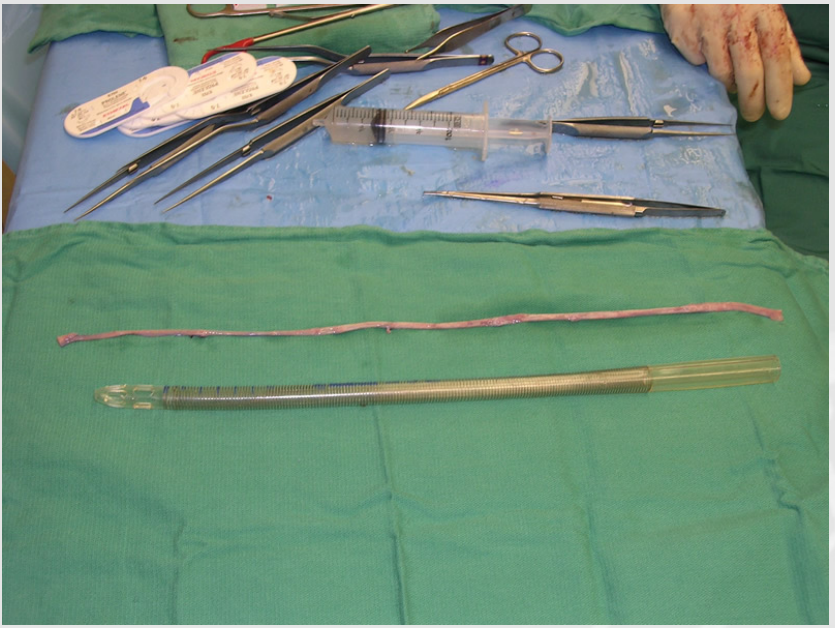
Open Surgical Reconstruction

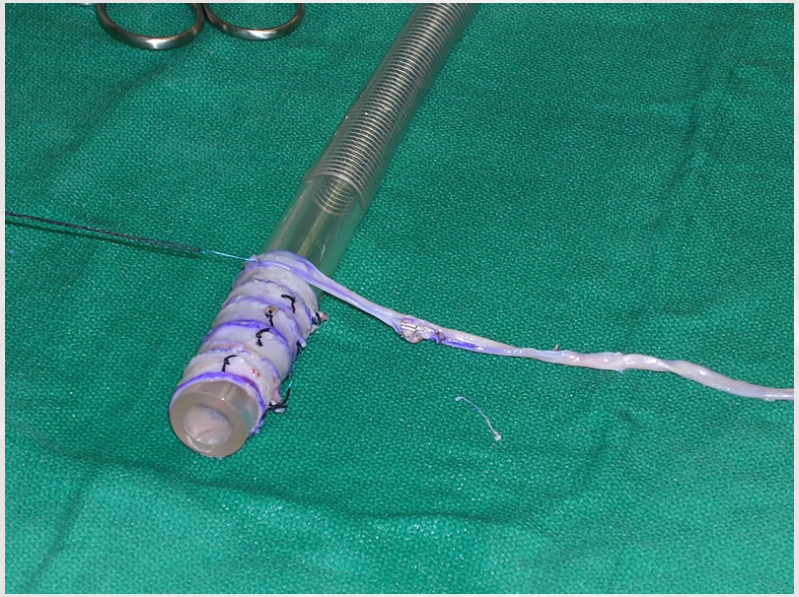
- Failed endovascular therapy
- Severely symptomatic patients with reasonable life expectancy
- Ideal patient: unilateral iliac vein occlusion, minimal distal thrombus/venous reflux

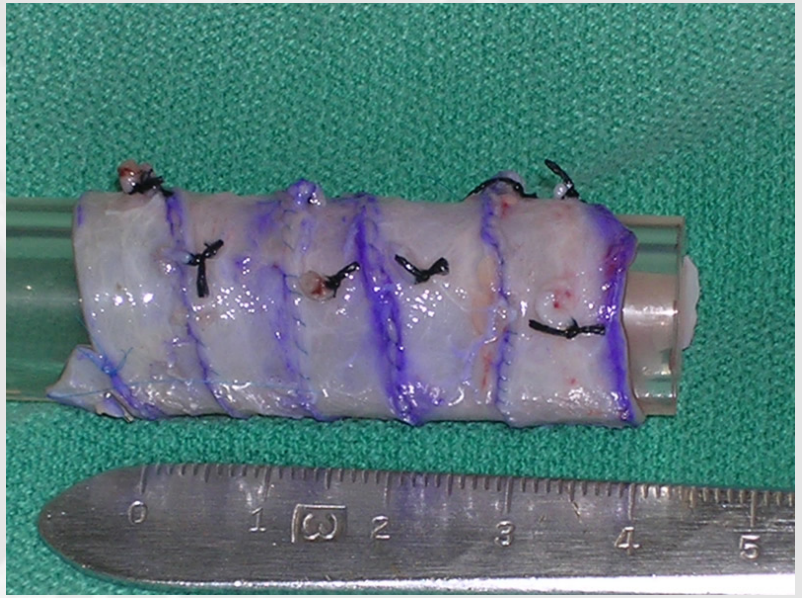
Open Surgical Reconstruction

- Essentially venous bypass
- Autogenous venous grafts are best:
  - GSV
  - Femoral vein
  - Spiral and panel grafts are less successful than in the SVC
- Externally supported ePTFE grafts are the usual conduits
- Other biologic grafts are of less use

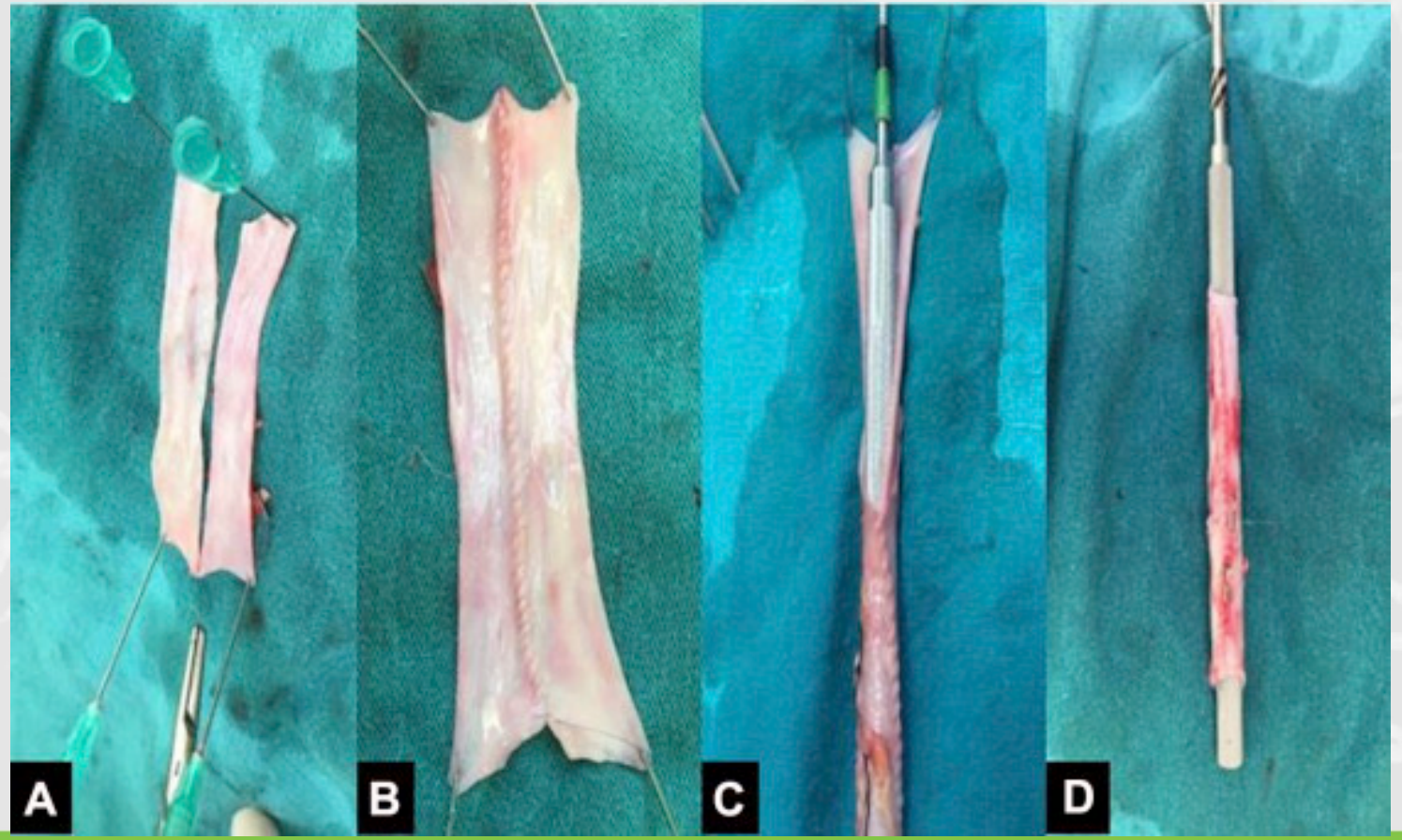
Spiral Graft





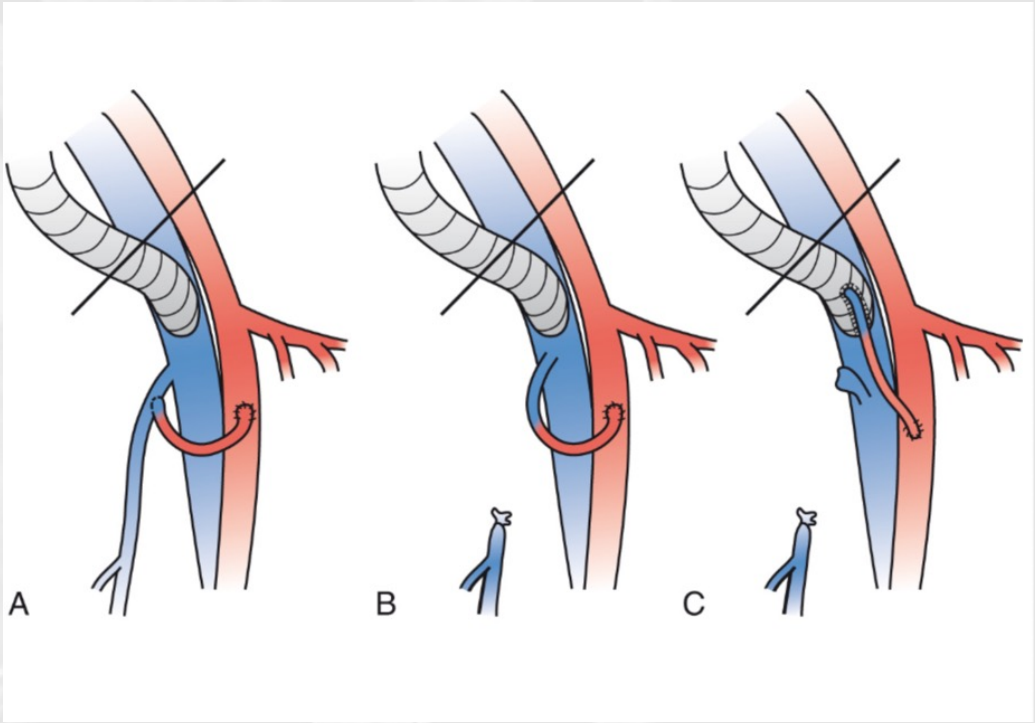


Panel Graft

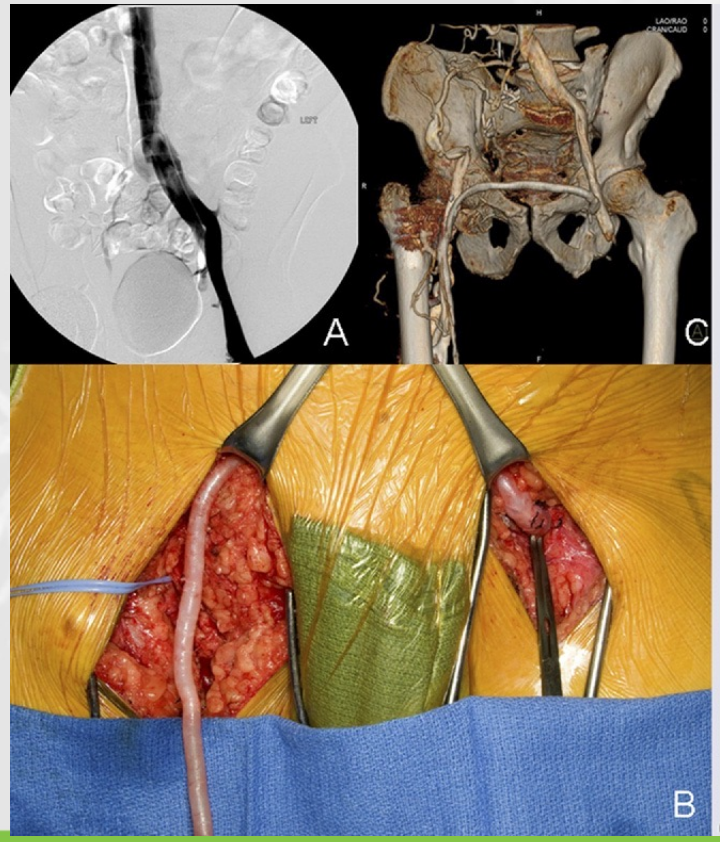


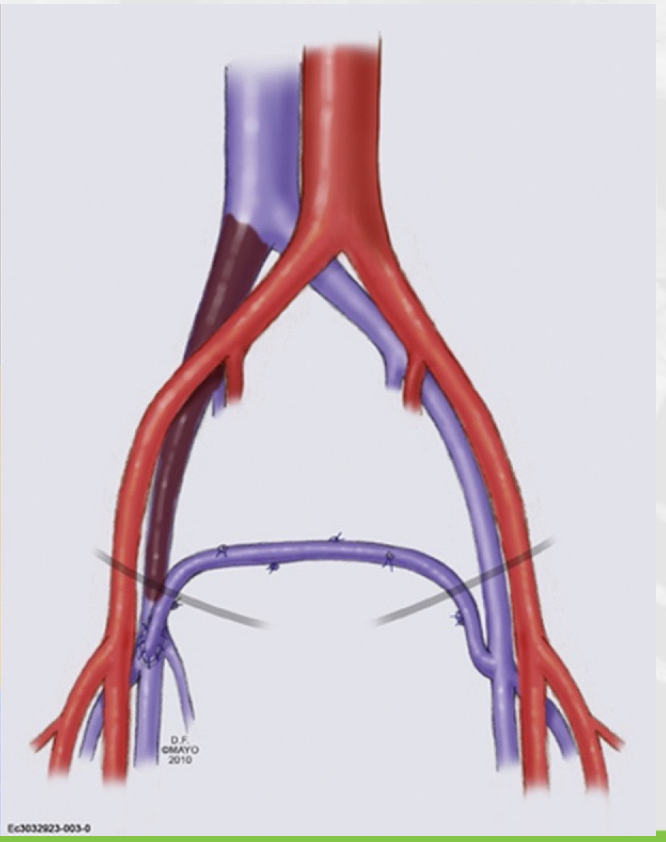
Open Surgical Reconstruction

- Venous bypass have higher tendency to thrombosis
- Surgical AVF created to improve flow through the graft especially with prosthetic bypasses
- Long term anticoagulation in prosthetic grafts



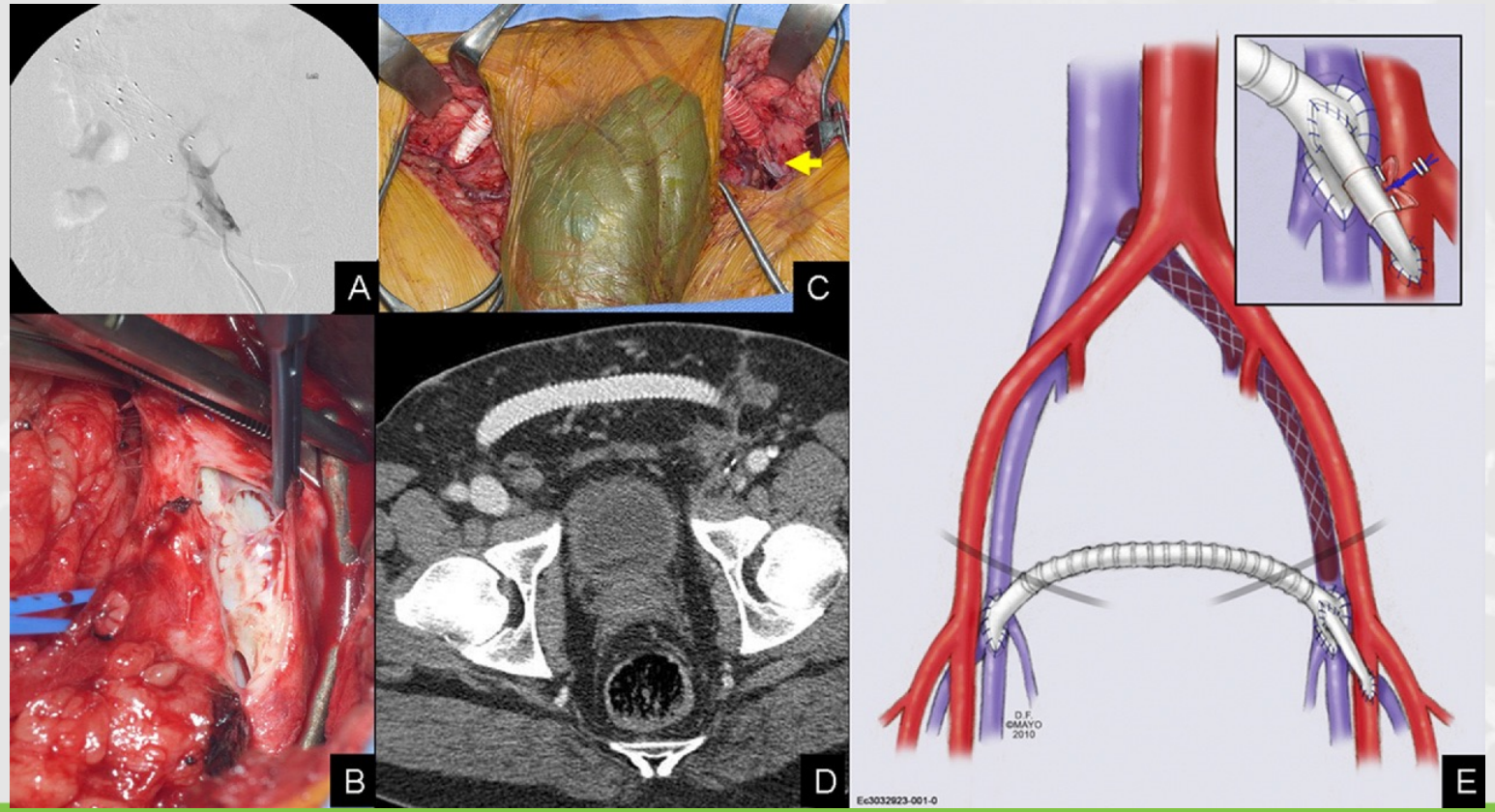
Palma Operation





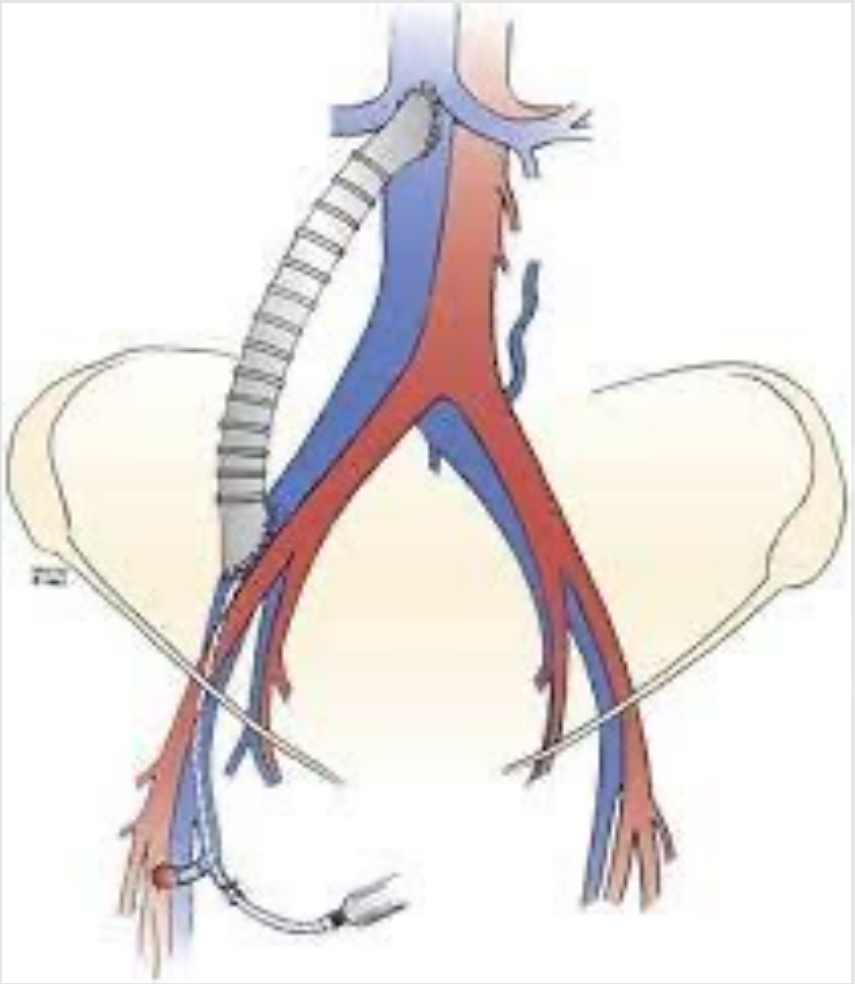
(Garg et al, JVS, 2011)

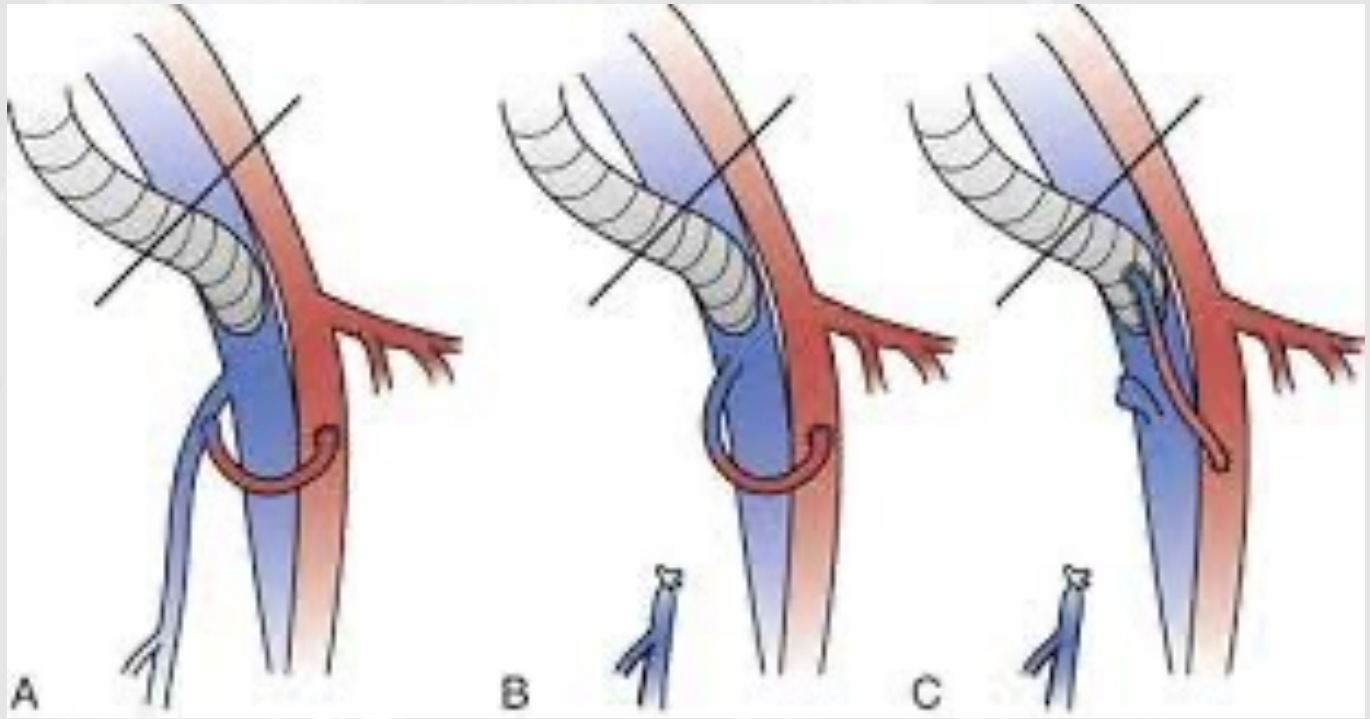
Palma Prosthetic



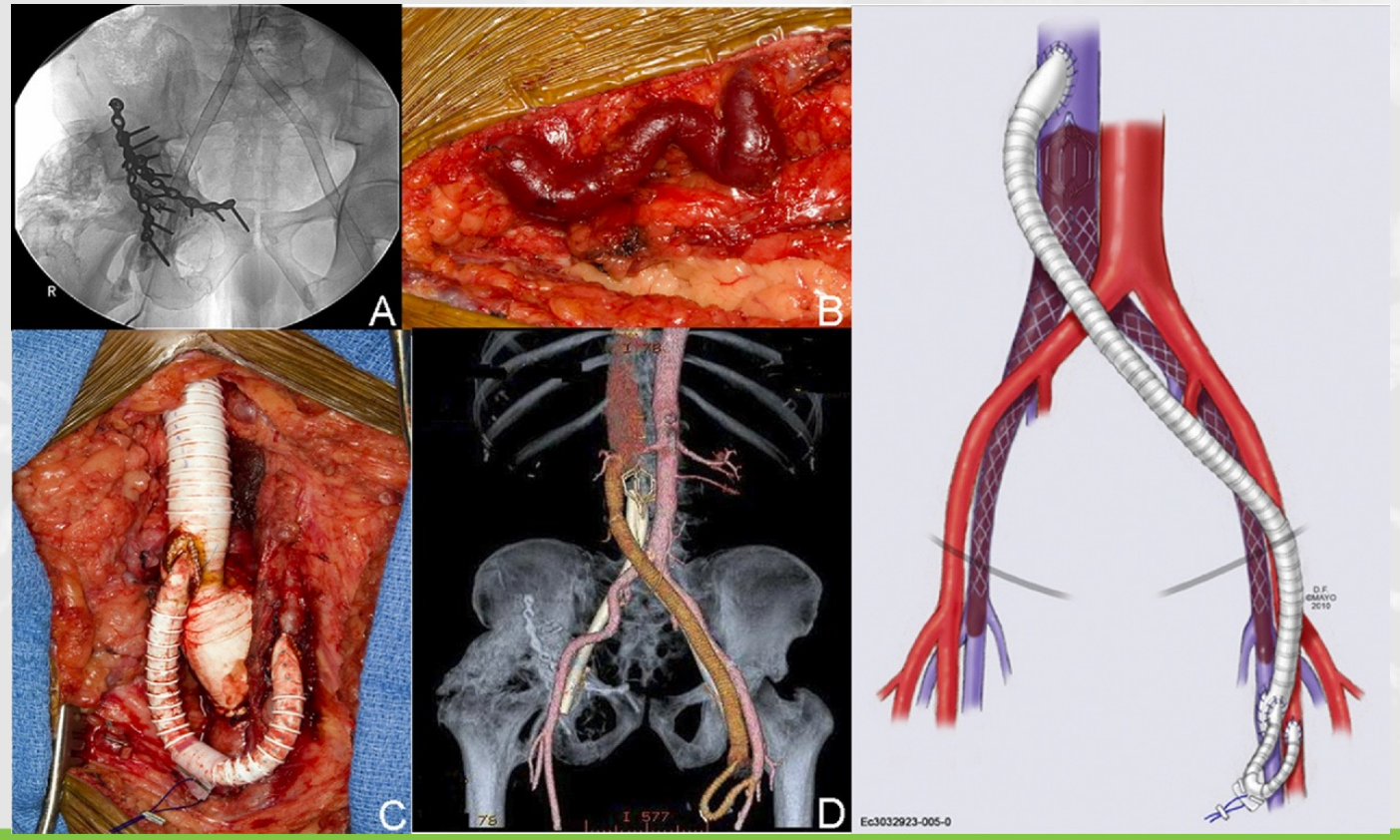
(Garg et al, JVS, 2011)

Ilio-caval bypass

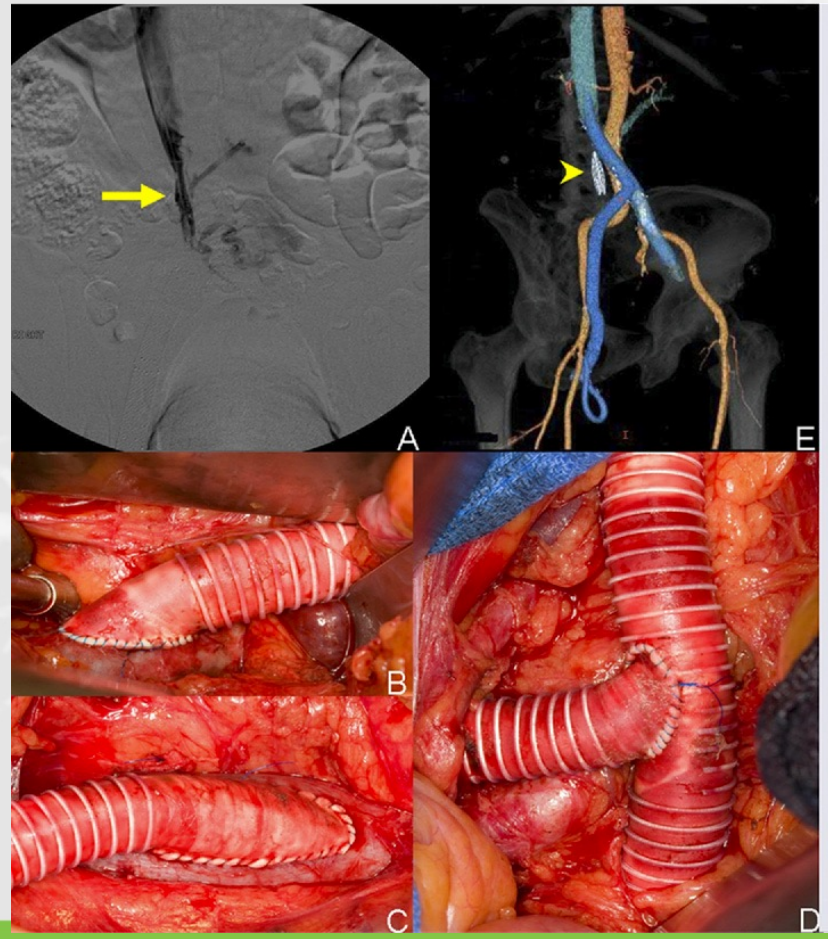


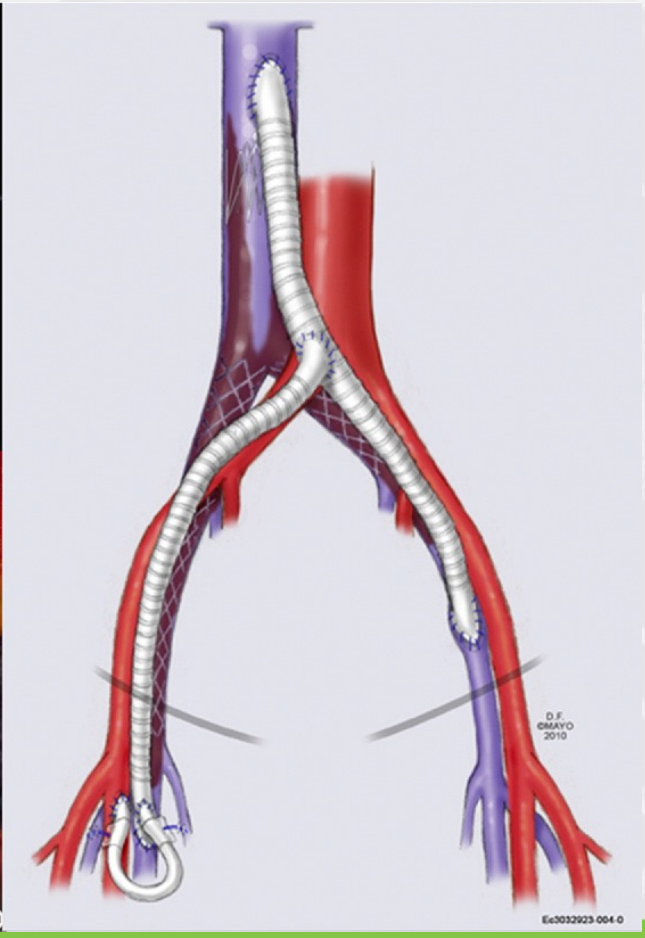


Femoro-caval bypass

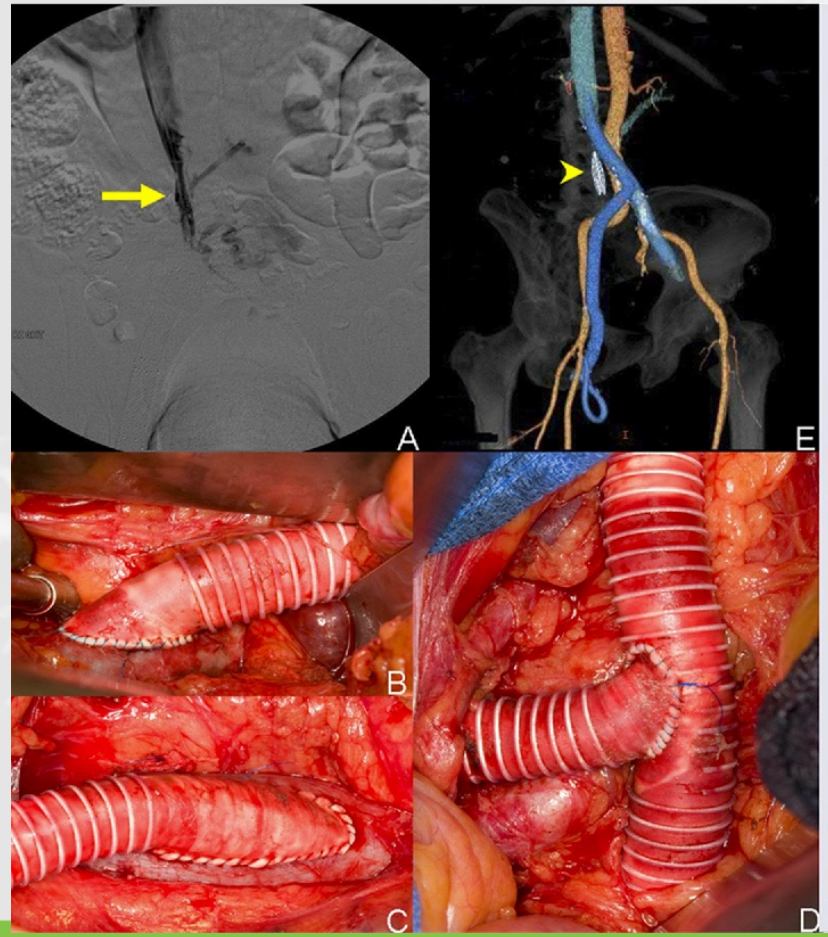


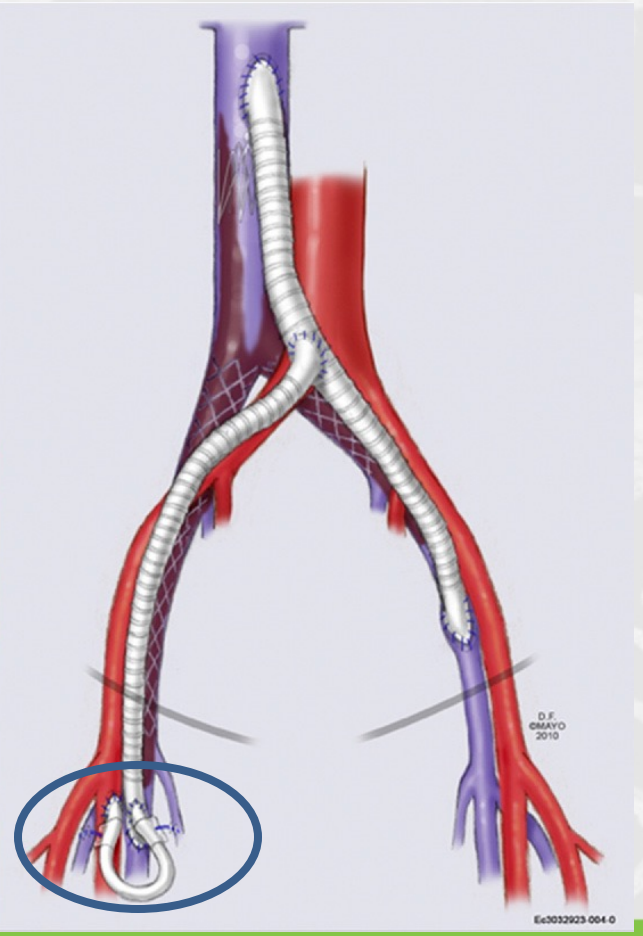
Complex Reconstruction





Complex Reconstruction



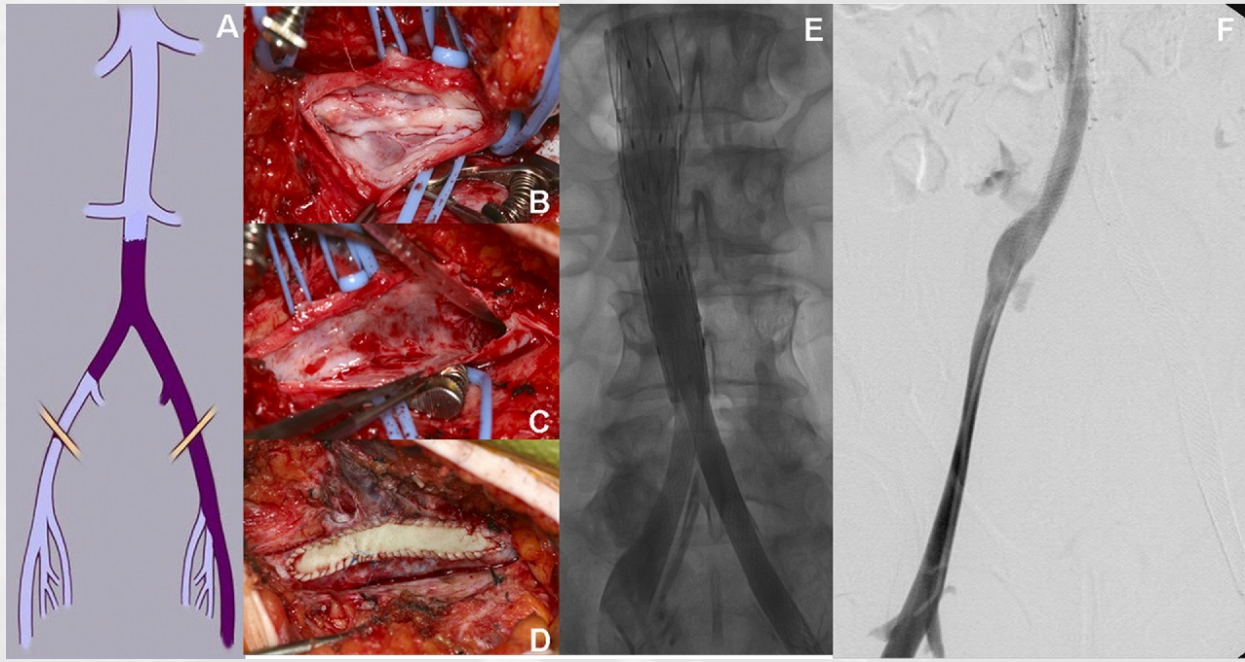


Outcomes

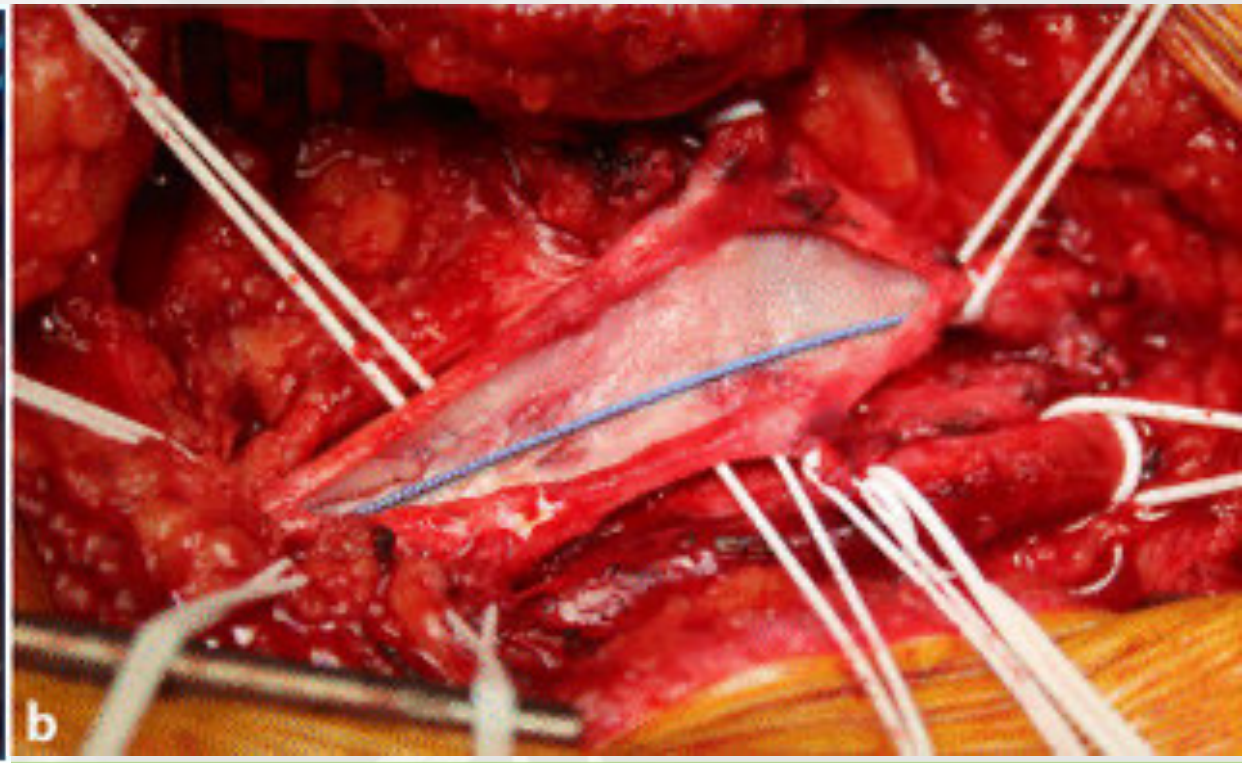
- Limited experience in selected centers
- Literature is very scarce with very variable follow up duration and different endpoints
- Cross femoral venous bypasses (433 patients in largest 10 series)
  - Clinical improvement 63-89%
  - Patency 70-85%
- Femoro/ilio-caval bypasses
  - Clinical improvement 67-100%
  - 1-3 year patency 54-100%

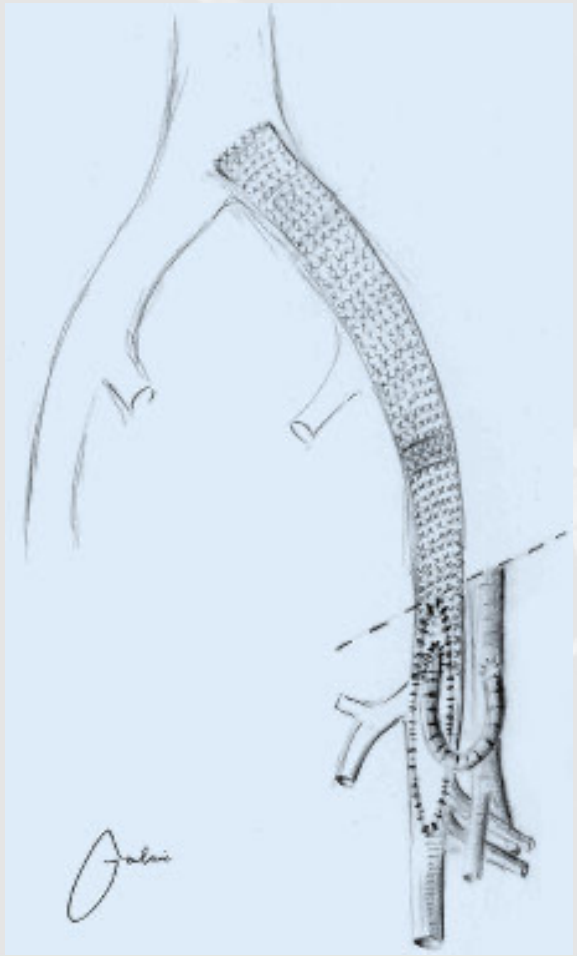
Hybrid Repair

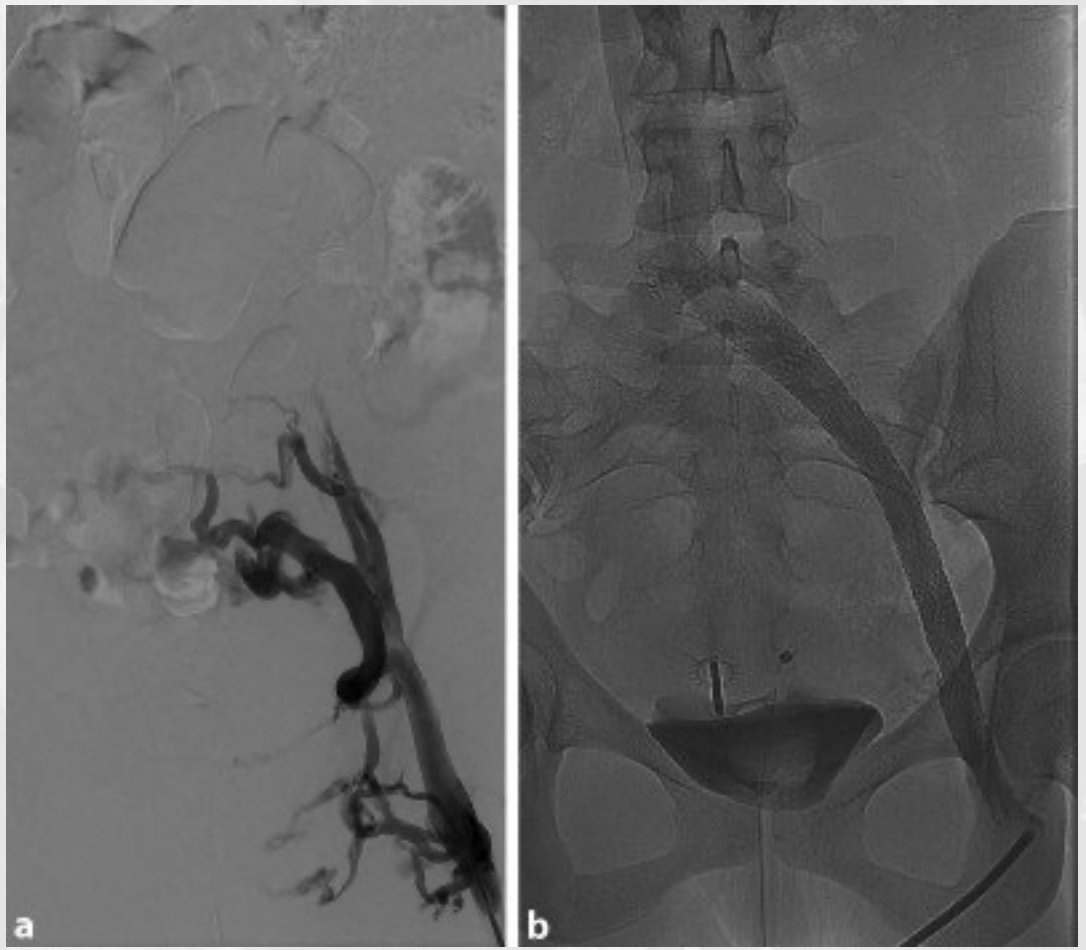
- Iliac vein occlusion with significant femoral vein disease
- Endovascular recanalization of the iliac vein and endophlebectomy of the femoral vein
- Stenting into the femoral vein



Endo-Phlebectomy







(Jalaie et al, 2016)

Upper Extremity CVO

- Quiet heterogenous group of patients
- The commonest cause is central venous catheters and pacemaker devices
- TOS can be the primary etiology, however, it is usually a contributing factor
- Most of the time is asymptomatic except
  - Intrathoracic malignant neoplasms (SVC syndrome)
  - Dialysis patients with functional access

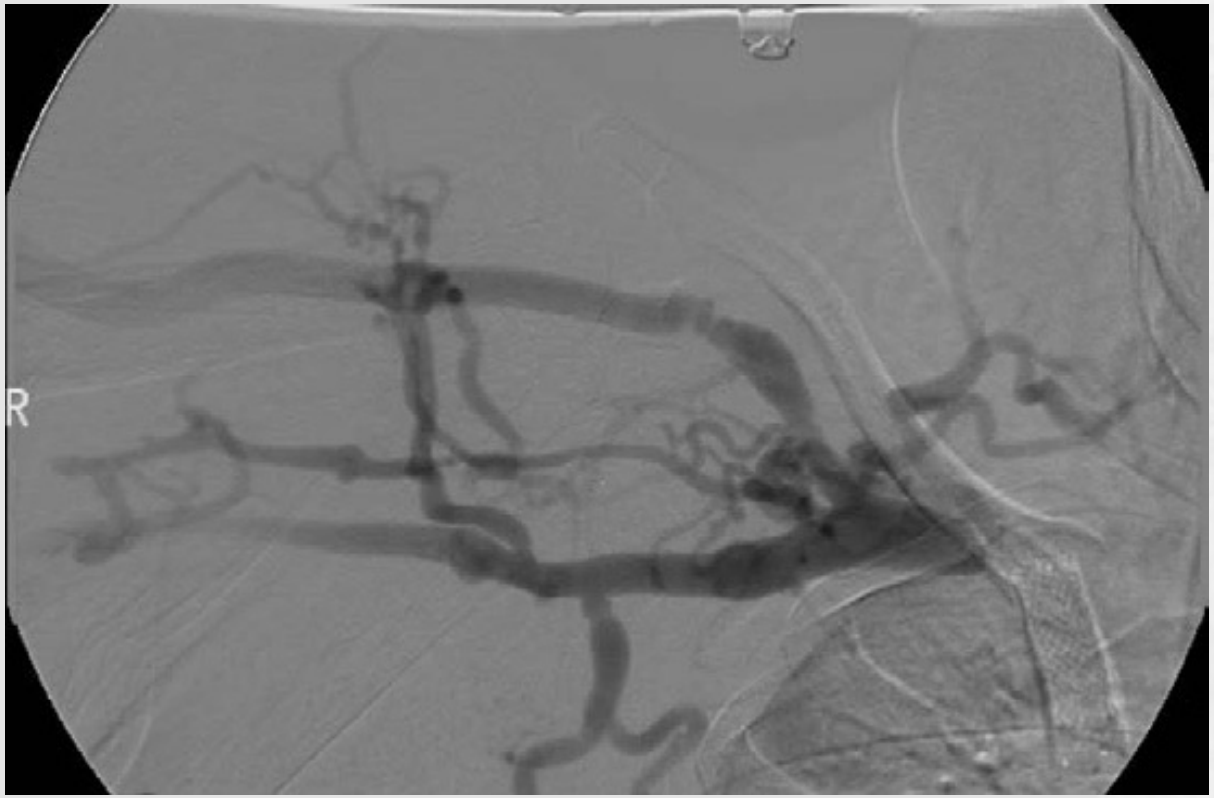
SVC Syndrome

- Acute or chronic SVC occlusion
- 50% of the time due to intrathoracic malignancy mostly lung cancer. There is a long list of tumor etiology though.
- Indwelling catheters and pacemakers are the commonest benign causes. (1-3% of patients)

Diagnosis

- Clinically:
  - Head and neck fullness and swelling
  - SOB, orthopnea, headache dizziness, cough
  - Dilated neck veins, prominent chest wall veins
  - Manifestations are accentuated in ESRD patients with functional UE access
- Investigations
  - CXR
  - Venous duplex
  - CT venogram, MRV
  - Venography (the gold standard

SVC Occlusion



Treatment

- Initial Treatment:
  - Head elevation
  - Diuretics
  - Heparin (in cases of acute exacerbation with DVT)
- Irradiation:
  - In patients with malignant disease
  - Usually effective in relieving symptoms (80% of cases)
  - Usually takes time (mean of 4 weeks)

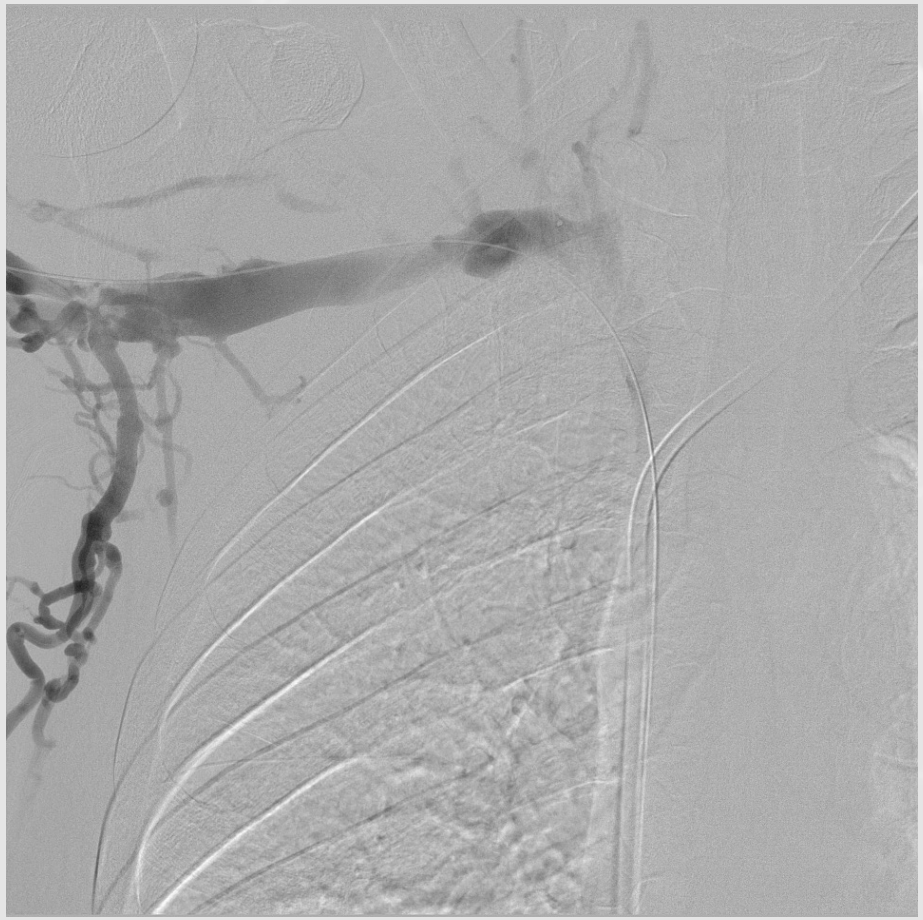
Endovascular Therapy

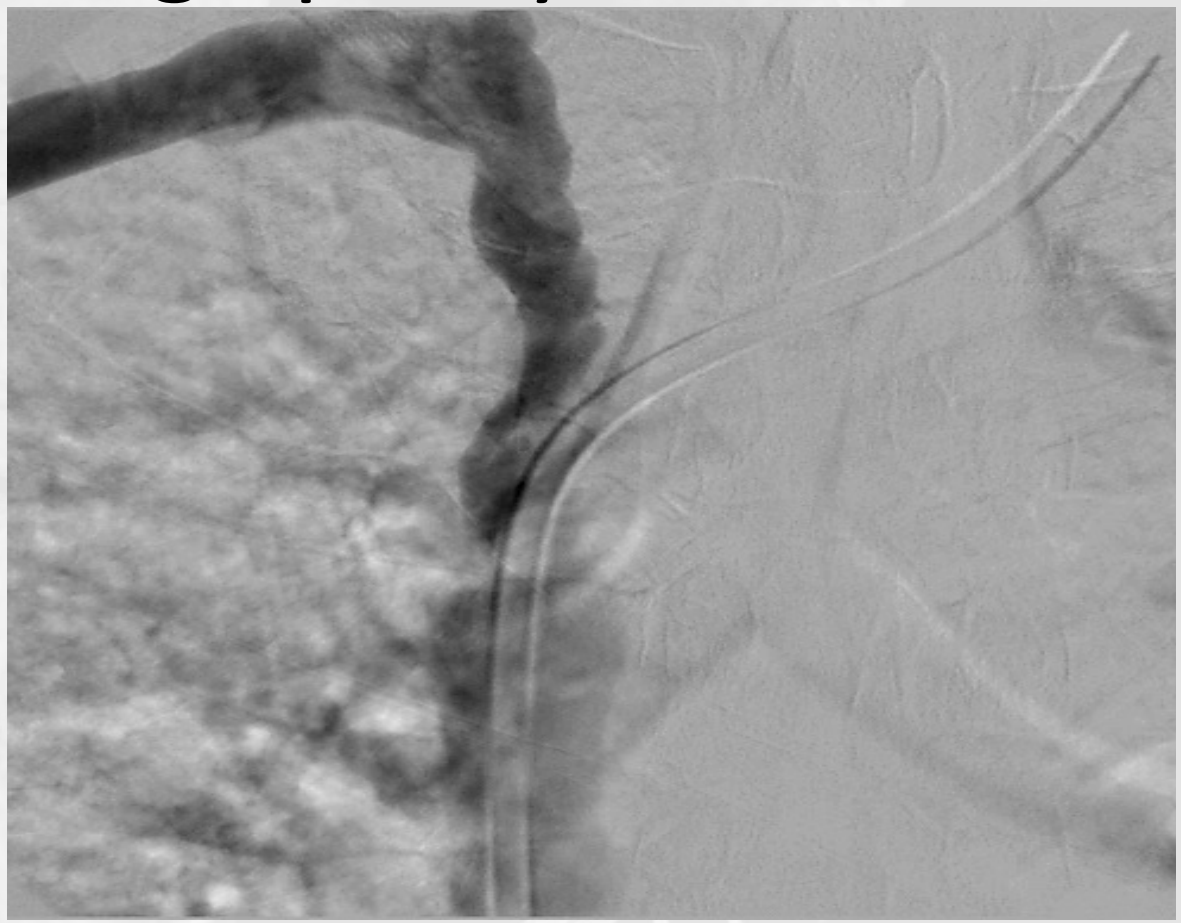
- First line treatment in benign disease and in malignant cases until radiotherapy effect shows up
- Thrombolysis/thrombectomy is attempted in patients who have acute DVT component that may have precipitated symptoms
- Crossing the obstruction and management follows the same principles of ilio-caval obstruction.

Endovascular Therapy

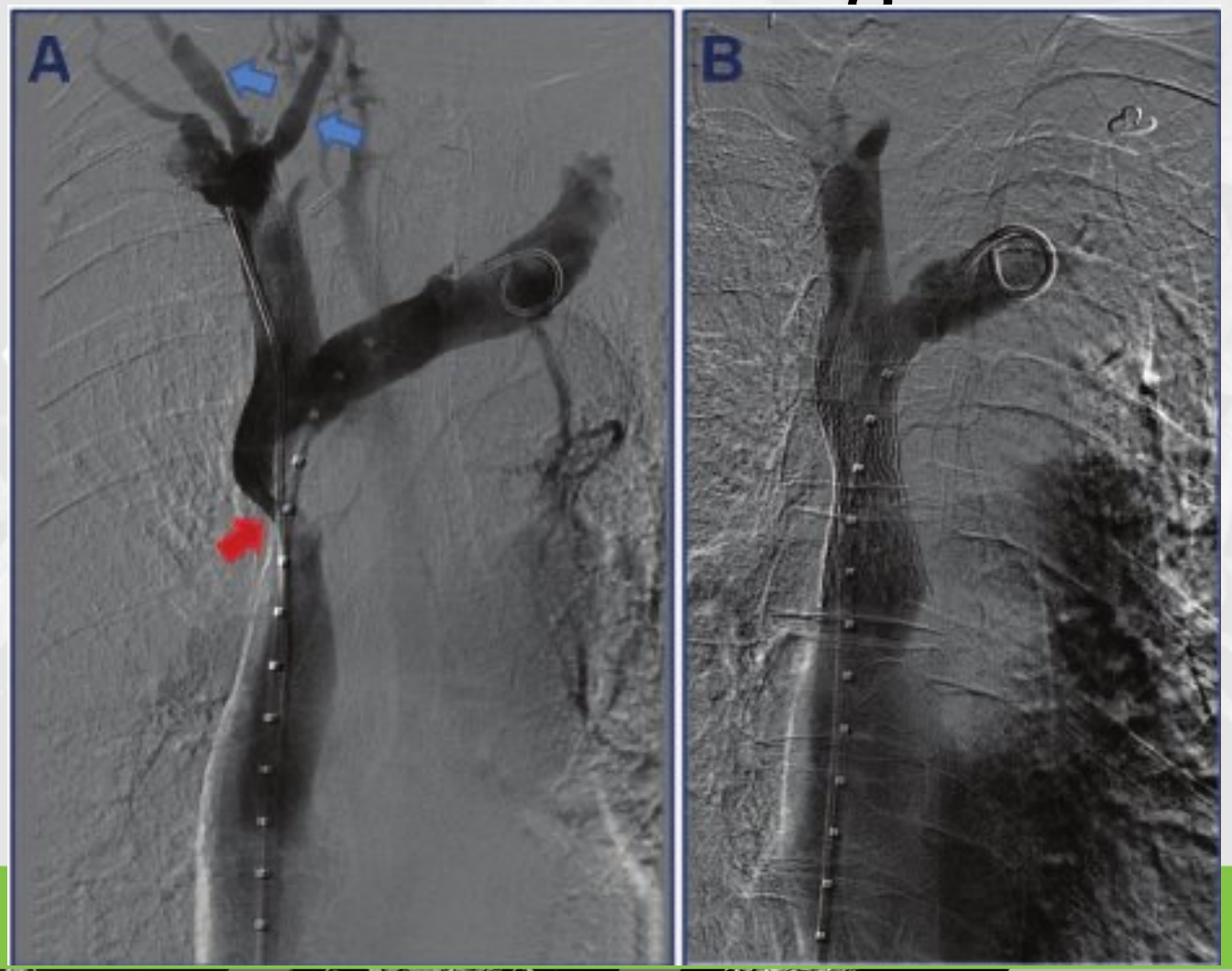
- Angioplasty alone is usually not successful or short lived.
- Stenting is the usual therapy needed
  - BMS vs Covered stents
  - Self expanding vs balloon expanding stents
  - Unilateral, kissing stents, isolated SVC stents
- Beware of the lower half of the SVC (pericardial tamponade)

Balloon Angioplasty





SVC Stenting

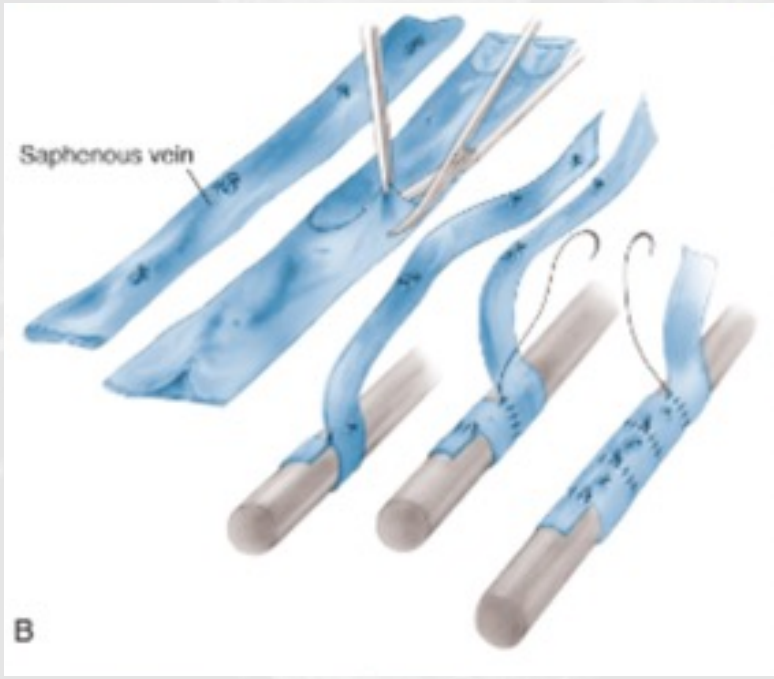


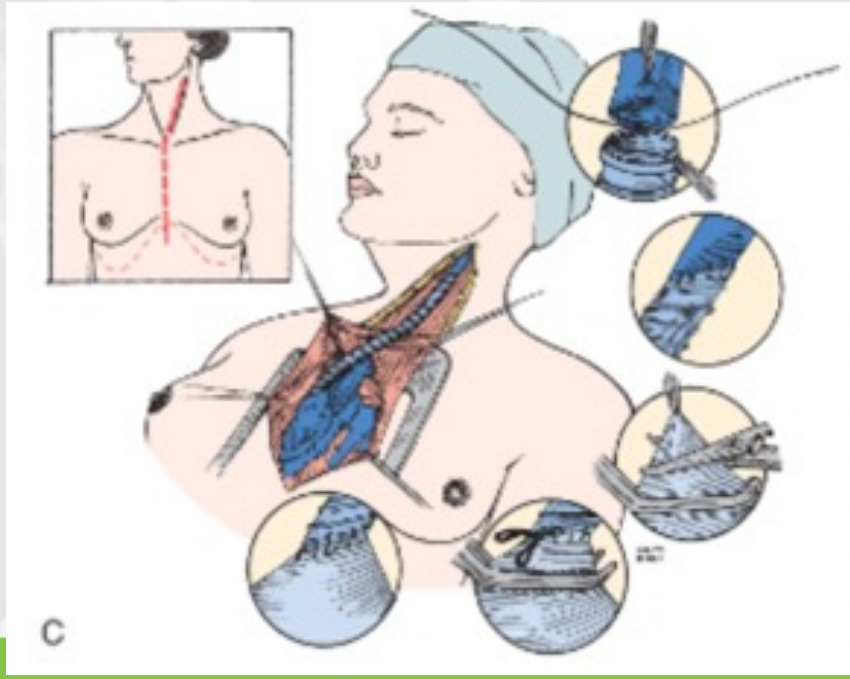
SVC Kissing Stenting

Open Surgical Management

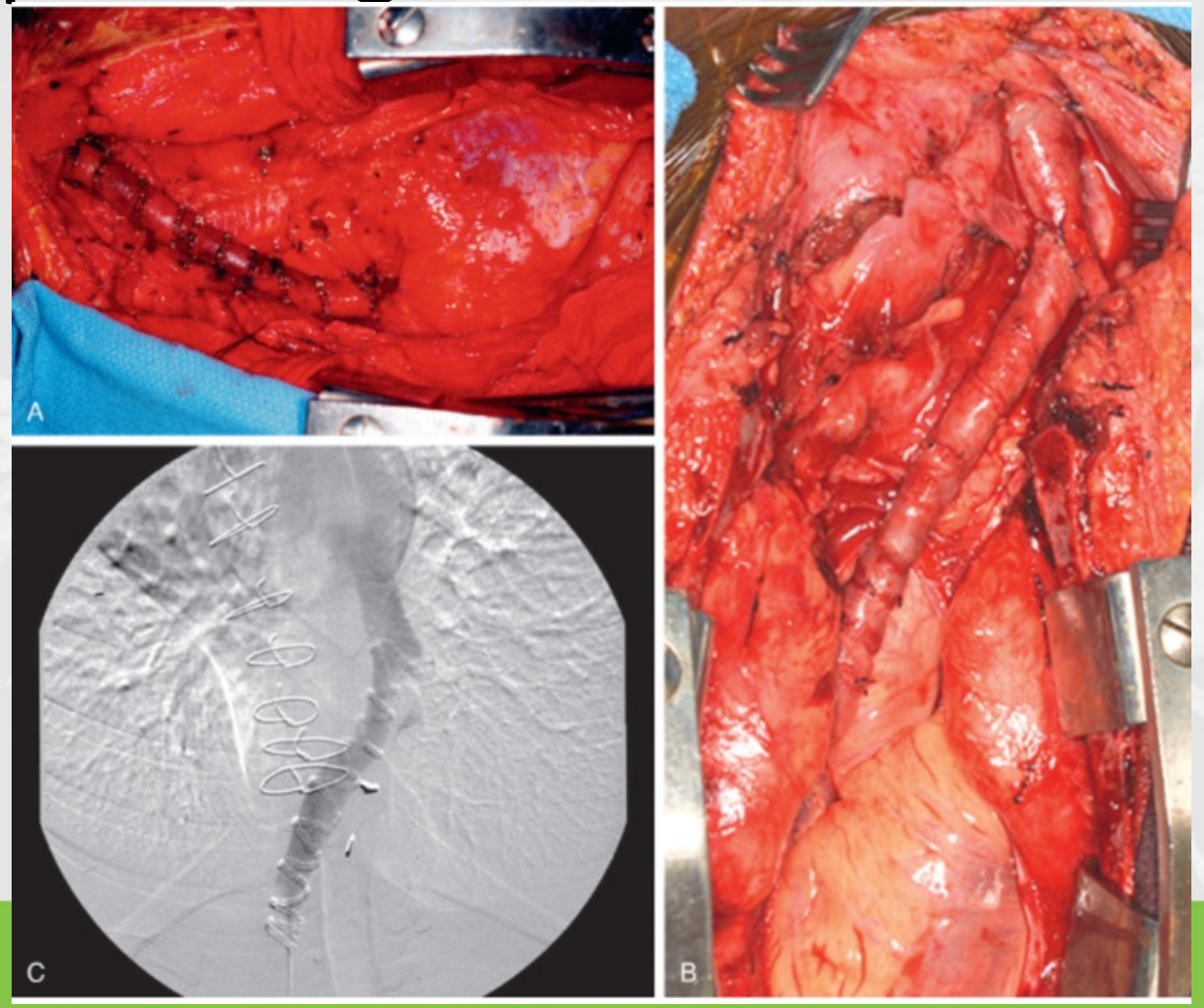
- In patients with failed endovascular therapy who are good surgical risk and have a long life expectancy
- Requires median sternotomy and bypass to the right atrial appendage
- The conduit is preferably autologous vein (GSV/FV, Spiral or Panel configuration)
- Externally supported ePTFE is the preferred prosthetic

Open Surgical Reconstruction

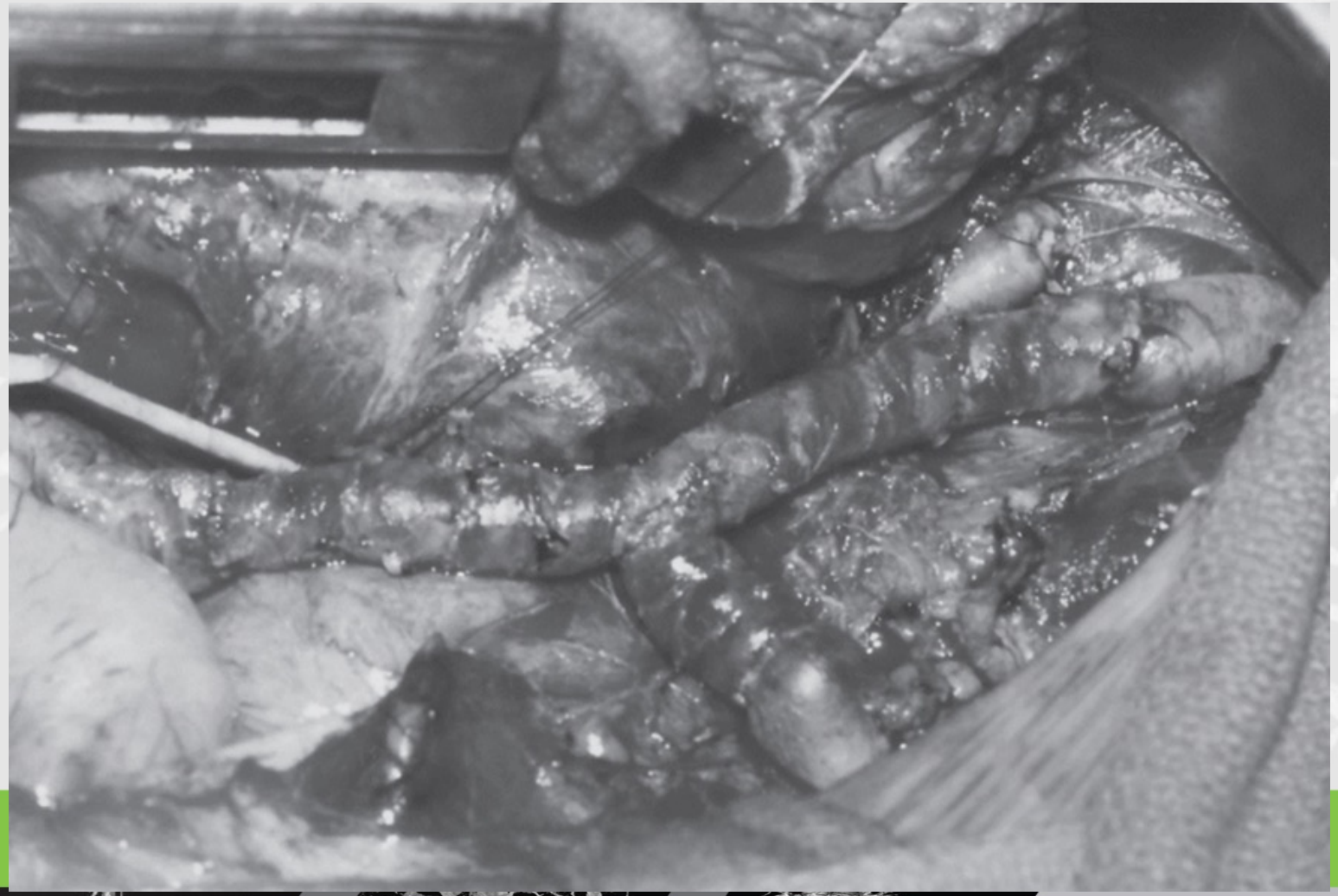




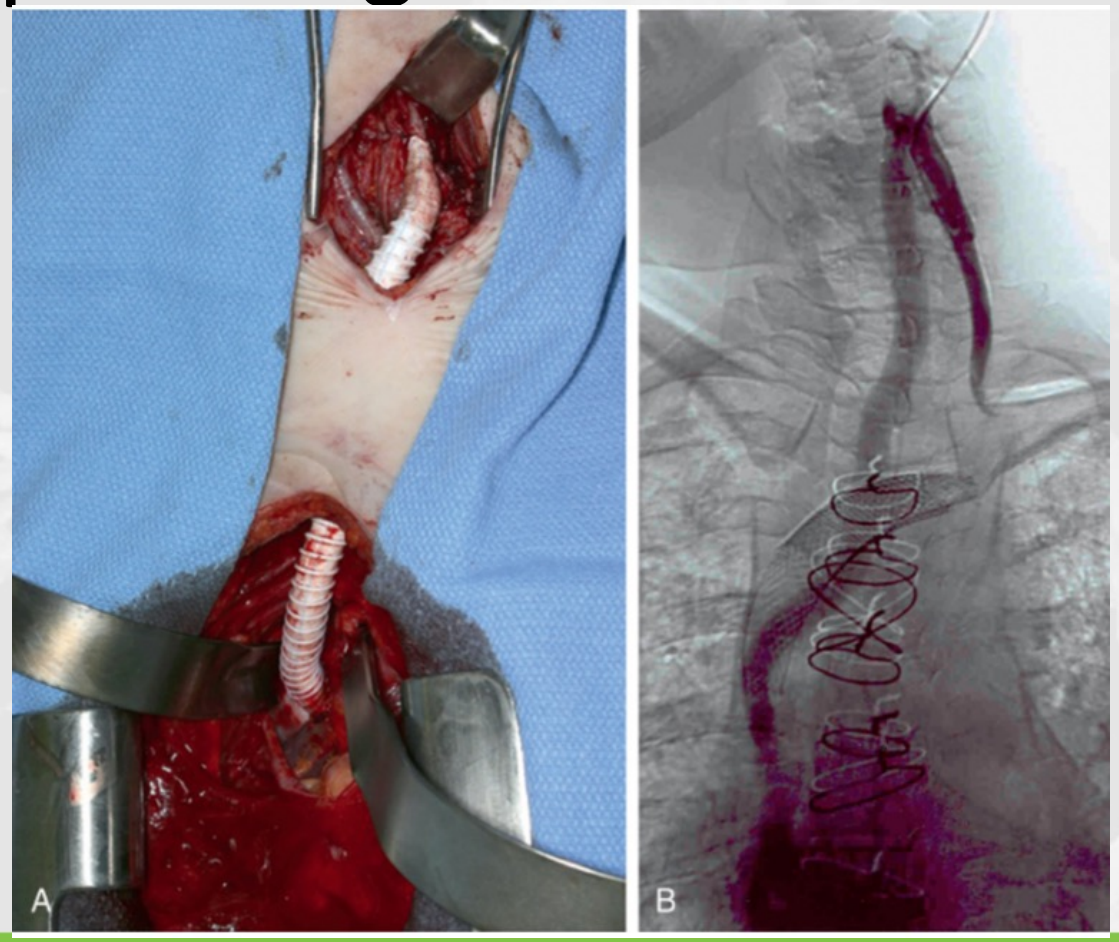
Open Surgical Reconstruction



Open Surgical Reconstruction

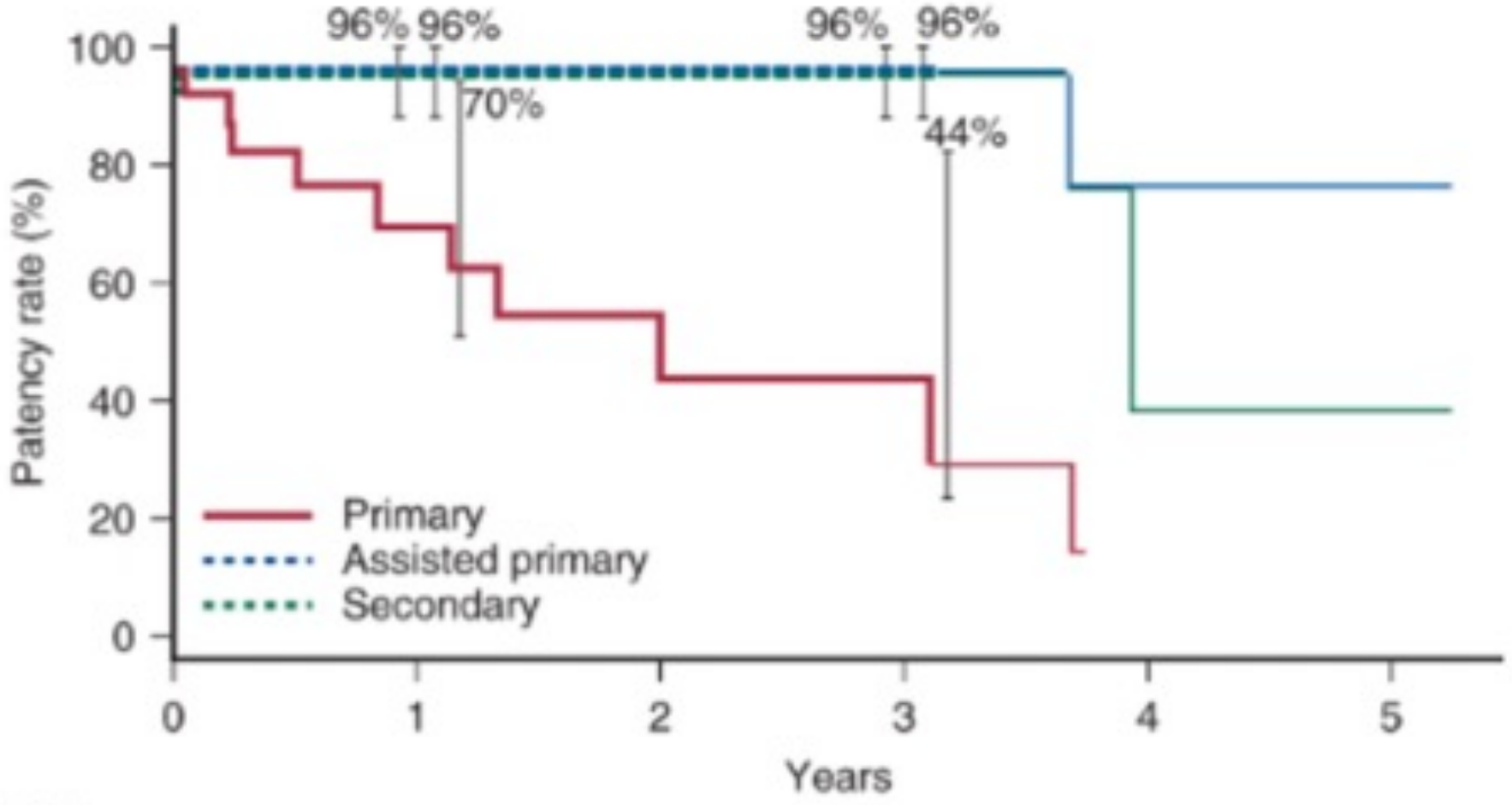


Open Surgical Reconstruction



Outcomes

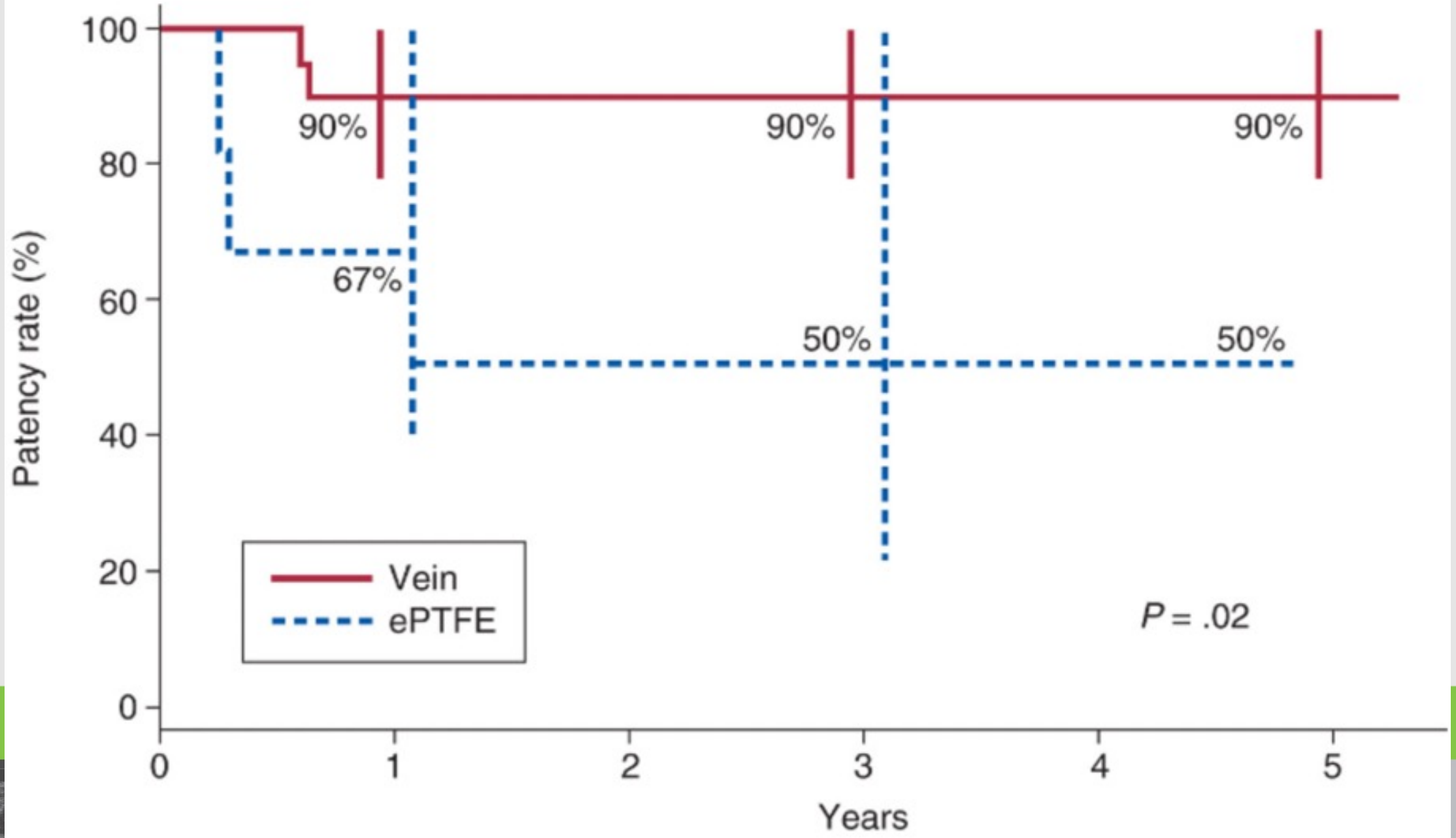
- Endovenous treatment
  - Over 90% success rate in controlling symptoms
  - 1ry patency at 3 years of 44%
  - Secondary patency at 3 years of 96%.
  - Usually requires multiple interventions
  - Very low complication rate. Pericardial tamponade being the most feared one, albeit very infrequent.



Number at risk						
Secondary	28	15	9	6	1	1
Assisted primary	28	15	9	6	1	1
Primary	28	10	5	3		

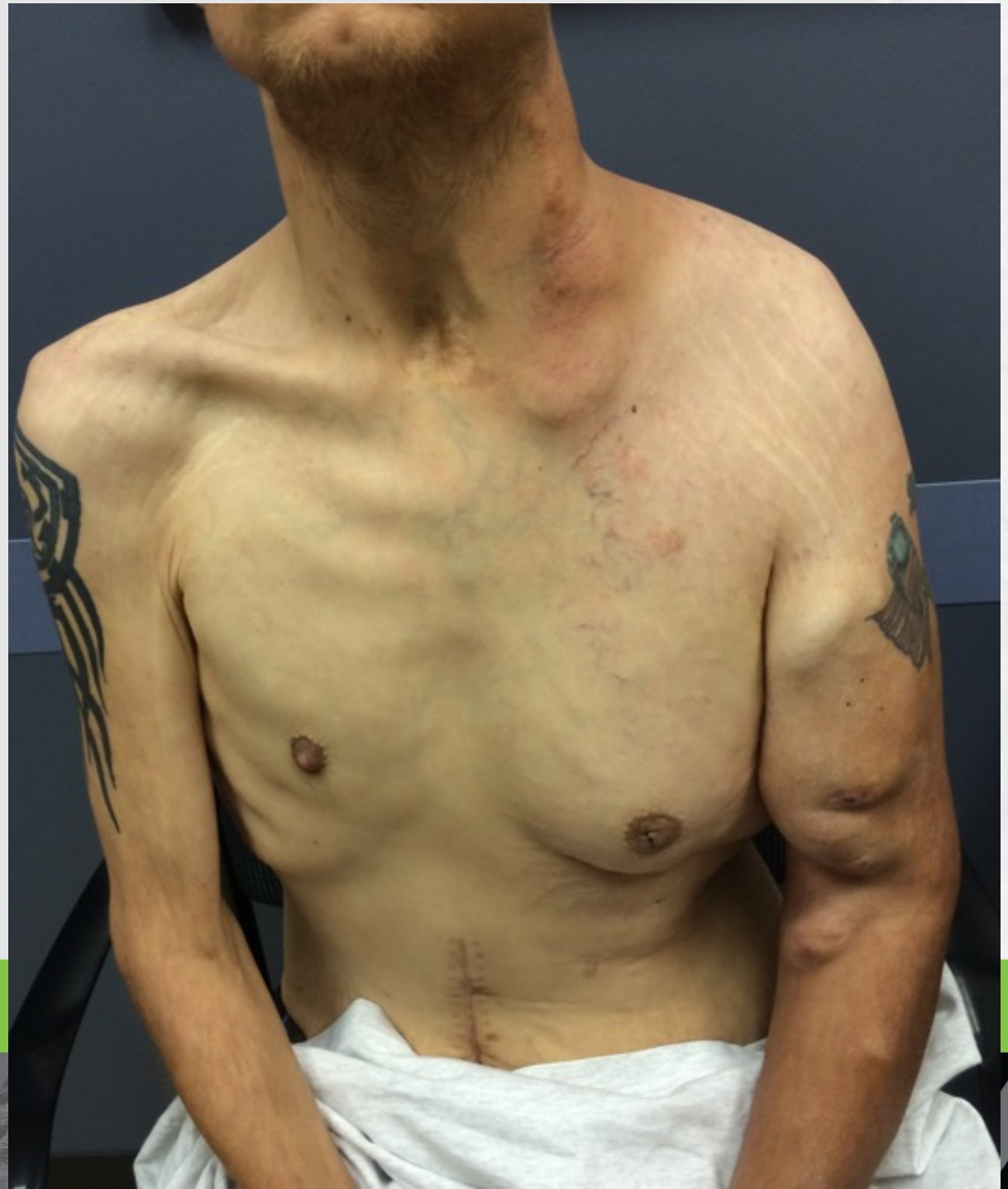
Outcomes

- Open Surgical Therapy:
  - Excellent for controlling symptoms
  - 88% patency with 10 year follow up
  - Better with vein conduits with more occlusions in prosthetic conduits
  - Creation of AVF in the arm may help patency of prosthetic conduits
  - Long term anticoagulation is recommended


100
80
60
40
20
0
Patency rate (%)
90%
90%
90%
67%
50%
50%
Vein
ePTFE
P = .02
0
1
2
3
4
5
Years

Unilateral CVO

- Usually asymptomatic
- May be related to TOS !!
- The symptomatic ones are usually ESRD patients with AV access
  - Malfunctioning AV access
  - Inability to create functional AV access
  - Upper extremity symptomatic venous hypertension



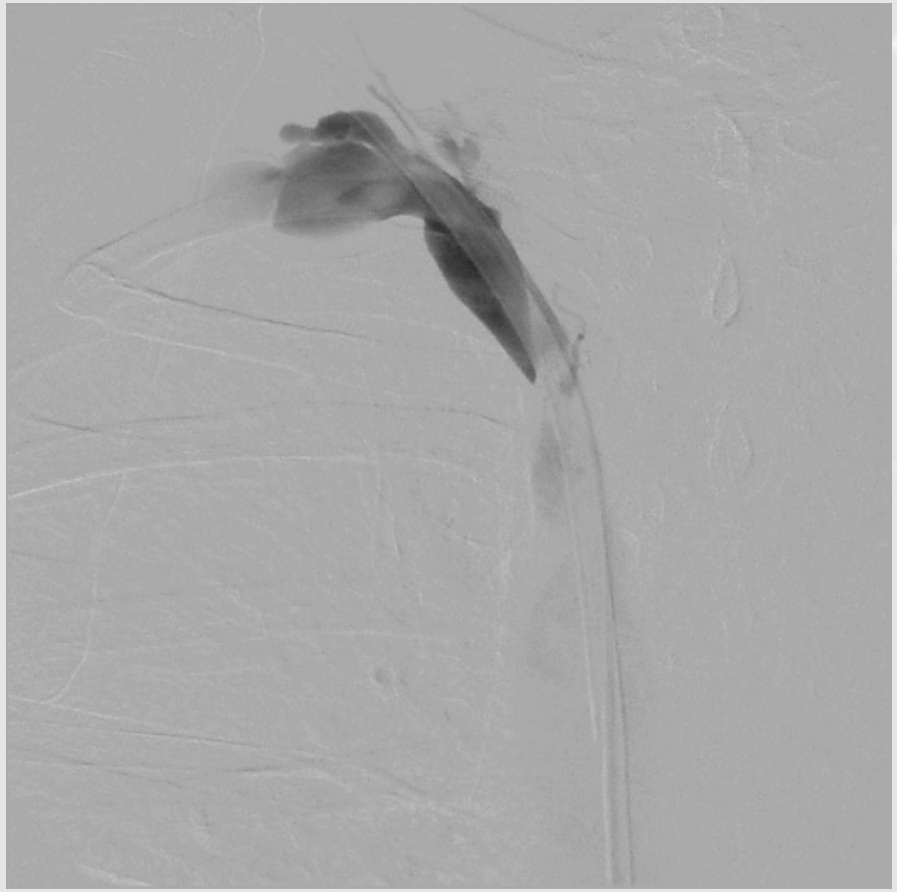

Griggs

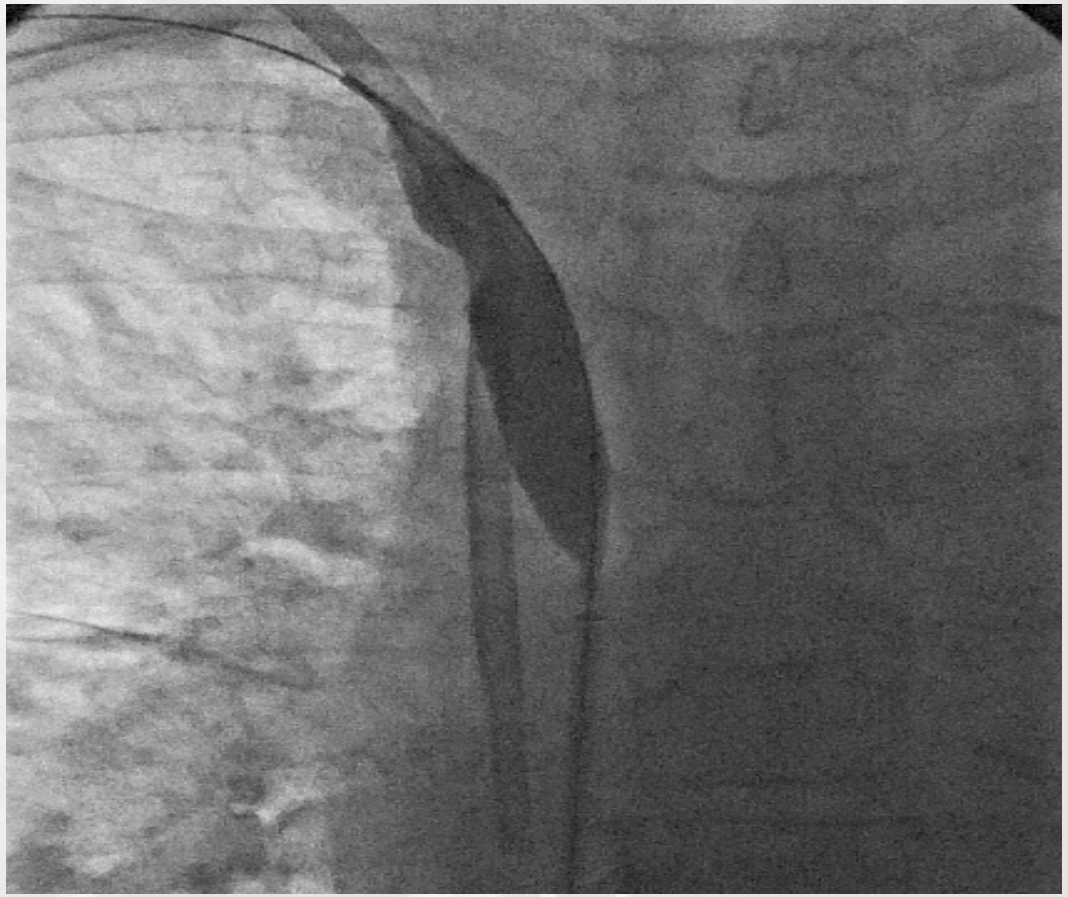
SCV Stenosis/ Pacemaker

Management

- Endovascular therapy is first line treatment
  - Balloon angioplasty alone can be attempted (12-14 mm).
  - Stenting for failed angioplasty or rapid recurrence
  - Self expanding stenting (for flexibility)
  - Covered stents have better patency at the expense of covering collaterals.
  - Avoid stenting at the costo-clavicular triangle (TOS Pathology)
  - Results are much more inferior than cases of ilio-caval endovascular interventions

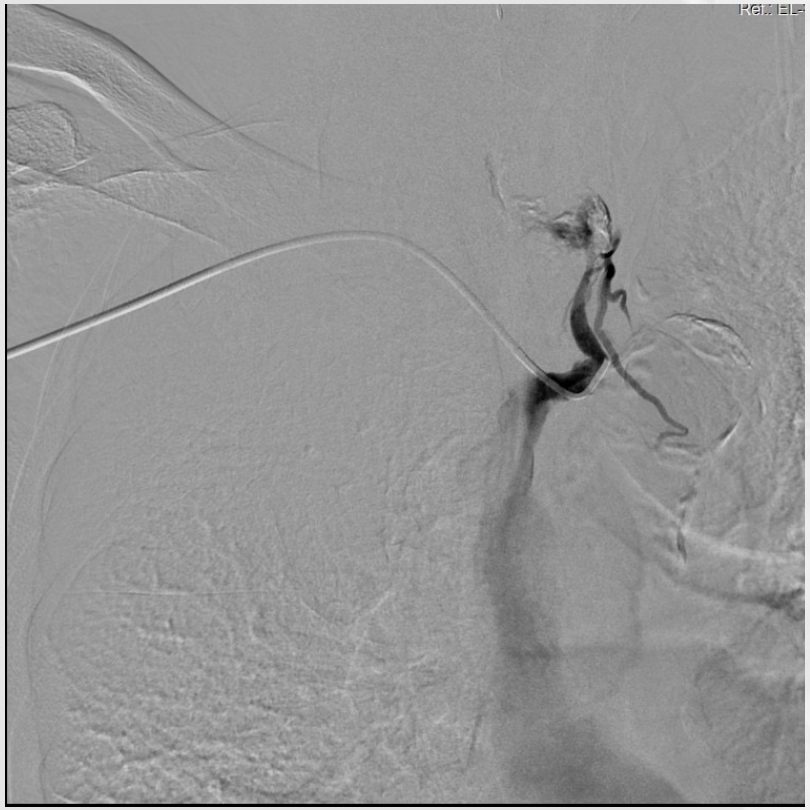
Balloon Angioplasty



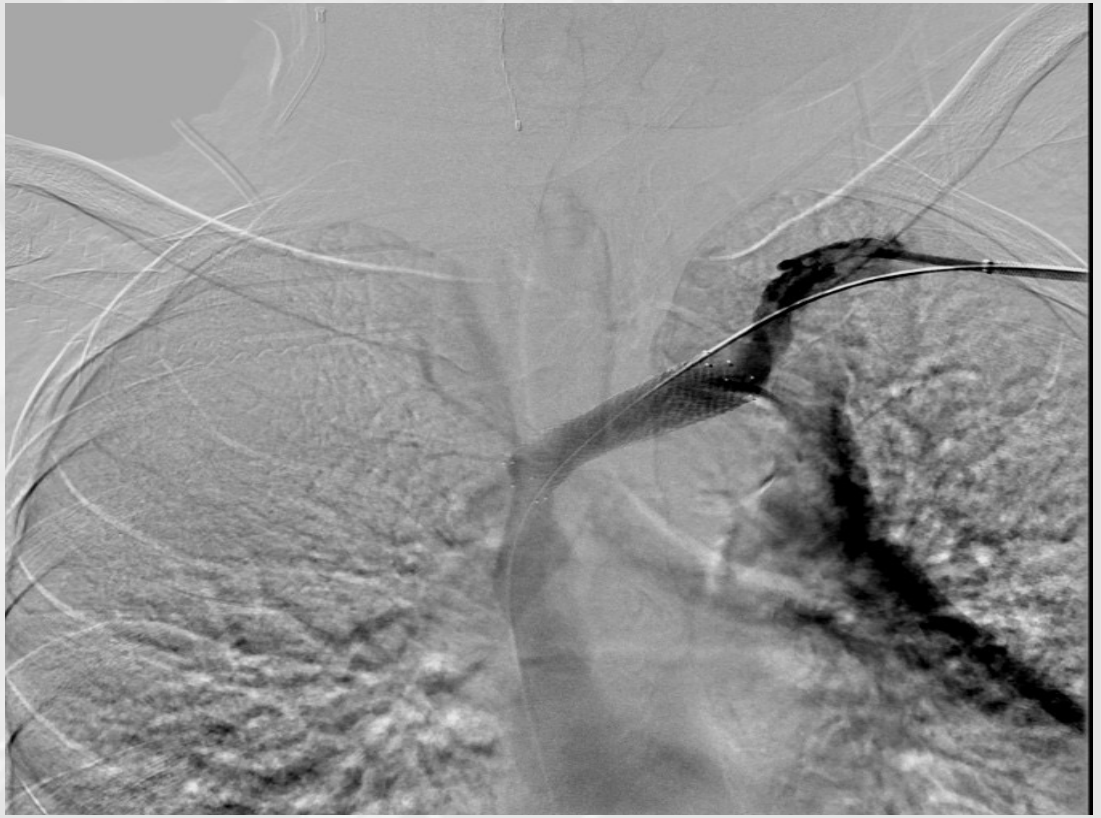


Balloon Angioplasty

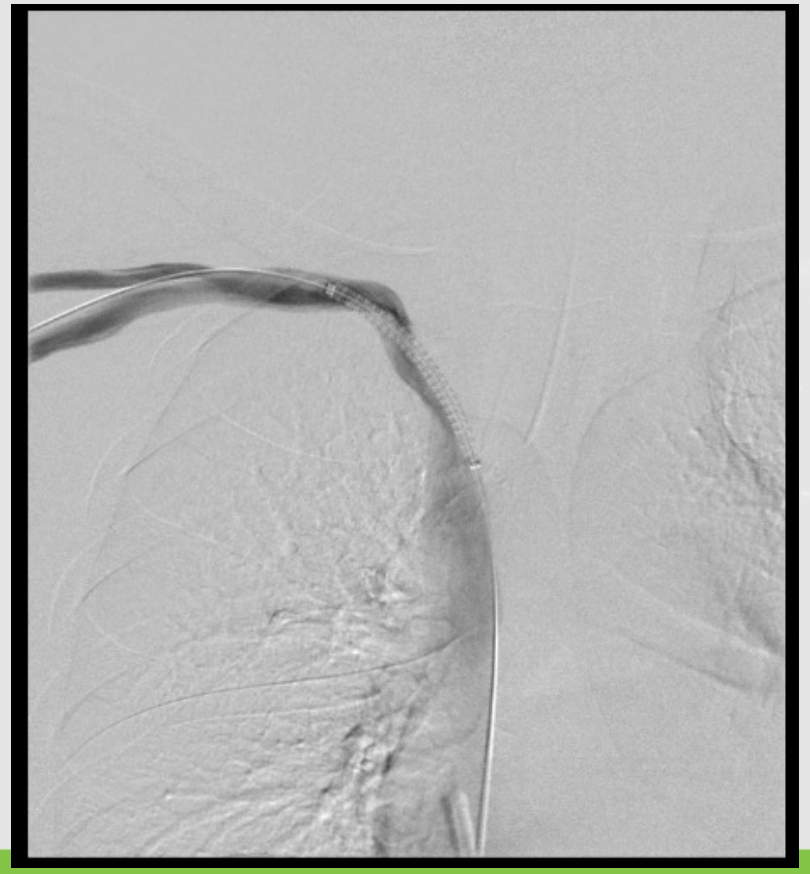
Central Venous Occlusion



After Central Venous Stenting



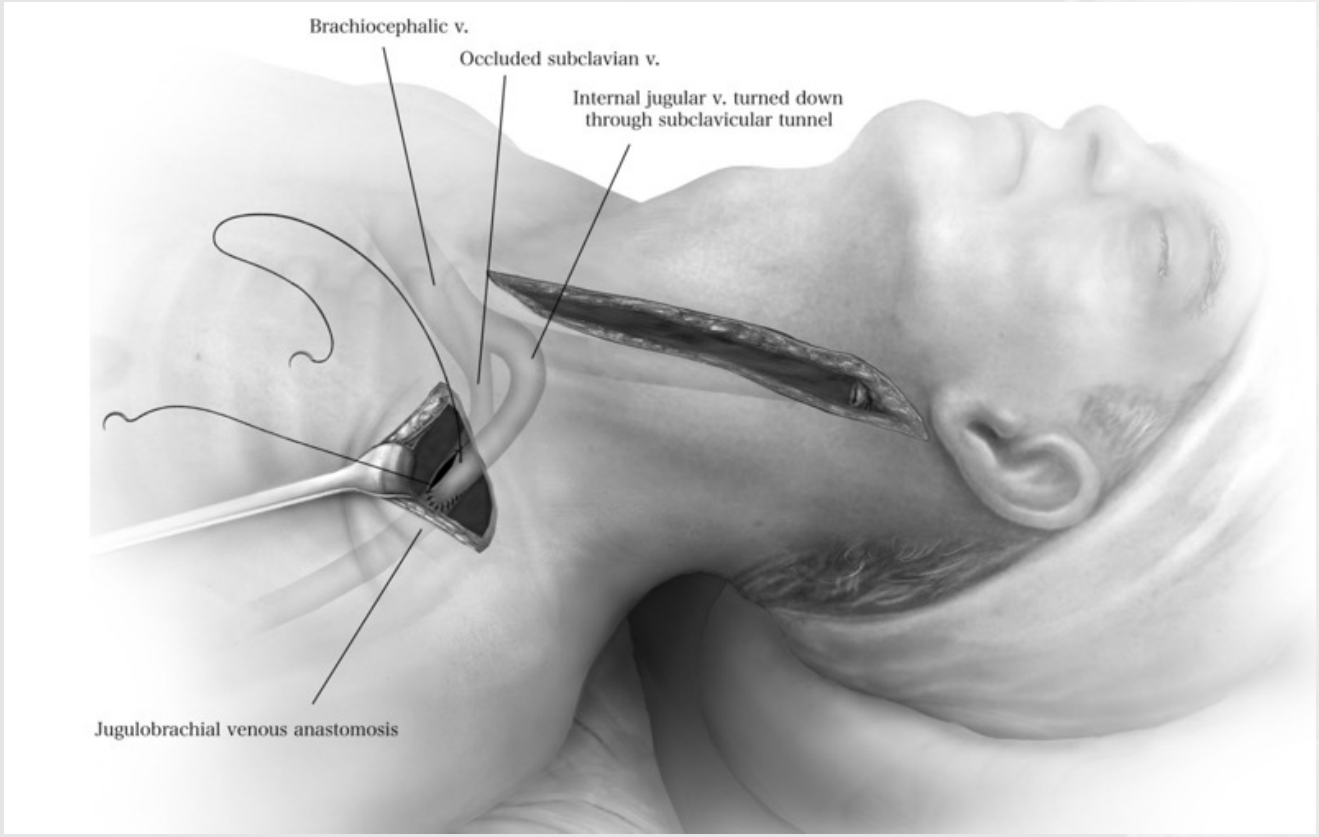
Covered Stent
For Central Venous Stenosis



Failed Endovascular Therapy

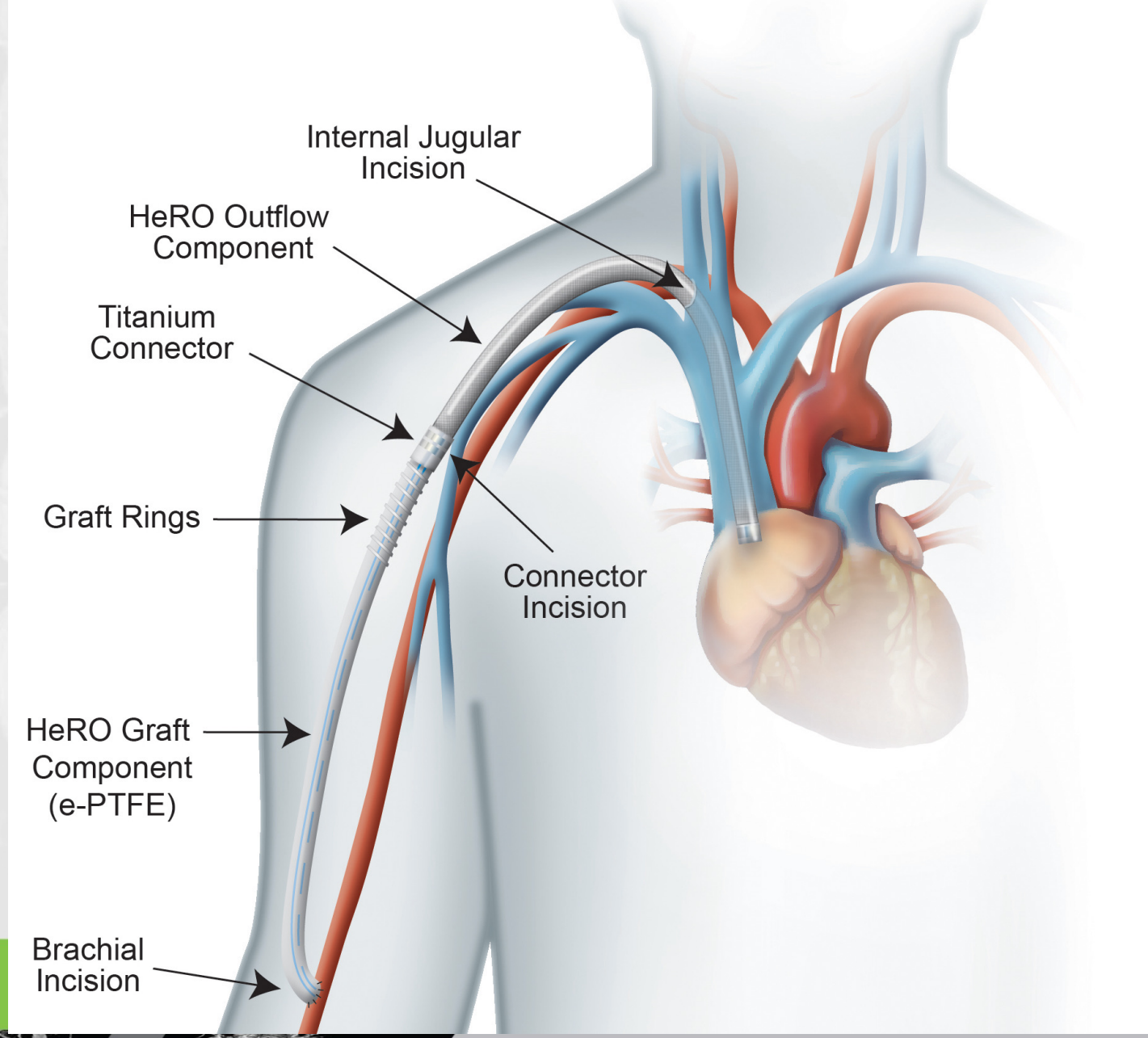
- Ligation of the access and using the other UE.
- Jugular Turndown or Jugular bypass
- HeRo Device (Hemo-access Reliable Outflow Vascular Access Device)
- Inside Out HeRo technique.
- Brachial to Atrial bypass

Jugular Turndown



HeRO™ Vascular Access Device

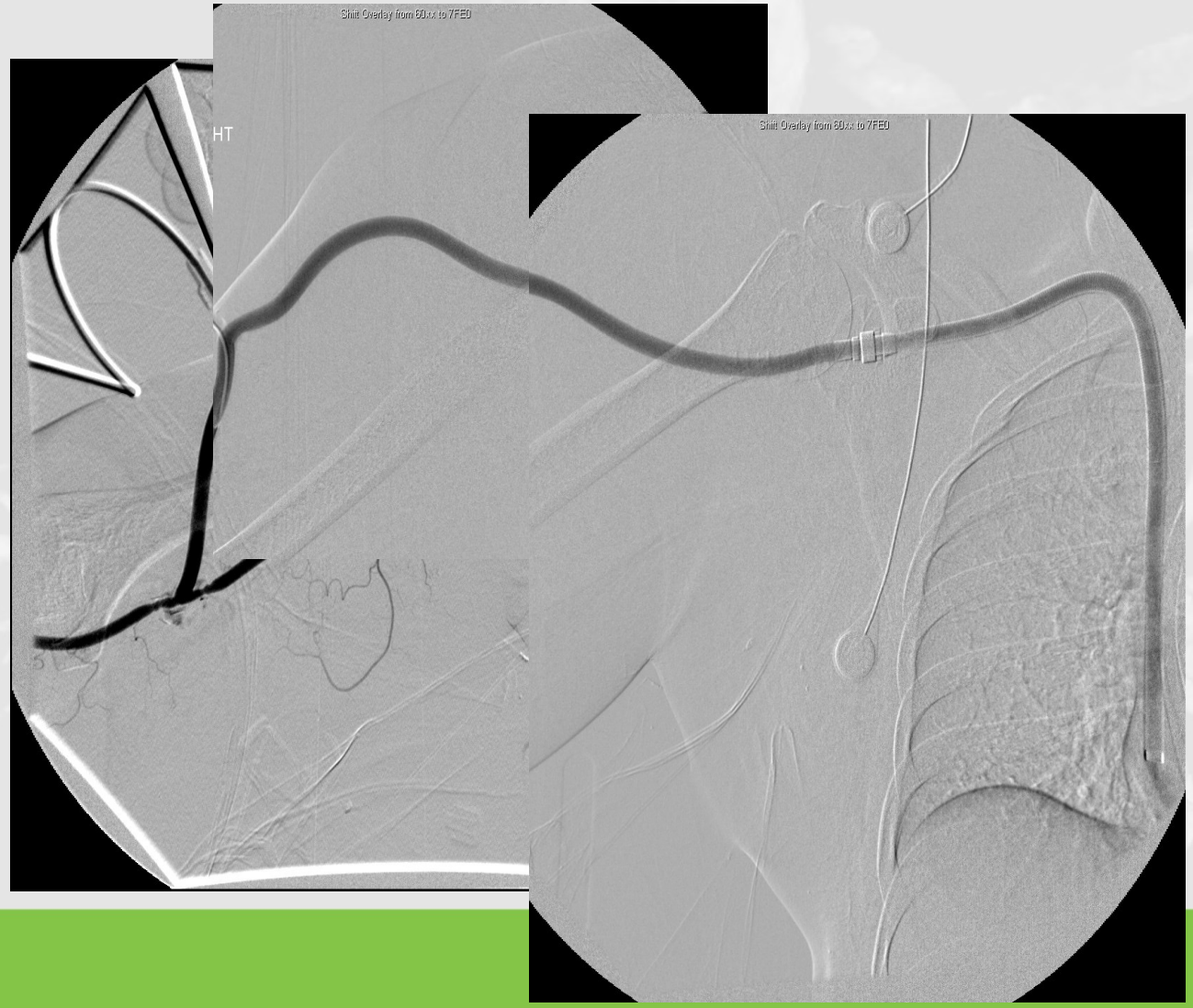
- Cases of central venous obstruction with failed endovascular therapy or rapid recurrence
- Needs central access into the right atrium



HeRO™ Vascular Access Device

- Essentially a large catheter placed through the central vein (usually IJV) into the right atrium and then tunneled and connected to a graft attached to the brachial artery
- Essentially internal central bypass

HERO™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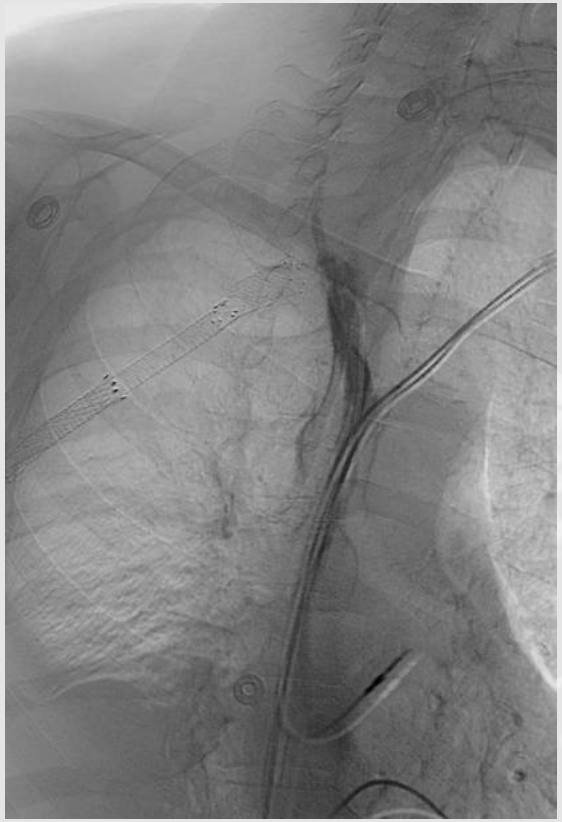
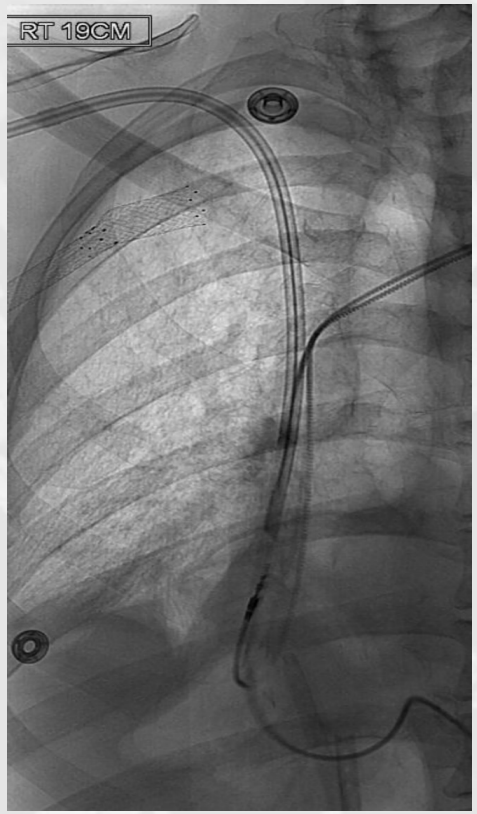
HT
Shift Overlay from 80.xx to 7FE0

Inside Out Technique





Brachial to Atrial Bypass

Summary

- Central venous obstruction is a heterogenous group of diseases and pathology.
- Ilio-caval obstruction is distinct from UE CVO.
- Management is tailored to the symptoms, pathology and available expertise
- Endovascular first management is feasible and usually successful at a low morbidity and mortality
- Open surgical intervention is more complex but longer lasting

Thank You