East Lancashire Hospitals NHS
NHS Trust

Intra-Operative Angiography

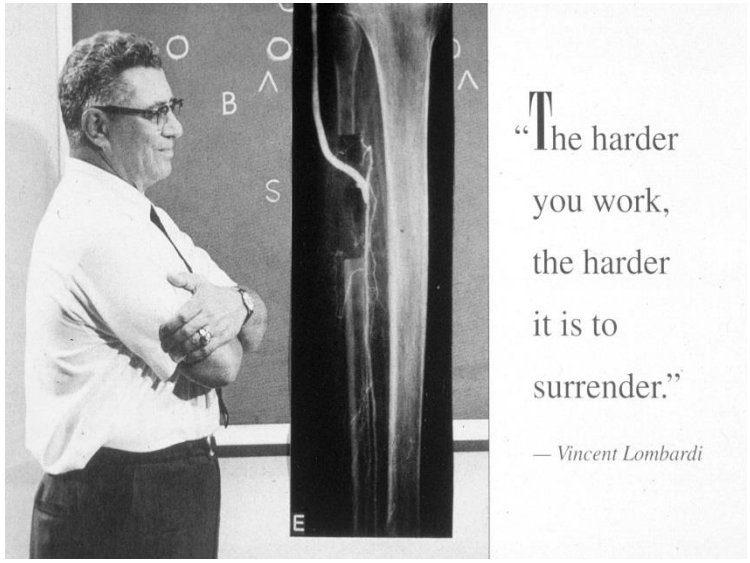
Mr Mark E. O'Donnell
Consultant Vascular and Endovascular Surgeon
DipSEM(GB&I) MFSEM(UK) MFSEM(RCSI&RCPI) MFSTEd MMedSc(Dist) MD
ECFMG RPVI(ARDMS) FRCSEd(Gen&Vasc Surg) FEBVS(Hon)

Cumbria and Lancashire Vascular and Endovascular Centre
Operative Department Training – 5th April 2016

Safe | Personal | Effective

Disclosure

- No disclosures declared.
- No financial relationship with content.
- Personal experience with clinical evidence.



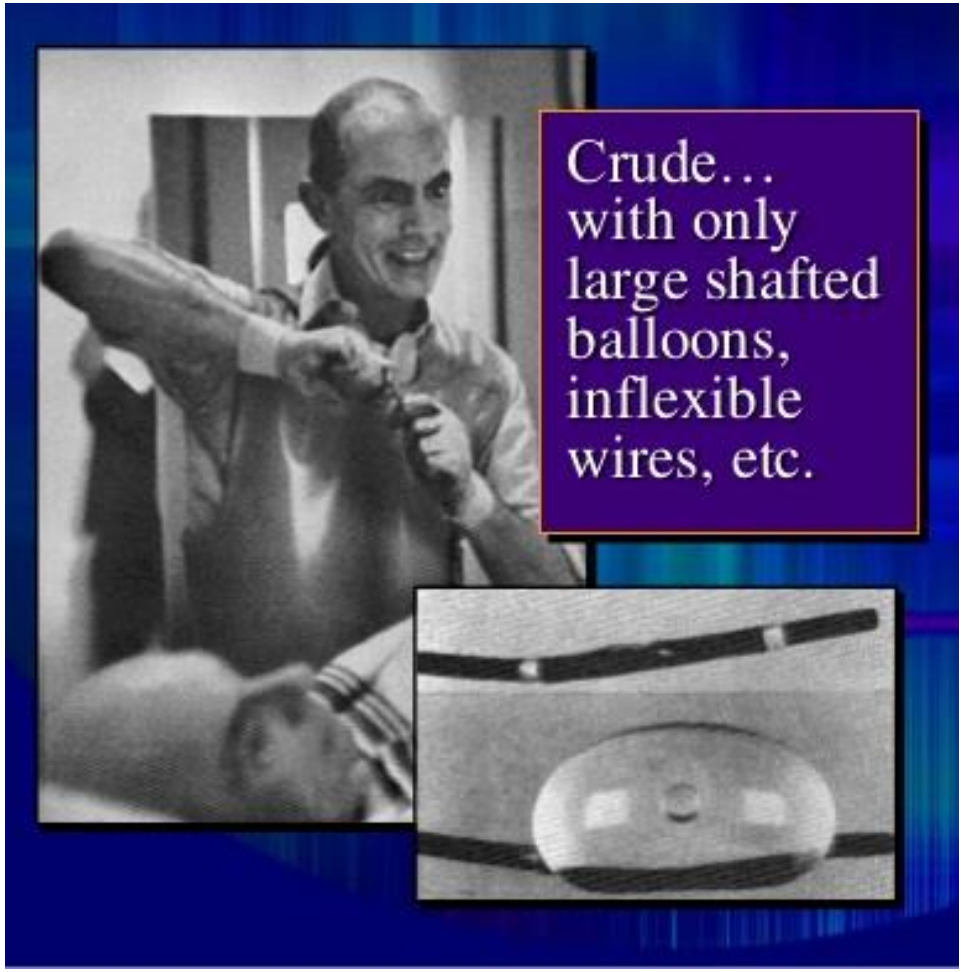
East Lancashire Hospitals NHS
NHS Trust

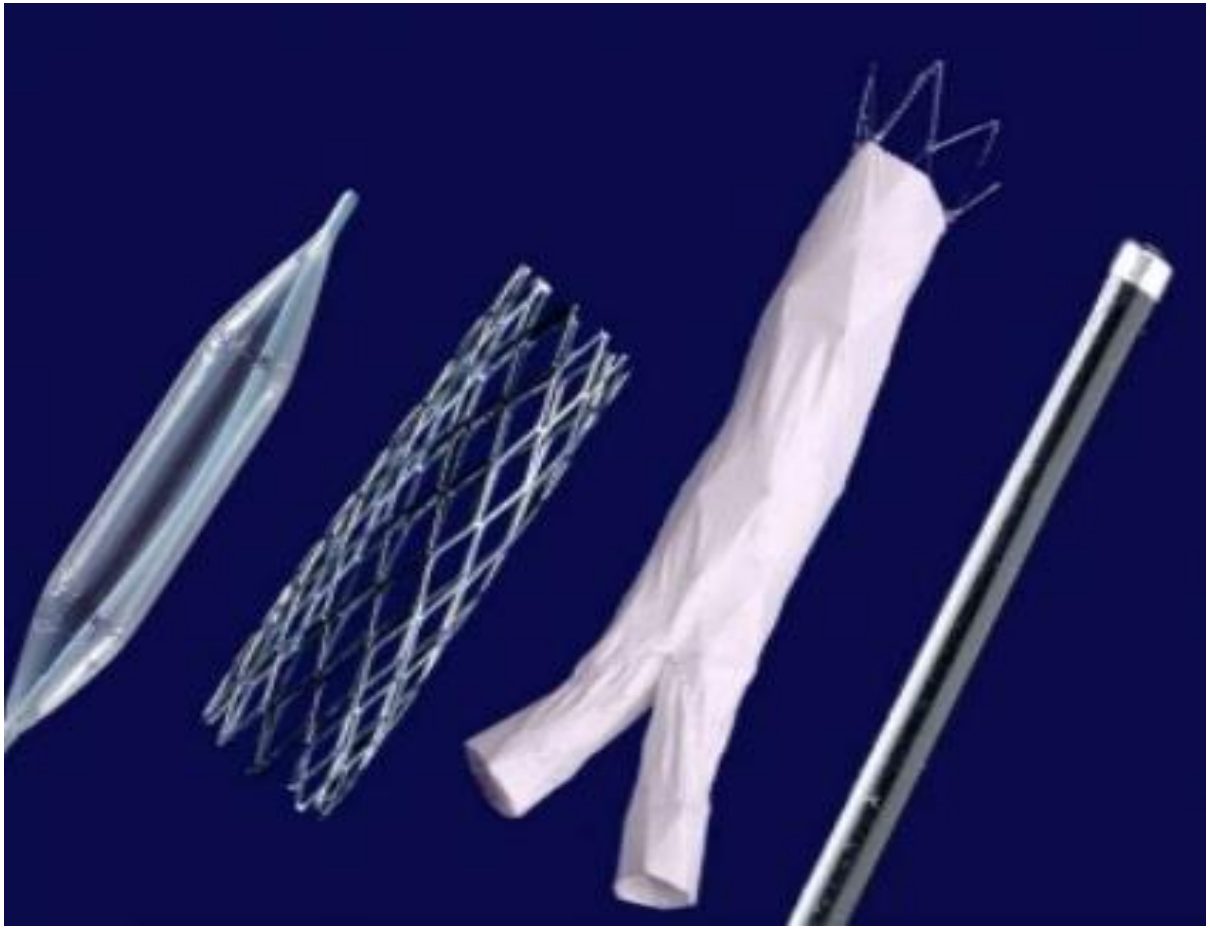
Learning Outcomes

- What and why ?
- Theatre Set-Up / Radiation Safety / Contrast.
- Arterial Access.
- Wires.
- Sheaths.
- Catheters.
- Balloons / Stents.

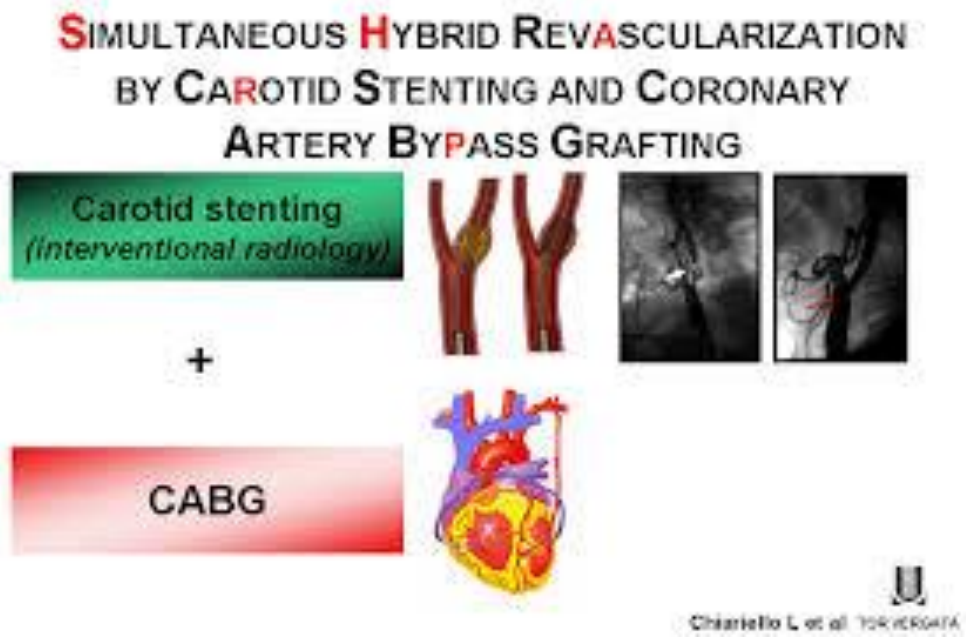
East Lancashire Hospitals NHS
NHS Trust

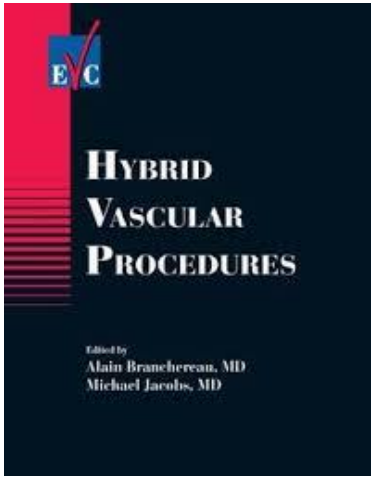
What and Why ???


Crude…
with only
large shafted
balloons,
inflexible
wires, etc.

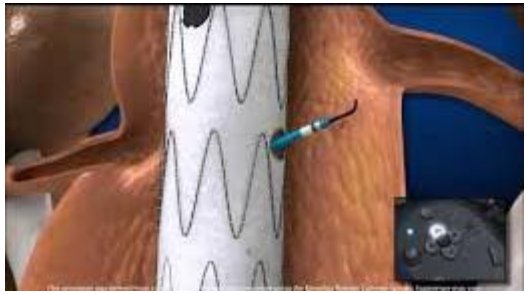


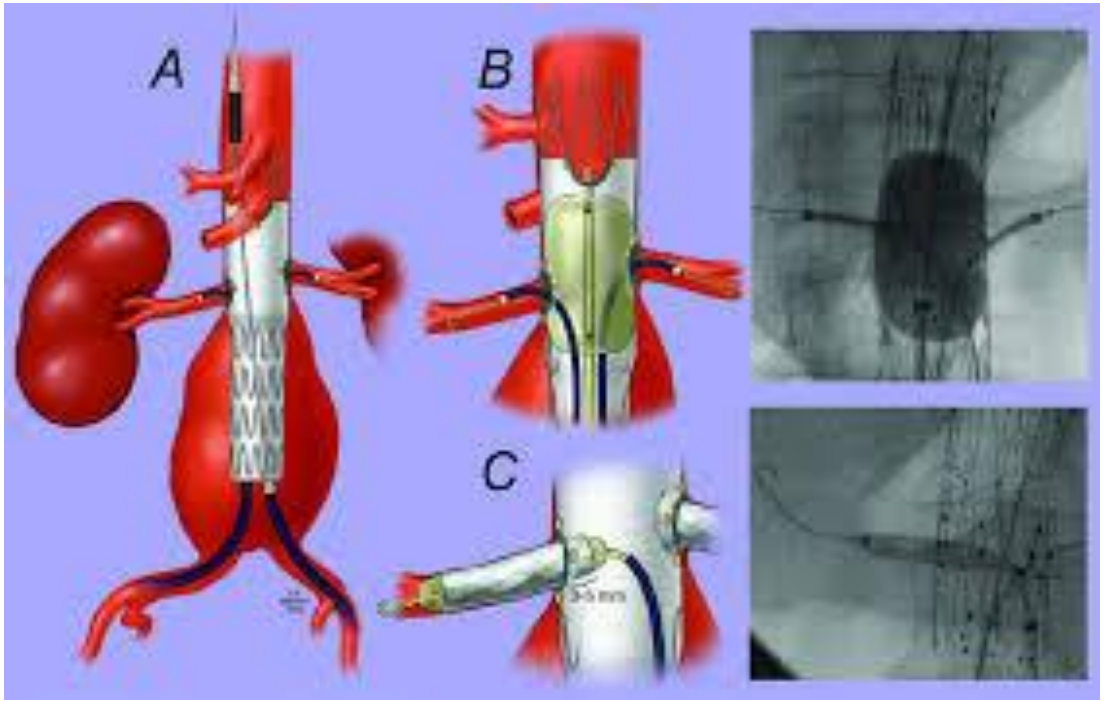
East Lancashire Hospitals NHS
NHS Trust

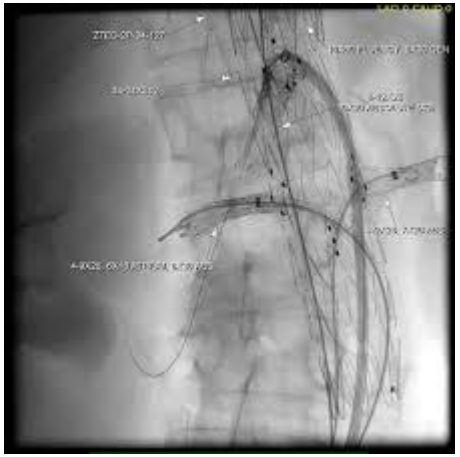




Safe | Personal | Effective




A
B
C

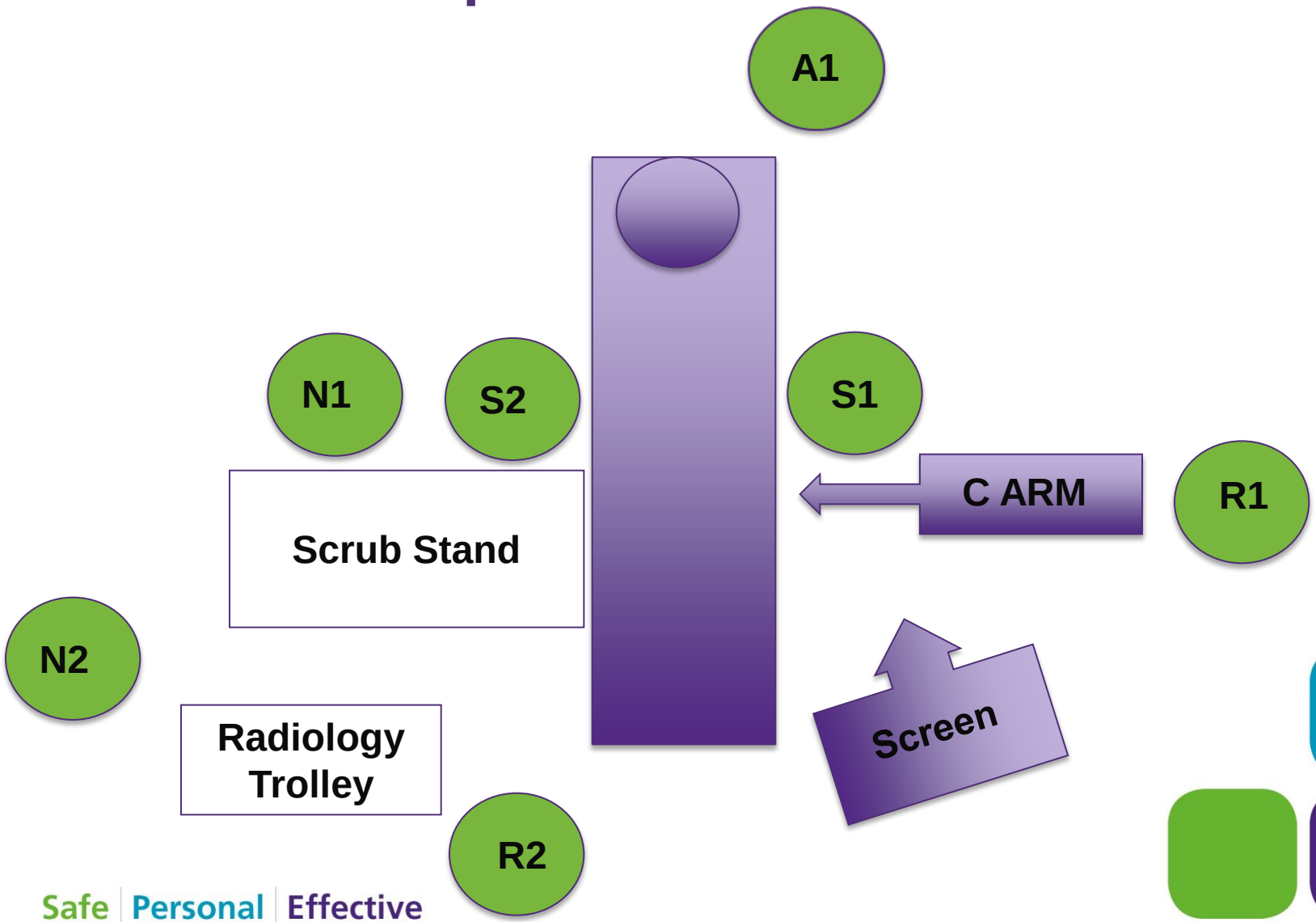


Patient Positioning

- Angio table.
- Supine.
- Head at anaesthetic end.
- Table rotated accordingly:
  - Abdominal procedure for Aortic-Iliac Segment.
  - Lower limb procedure for SFA to distal vessels.

Theatre Set-Up

East Lancashire Hospitals NHS
NHS Trust



Safe | Personal | Effective

East Lancashire Hospitals NHS
NHS Trust

Radiation Safety

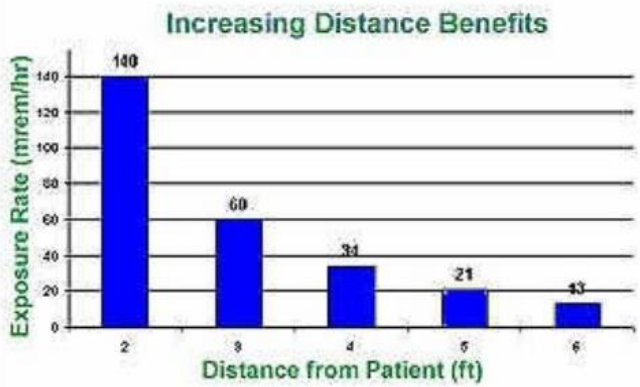
- Basic lead aprons.
- Maximise distance from c-arm.
- Awareness of difference between “fluro” and a “run”.
- Lack of operating table lead !!!

Radiation Safety

You do the math!

- Doubling your distance from the X-ray tube reduces your exposure by a factor of four

- Tripling your distance from the X-ray tube reduces your exposure by a factor of nine!

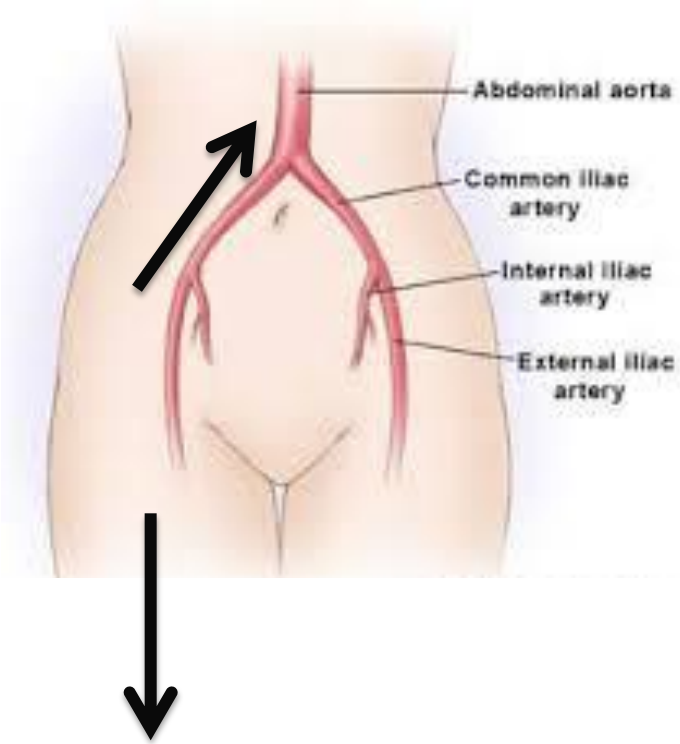


Arterial Access

- Any vessel.

Arterial Access

- Any vessel.
- Any direction:
  - Retrograde.
  - Antegrade.



Arterial Access – Any vessel

- Skin shaving may be required.
- Local, Regional or General Anaesthetic.
- Small transverse incision or during open procedure.
- Needle insertion – no requirement for syringe as arterial flow will be evident – 19G needle.

NEEDLES

Needles	Diameter (gauge)	Maximum Guidewire Diameter (in.)	Common Length
Seldinger	18 19 20 21	0.038 0.025 0.021 0.018	2 ¾ inch
Potts	18 20	0.038 0.021	2 ¾ inch
Amplatz (with 5 Fr Teflon sheath over cannula)	18 20	18-gauge sheath accepts 0.038	2 ½ inch
Butterfly venipuncture	19 21	0.028 0.021	Various
Jelco IV (with Teflon sheath)	18 20	0.035 0.025	Various
Syringe Needles	18 20 21	0.025 0.021 0.018	Various
Percutaneous Transhepatic Cholangiography	22 (black hub) 23 (green hub)	0.018	20 cm
Sheath Needle	16G sheath (19-gauge stylet)	0.038	24 cm

Contrast Media

- Check renal function.

Contrast Media

- Check renal function.
- Non-ionic vs. Ionic.

Contrast Agents	Anion	Cation
Ionic Agents		
Renografin Angiovist Hypaque	Diatrizoate	Sodium, meglumine, or mixture of both salts
Conray	Iothalamate	Meglumine, sodium, or both
Low Osmolar Agents		
Iohexol (Omnipaque)	Nonionic dimer	
Iopamidol (Isovue)	Nonionic dimer	
Ioxaglate (Hexabrix)	Ioxaglate	Meglumine and sodium

Wires – Access or Directional

- Size:
  - 035, 018, 014.
  - Usually mandated by vessel size and by type of adjunct procedure eg. Angioplasty / stenting.

Wires – Access or Directional

- Size:
  - 035, 018, 014.
  - Usually mandated by vessel size and by type of adjunct procedure eg. Angioplasty / stenting.

- Length:
  - 60cm through to 300cm – vessel and procedure.

Wires – Access or Directional

- Size:
  - 035, 018, 014.
  - Usually mandated by vessel size and by type of adjunct procedure eg. Angioplasty / stenting.

- Length:
  - 60cm through to 300cm – vessel and procedure.

- Stiffness:
  - Prelude, Bentson, J-wire
  - Terumo Glidewire
  - Rosen
  - Amplatz
  - Meier, Lunderquist

Wires – Access or Directional

- Size:
  - 035, 018, 014.
  - Usually mandated by vessel size and by type of adjunct procedure eg. Angioplasty / stenting.

- Length:
  - 60cm through to 300cm.

- Stiffness:
  - Prelude, Bentson, J-wire → Access
  - Terumo Glidewire → Occlusions
  - Rosen → Up and Over
  - Amplatz → Tortuosity
  - Meier, Lunderquist → EVAR

Initial Access Wires

- Atraumatic soft wires.
- Wires that won't be traumatised with passage through needle.
  - Prelude.

  - Bentson.

  - J-wire.

Directional Wires

- Wire tip shape can be modified.
- Can be passed through embolectomy balloons / aspiration catheters.
- Can cause VESSEL TRAUMA – INCREASED CARE.
  - Glidewire.

  - V18 wire.

Sheaths

- Haemostatic conduits.

- Placed within arterial to avoid repeated access trauma for endovascular instruments.

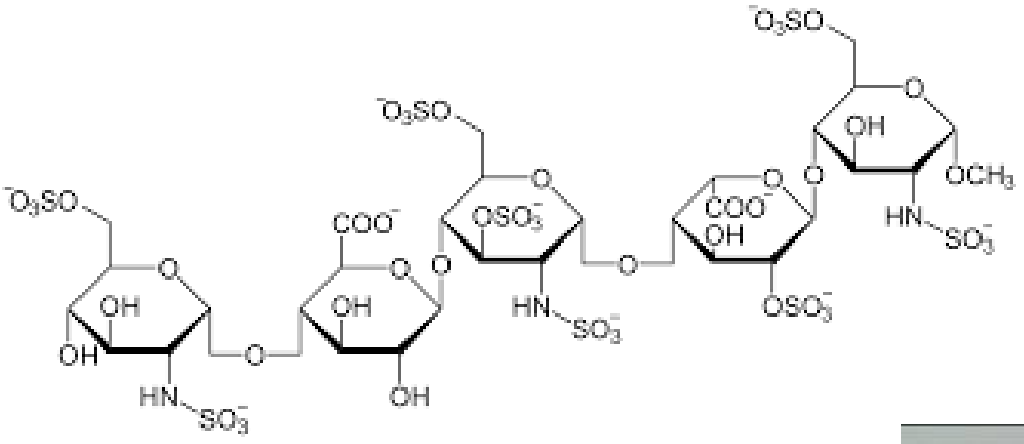
Sheaths

- Haemostatic conduits.
- Placed within arterial to avoid repeated access trauma for endovascular instruments.
- Size:
  - 4Fr through to 22/24Fr.

Sheaths

- Haemostatic conduits.
- Placed within arterial to avoid repeated access trauma for endovascular instruments.
- Size:
  - 4Fr through to 22/24Fr.
- Length:
  - Short – renal AVF or difficult lower limb cases.
  - Standard.
  - Long – intra-abdominal cases or up/over cases.

Heparin



Sheath Sizes

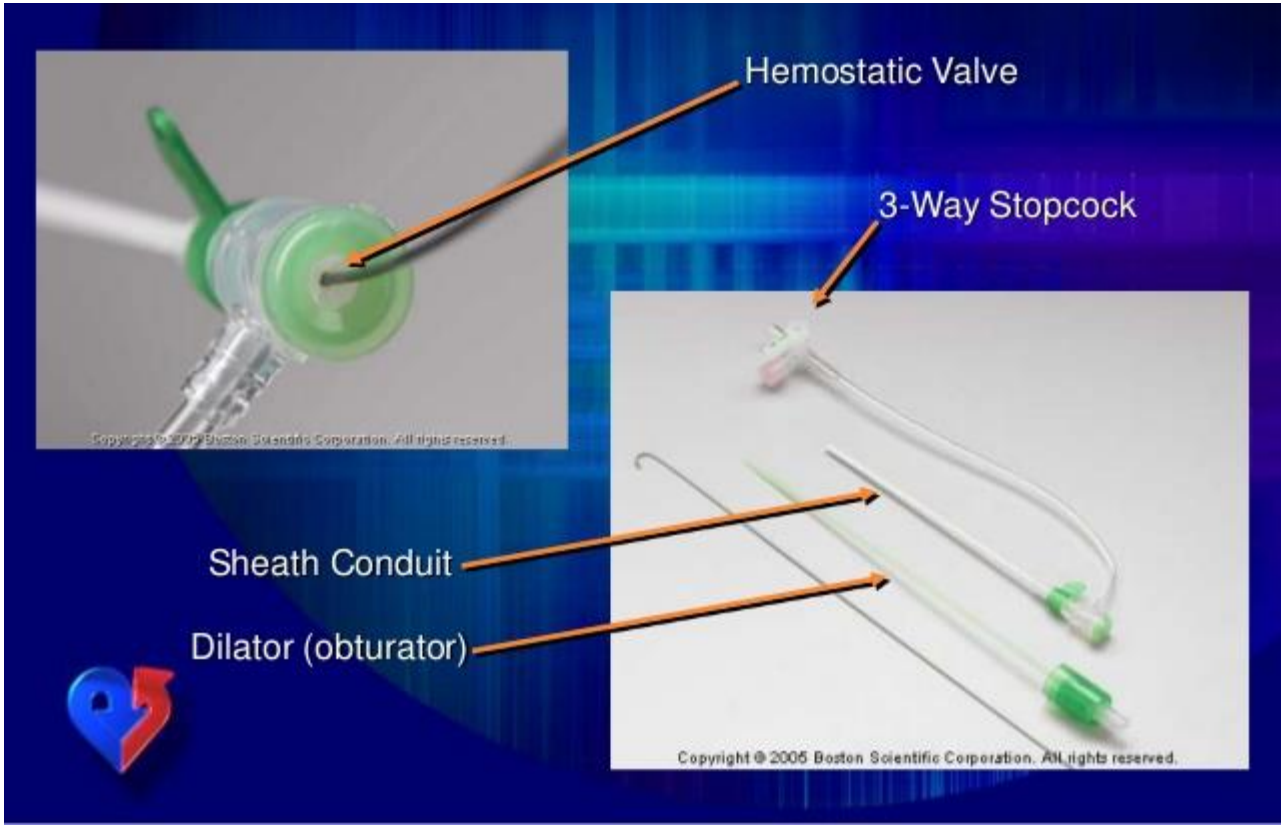
Peripheral and coronary sheaths have a universal color code

Universal color coding

- 4 Fr = red
- 5 Fr = gray
- 6 Fr = green
- 7 Fr = orange
- 8 Fr = blue
- 9 Fr = black
- 10 Fr = violet
- 11 Fr = yellow

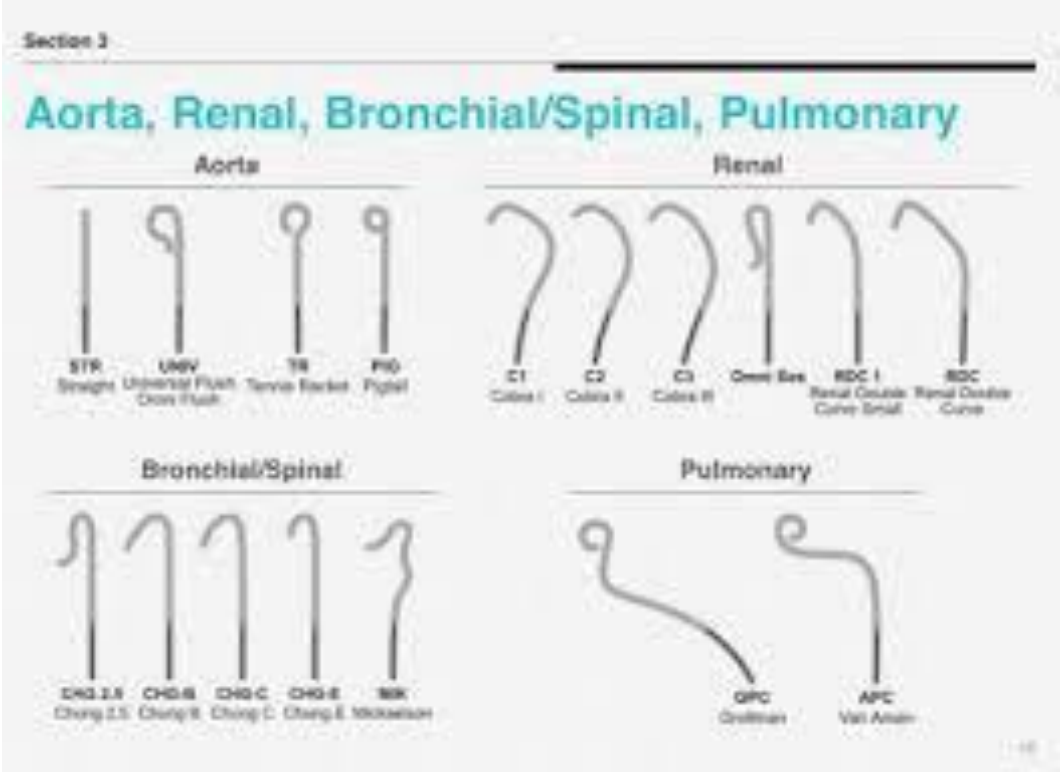
Sheaths are measured inner diameter in french size (1fr = .33mm)

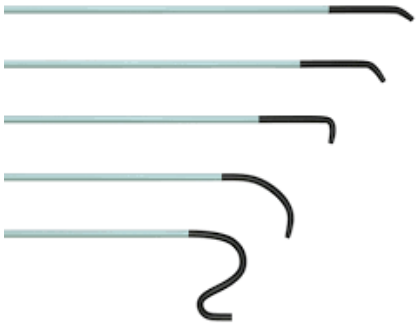
Sheath Construction



Catheters

Catheters





- Size.
- Shape.

Catheters

1. Straight
   - End holed
   - Flush
2. Rim
3. JB2
4. IMA
5. Pig
6. Omni
7. Head Hunter
8. Simmons/VTEK
9. Cobra 2
10. Berenstein
11. Grollman

Catheters

- UF.

- Pig-tail.

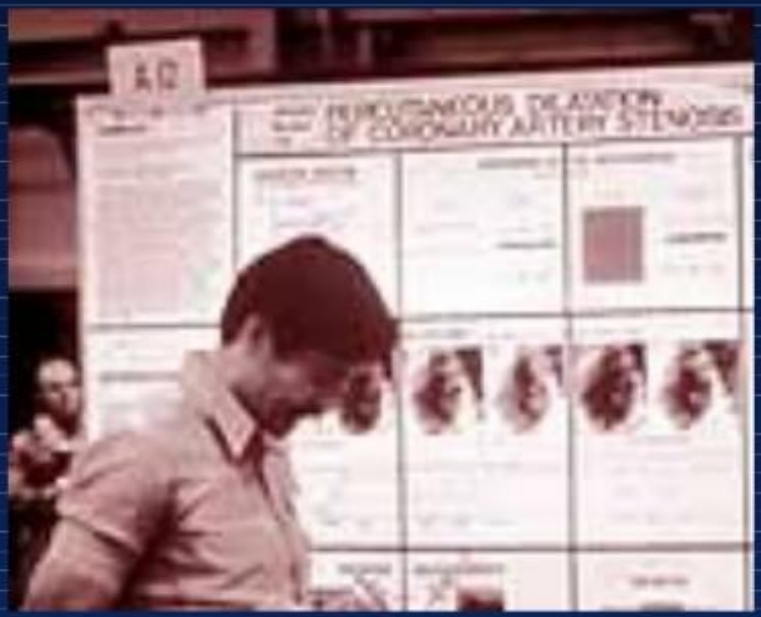
- Van Shee / Berenstein.

- Omni.

- Cobra.

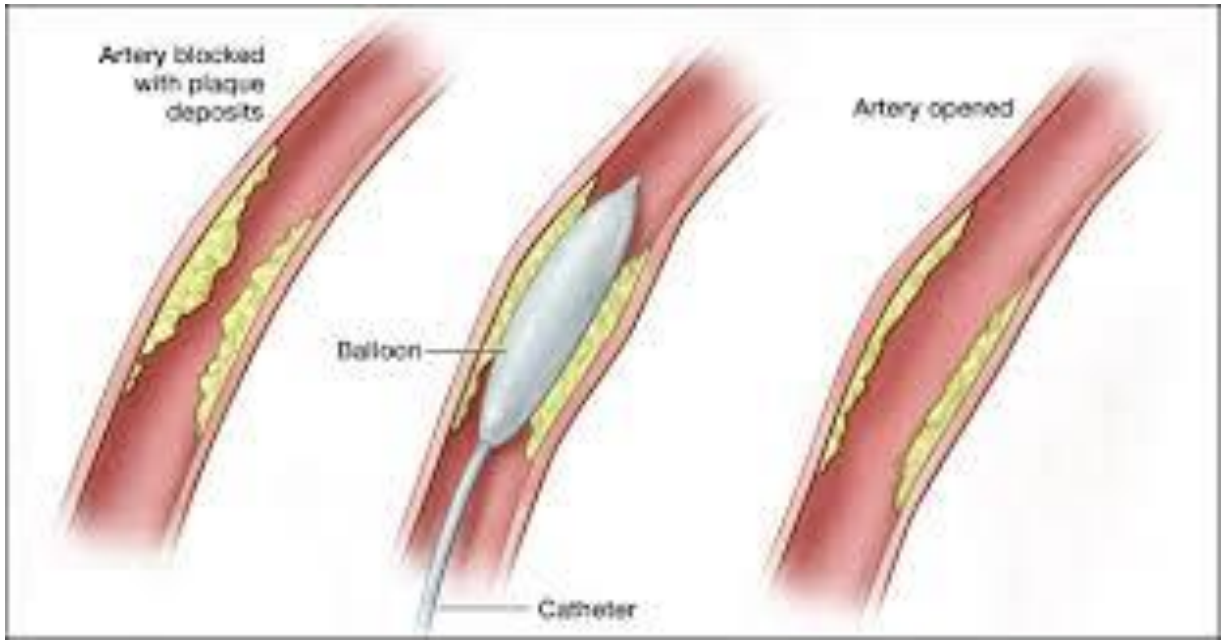
Balloon Angioplasty

- **1974** — Andreas Gruentzig performs first peripheral human balloon angioplasty
- **1976** — Gruentzig presents results of animal studies of coronary angioplasty at AHA meeting



East Lancashire Hospitals NHS
NHS Trust

Balloon Angioplasty



Safe | Personal | Effective

Balloon Angioplasty

The Encore Inflation Device is a latex free, high pressure inflation device designed to exert pressure for balloon inflation and deflation.

It features an inflation capability of 20cc. It comes complete with a pressure gauge with a large printed dial and a finger latch mechanism for 1-step locking and pressure release.

Remember to fill with half and half …….

East Lancashire Hospitals NHS
NHS Trust

Balloon Angioplasty

The Encore Inflation Device is a latex free, high pressure inflation device designed to exert pressure for balloon inflation and deflation.

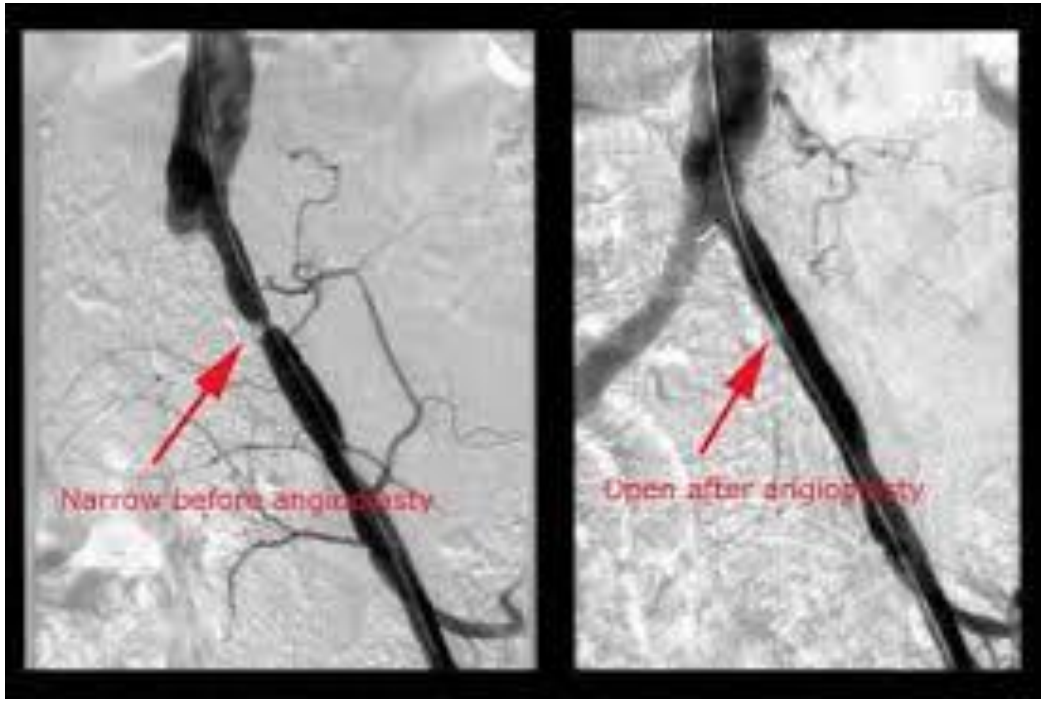
It features an inflation capability of 20cc. It comes complete with a pressure gauge with a large printed dial and a finger latch mechanism for 1-step locking and pressure release.

Remember to fill with half and half …….

Review Absolute and Burst Pressures on Angioplasty Card

Safe | Personal | Effective

Balloon Angioplasty

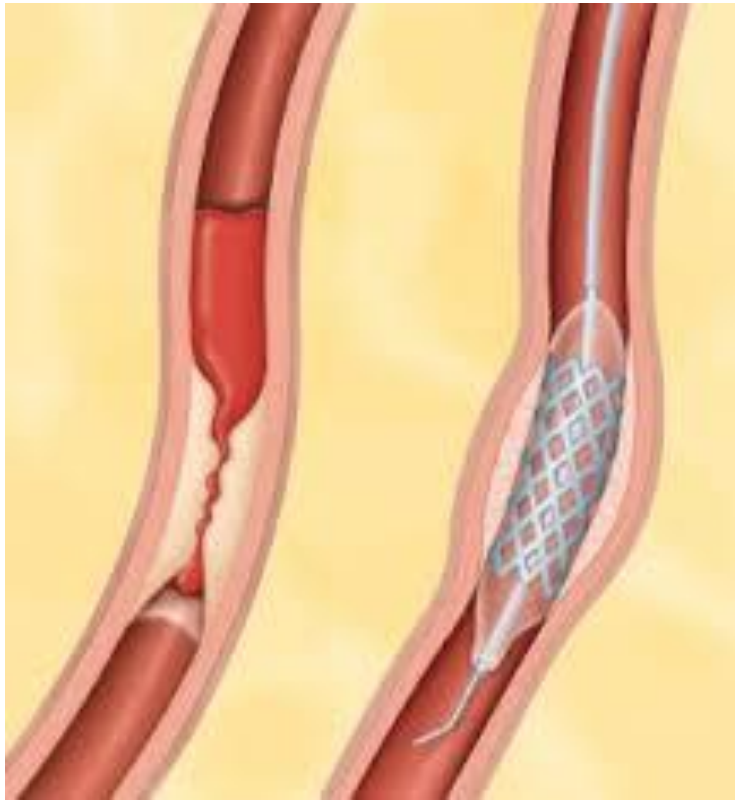


East Lancashire Hospitals NHS
NHS Trust

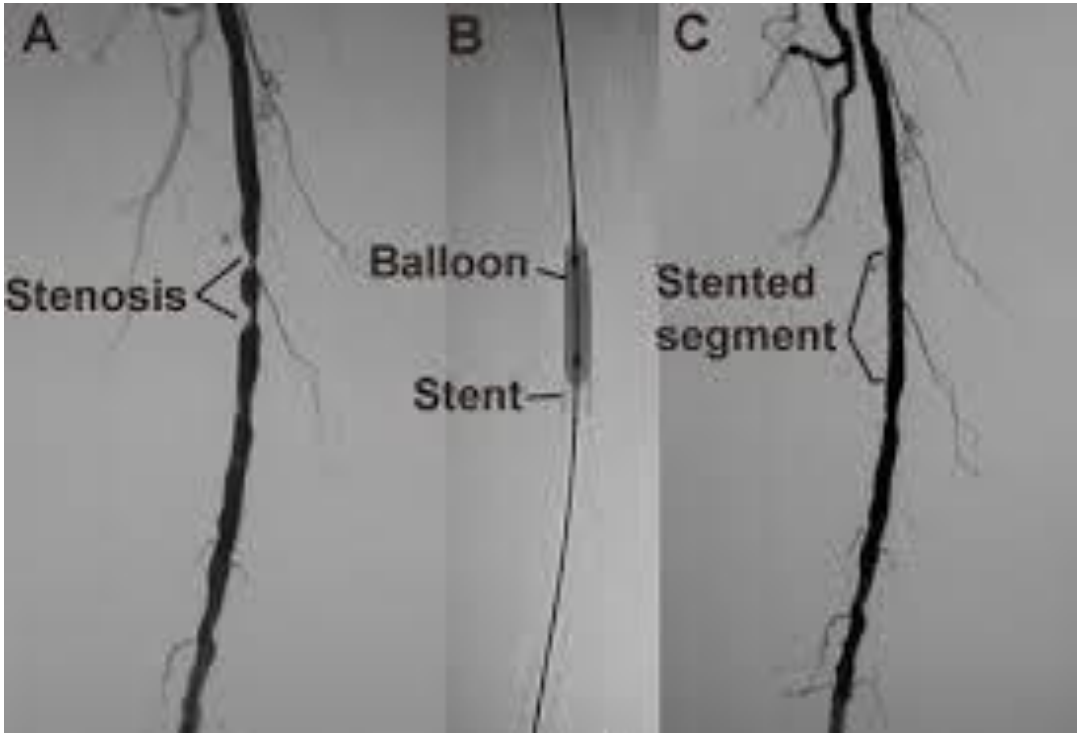
Drug Coated Balloon Angioplasty

Safe | Personal | Effective

Stents



Stents



Stents


Why Drug-Eluting Stents?
First Bare Metal Stent was implanted 1987
Set the stage for stents to be regulated by CDRH (with review of CMC by CDER)
First DES approved in US (Cypher™) in 2003
Drug/polymer matrix is applied to a scaffold that props the artery open.
Drug slowly elutes further reducing restenosis
In some cases, the remaining metal is endothelialized in the arterial wall

Stents

Post-procedural care

- Consider protamine if required.
- Closure of vessel:
  - Suture mediated.
  - Device mediated – Starclose, Proglide.
- Post-procedural bed rest duration.
- Medical Therapy:
  - Aspirin, clopidogrel or both.
  - Warfarin.
  - Statin.

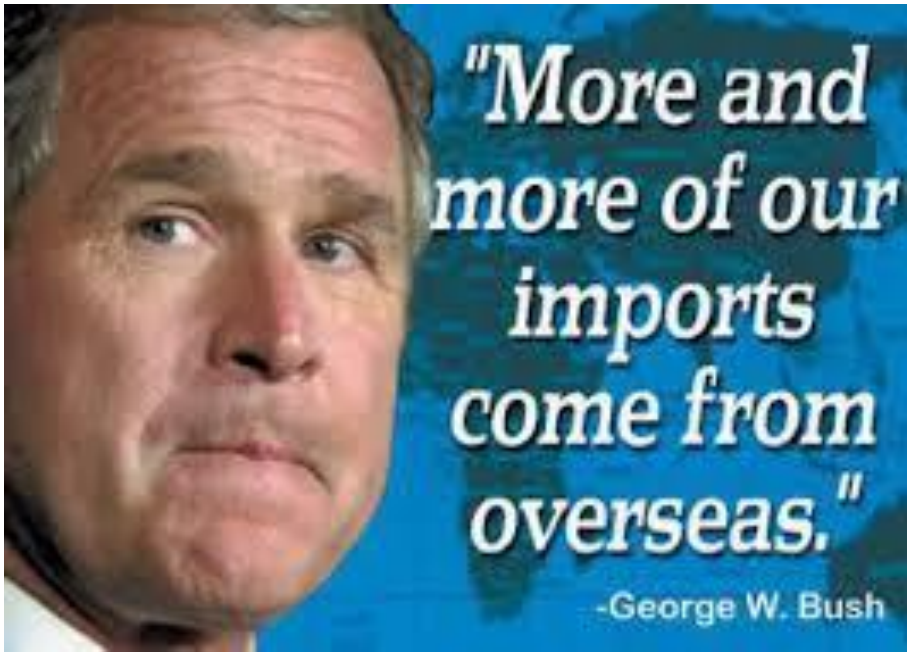
Post-procedural care

- Consider protamine if required.
- Closure of vessel:
  - Suture mediated.
  - Device mediated – Starclose, Proglide.
- Post-procedural bed rest duration.
- Medical Therapy:
  - Aspirin, clopidogrel or both.
  - Warfarin.
  - Statin.

Problems !!!

- Cannot stick vessel.
- Cannot progress wire.
- Cannot get sheath in.
- Vessel dissection.
- Vessel perforation.

Questions


"More and more of our imports come from overseas."
-George W. Bush