

# Angiography and Interventional Radiology

Brant and Helms Club

Liwei Jiang  
August 31, 2018



# First things first

- Not expected to know anything on day one
- Read IR section of resident website: [bwhradresidents.org](http://bwhradresidents.org)
  - Resident Rotation Guide, Angio-IR supplement
  - IR Tip Sheet from Yaralia Kelleher




# Angio-IR procedures: June 1 to 21, 2018

163	Venous access	1	IVC filter placement
56	CVC removal	1	IVC filter removal
54	Urinary interventions	1	Renal angiogram
39	Port removal	1	Bronchial artery embolization
17	Gastrostomy	1	Intercostal artery embolization
14	Biliary interventions	1	Visceral embolization (GI bleed)
11	Hepatic tumor interventions	1	Scleroembolization of knee venous malformation
6	PleurX	1	Gonadal vein embolization (varicose veins)
4	Transvenous liver biopsy	1	Calcium stimulation test (gastrinoma)
3	Thoracic duct embolization		
2	Pelvic embolization (trauma)		







# Resident's role

- Work up and present a few patients
  - Participate in procedures
  - Follow a few inpatients after procedures
  - Remove tunneled central lines
  - Obtain informed consent
  - Carry pager when on home call
    - 1 weeknight
    - 1 weekend
- 
- Change paging status to say “home call”
  - **Emergencies**
    - Bleeding
    - Infection
  - Communicate requests with attending
  - Don't feel pressured to give decision right away
  - **Stick to a checklist**



# When you get paged: “VACCINAL”

- ☐ Vitals stable?  Tolerate conscious sedation? Consider MAC/GA
- ☐ Allergies  Iodinated contrast, lidocaine, propofol, fentanyl
- ☐ Consent / healthcare agent
- ☐ Code status  Possible DNR/DNI reversal for procedure
- ☐ Indication and relevant history
- ☐ NPO status  At least 6 hours
- ☐ Anticoagulation
- ☐ Labs (CBC, INR, K+, Cr) and blood cultures



# Typical day

- Patient summary
- Procedure and site
- Consented or not
- Sedation plan and documentation
- Lab concerns

~06:30

Arrive

07:30

Rounds  
begin

08:00

First case

17:30-19:00

Go home and pass out

## Preparation

Overnight add-ons

Inpatient consents

Drain outputs (Epic handoff)

## Stuff happens (approximate numbers)

2-6 cases per room x 4 rooms

2-6 central line removals

0-4 outpatient evaluations (e.g. tube dysfunction)

2-6 inpatient consents



# Labs and anticoagulation \*

- **INR  $\leq 1.5$**  for most procedures
  - INR  $\leq 2.0$  for dialysis access, IVC filter placement, and catheter exchange (biliary and nephrostomy)
- **Platelets  $\geq 25,000/\mu\text{L}$**  for tunneled lines (other than chest ports)
  - Platelets  $\geq 50,000/\mu\text{L}$  for almost everything else
- Enoxaparin (Lovenox): withhold 1 dose or 12 hours
- Clopidogrel (Plavix): withhold for 5 days if possible
- Potassium  $\leq 5.4$  optimal for tunneled dialysis catheter placement
  - Potassium 5.4 to 5.9: if changes are present on cardiac monitor, then a normal 12-lead ECG is required
  - Potassium  $\geq 6.0$ : recheck potassium STAT, *and* a normal 12-lead ECG is required
- Negative blood cultures in last 48 hours for venous access

\* Thresholds for labs are variable among attendings and on a case-by-case basis.



# Needles

- Measured in gauge (outer diameter)
- 14G *larger* than 20G

Northcutt BG, Shah AA, Sheu YR, Carmi L. Wires, Catheters, and More: A Primer for Residents and Fellows  
Entering Interventional Radiology: Resident and Fellow Education Feature. Radiographics. 2015 Oct;35(5):1621-2.



16 gauge



18 gauge



20 gauge\*



21 gauge



22 gauge\*

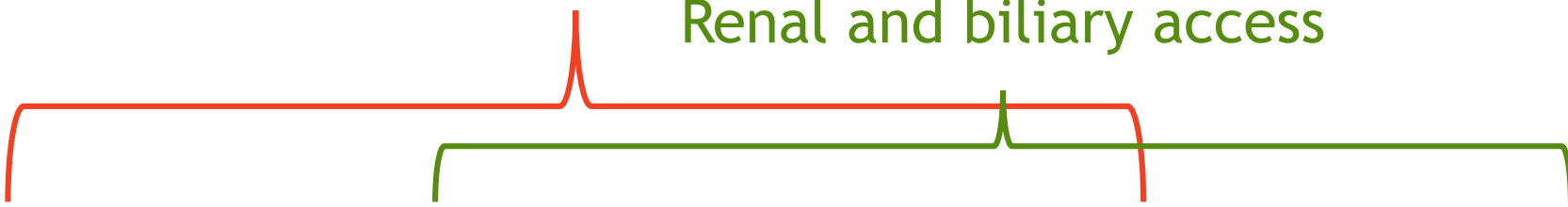


25 gauge



Vascular access

Renal and biliary access



16 gauge

18 gauge

20 gauge\*

21 gauge

22 gauge\*

25 gauge



# Catheters

- Measured in French (approx. *outer* circumference)
- More precisely,
  - French size = diameter (mm) x 3
  - 1 Fr = 1/3 mm
  - 1 Fr = 0.013 inch
- Flush before use
- Advance over wire to avoid scraping vessel lumen



## Flush

## Angled tip

## Cobra

## Reverse curve

Multiple side holes



Omniflush



Berenstein



Cobra



Sos



Simmons



Mikaelson

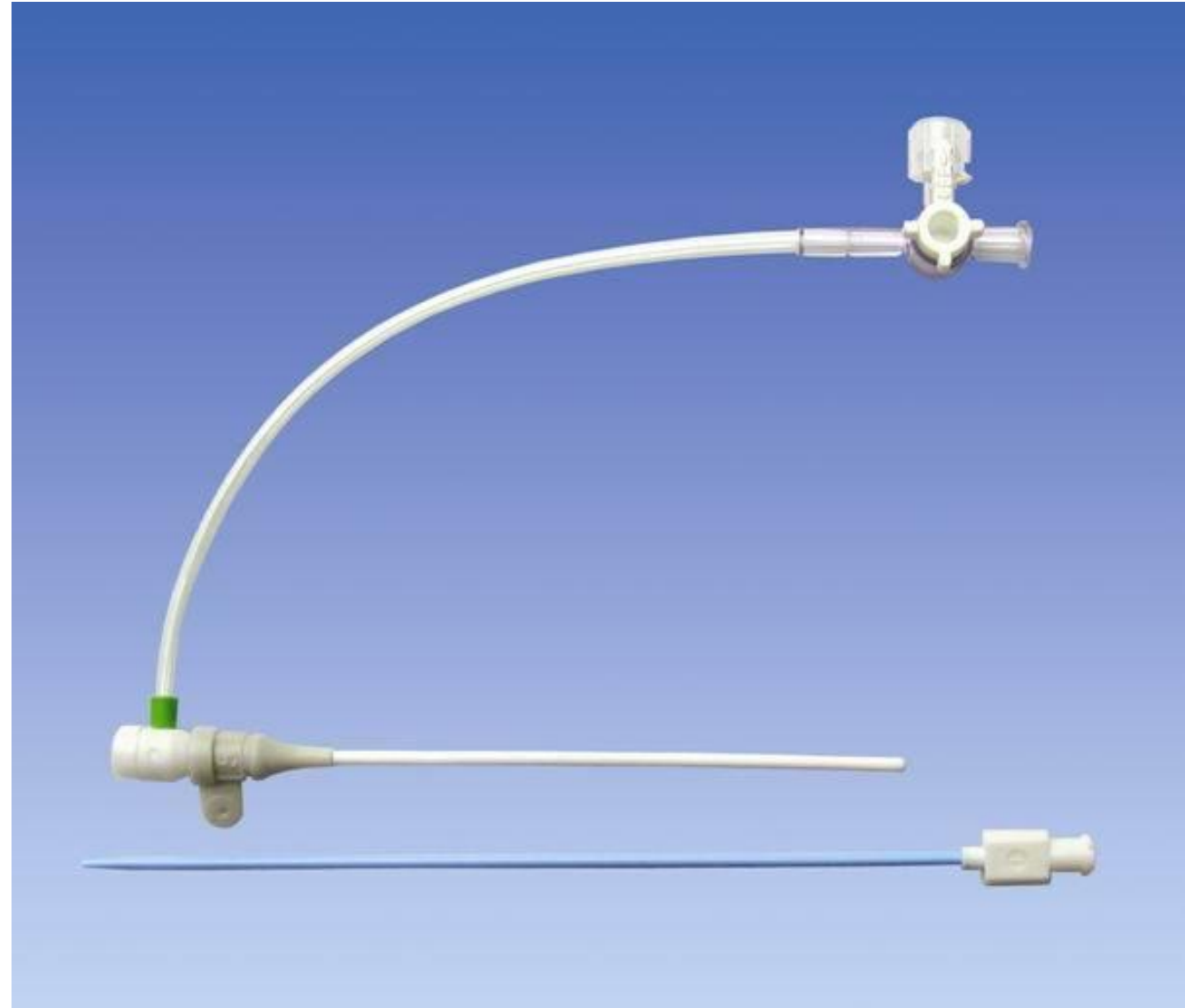
Contrast injection

Vessel selection



# Sheaths

- Measured in French (approx. *inner* circumference)
- A 6 Fr catheter fits into a 6 Fr sheath
- Supports access
- Facilitates additional instruments
- Flush end and side port before use
- Often have inner stiffener

















# Wires

- Measured in inches (diameter) x centimeters (length)
- 0.018 inch microwire
  - Fits in 22G needle or 3 Fr catheter
- 0.035 “standard” wire
  - Fits in 18G needle or 5 Fr catheter
- Stiffness
  - Stiff
  - Floppy
- Composition
  - Hydrophilic
    - Slippery when wet, sticky when dry
    - Less resistance in small vessels
  - Non-hydrophilic
    - Easier to grip
    - More resistance
















# Wire names you may hear

Diameter	Hydrophilic		Nonhydrophilic					
0.018"	- ---Stiffness--- +		- ---Stiffness--- +					
	 Glidewire	 V18	 Nitrex	 Cope				
0.035"	- ---Stiffness--- +		- ---Stiffness--- +					
	 Glidewire	 Stiff Glide	 Road Runner	 Bentson	 New Yorker	 Rosen	 Amplatz	 Lunderquist














# Maneuver wires: selecting vessels and other tubular structures

Diameter	Hydrophilic		Nonhydrophilic						
	- ---Stiffness--- +		- ---Stiffness--- +						
0.018"	<div></div> <div>Glidewire</div>	<div></div> <div>V18</div>	<div></div> <div>Nitrex</div>	<div></div> <div>Cope</div>					
0.035"	<div></div> <div>Glidewire</div>	<div></div> <div>Stiff Glide</div>	<div></div> <div>Road Runner</div>	<div></div> <div>Bentson</div>	<div></div> <div>New Yorker</div>	<div></div> <div>Rosen</div>	<div></div> <div>Amplatz</div>	<div></div> <div>Lunderquist</div>	<div></div> <div>Meier</div>















# Rail wires: exchanges and forceful maneuvers

Diameter	Hydrophilic		Nonhydrophilic				
0.018"	- ---Stiffness--- +		- ---Stiffness--- +				
	 Glidewire	 V18	 Nitrex	 Cope			
0.035"	- ---Stiffness--- +		- ---Stiffness--- +				
	 Glidewire	 Stiff Glide	 Road Runner	 Bentson	 New Yorker	 Amplatz	 Lunderquist



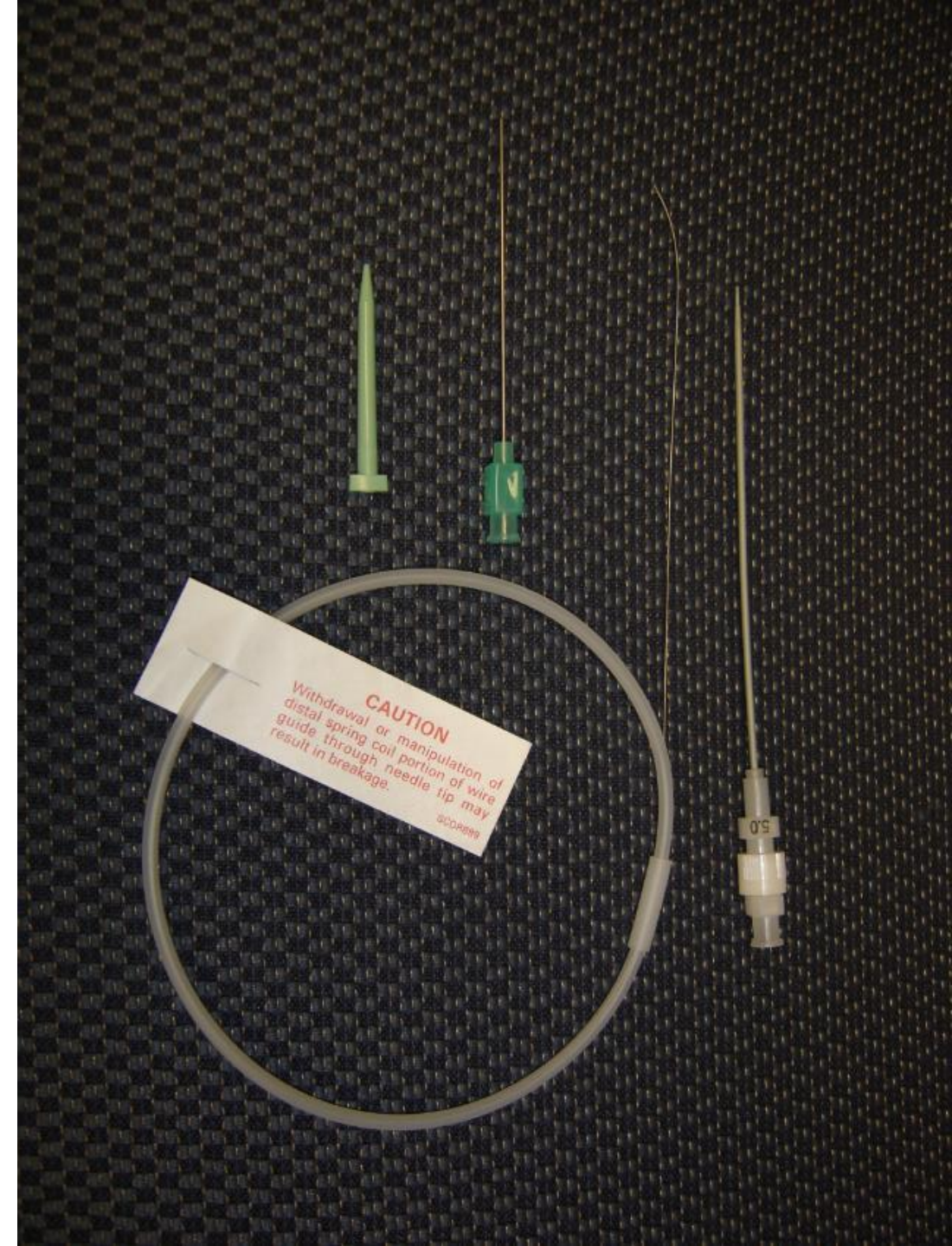
# Access wires: getting in

Diameter	Hydrophilic		Nonhydrophilic					
0.018"	- ---Stiffness--- +		- ---Stiffness--- +					
	 Glidewire	 V18	 Nitrex	 Cope				
0.035"	- ---Stiffness--- +		- ---Stiffness--- +					
	 Glidewire	 Stiff Glide	 Road Runner	 Bentson	 New Yorker	 Rosen	 Amplatz	 Lunderquist



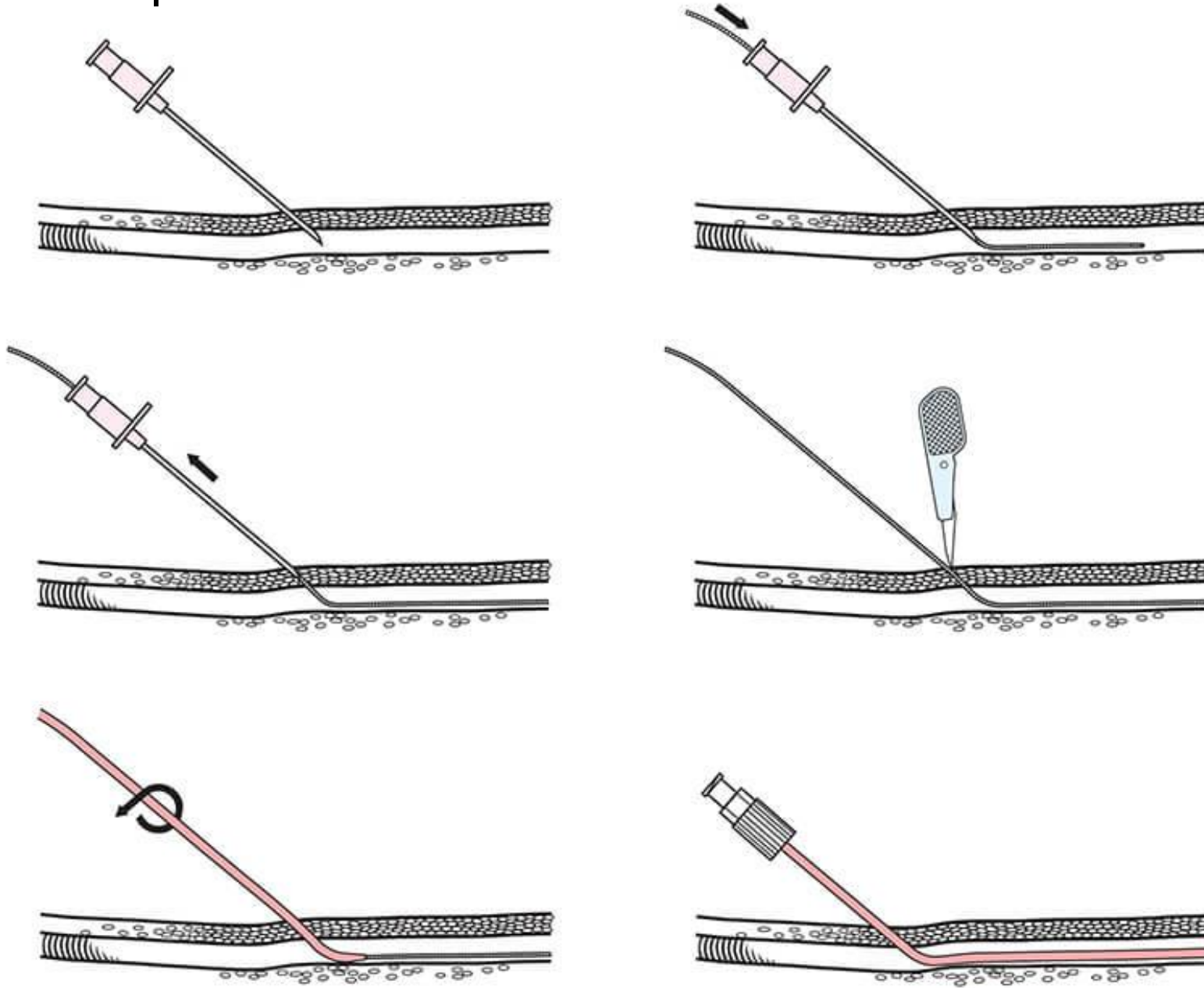
# Micropuncture set

- Introducer
- 21G needle
- 0.018 x 40 cm Cope wire
- 4 Fr or 5 Fr sheath with inner stiffener



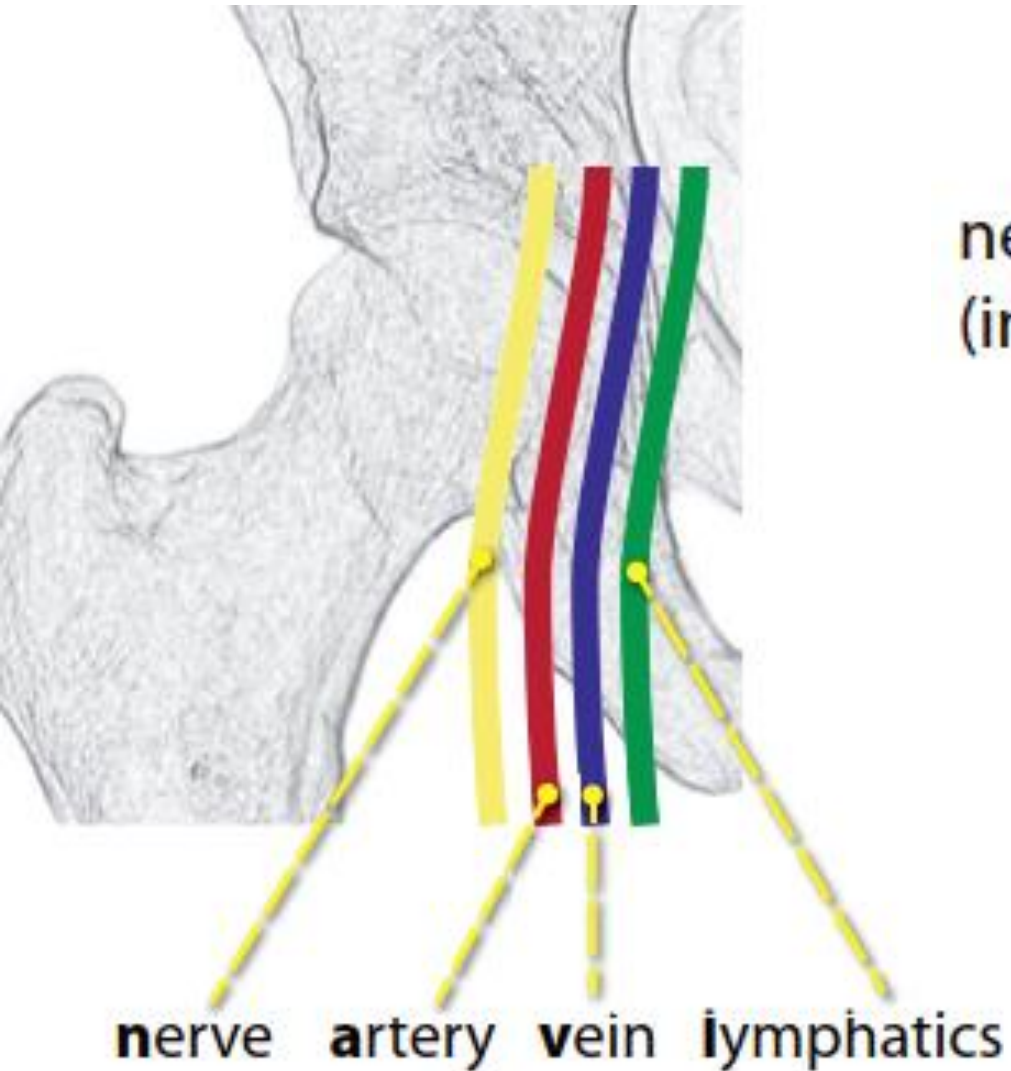


# Seldinger technique

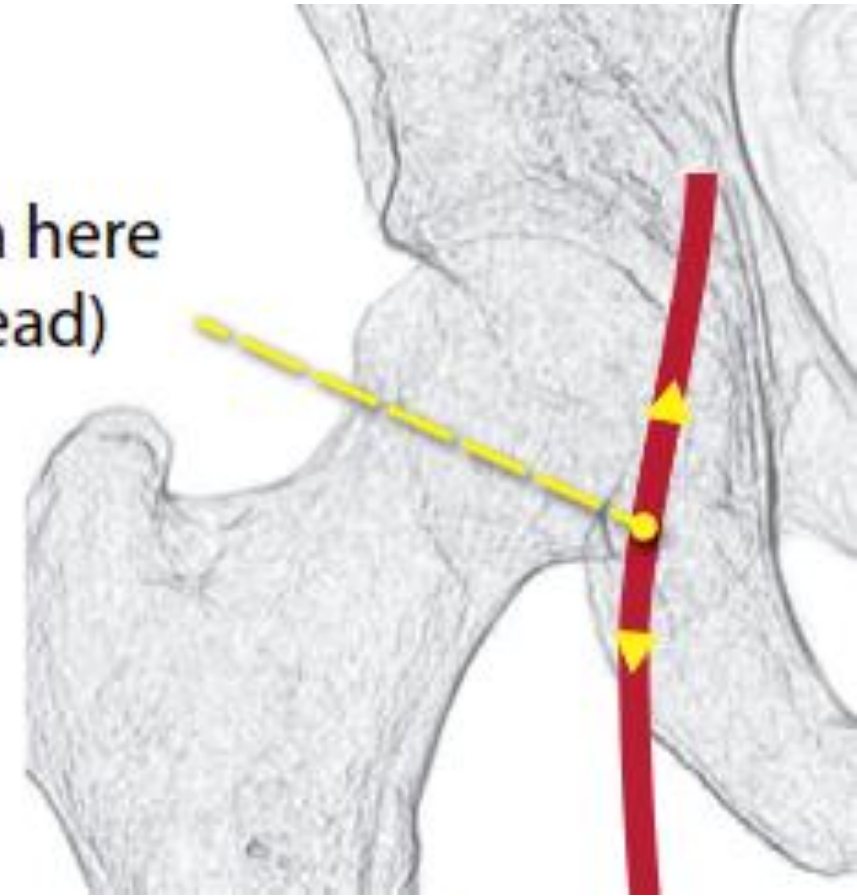




# Femoral access tips

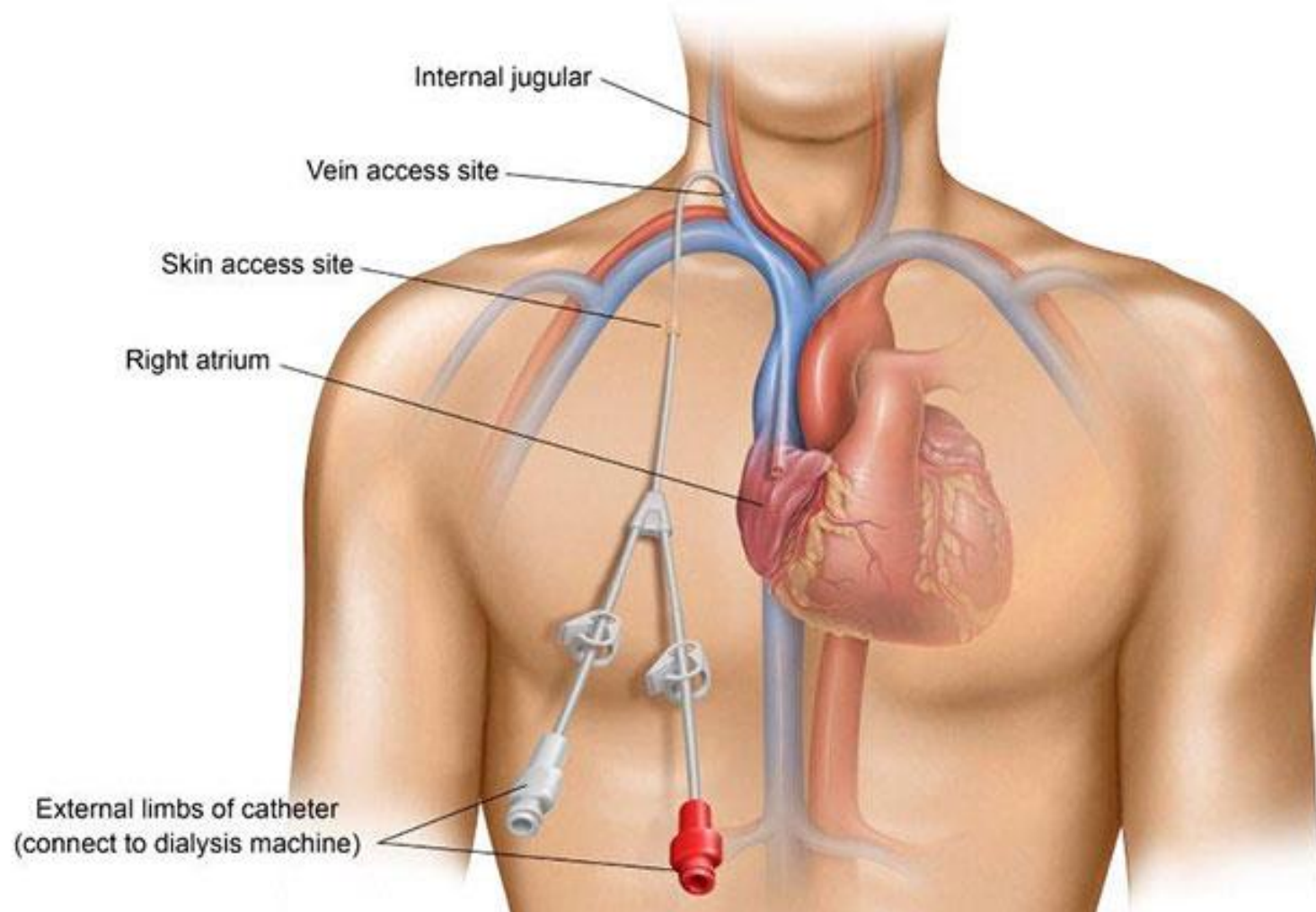


needle should enter skin here  
(inferomedial femoral head)





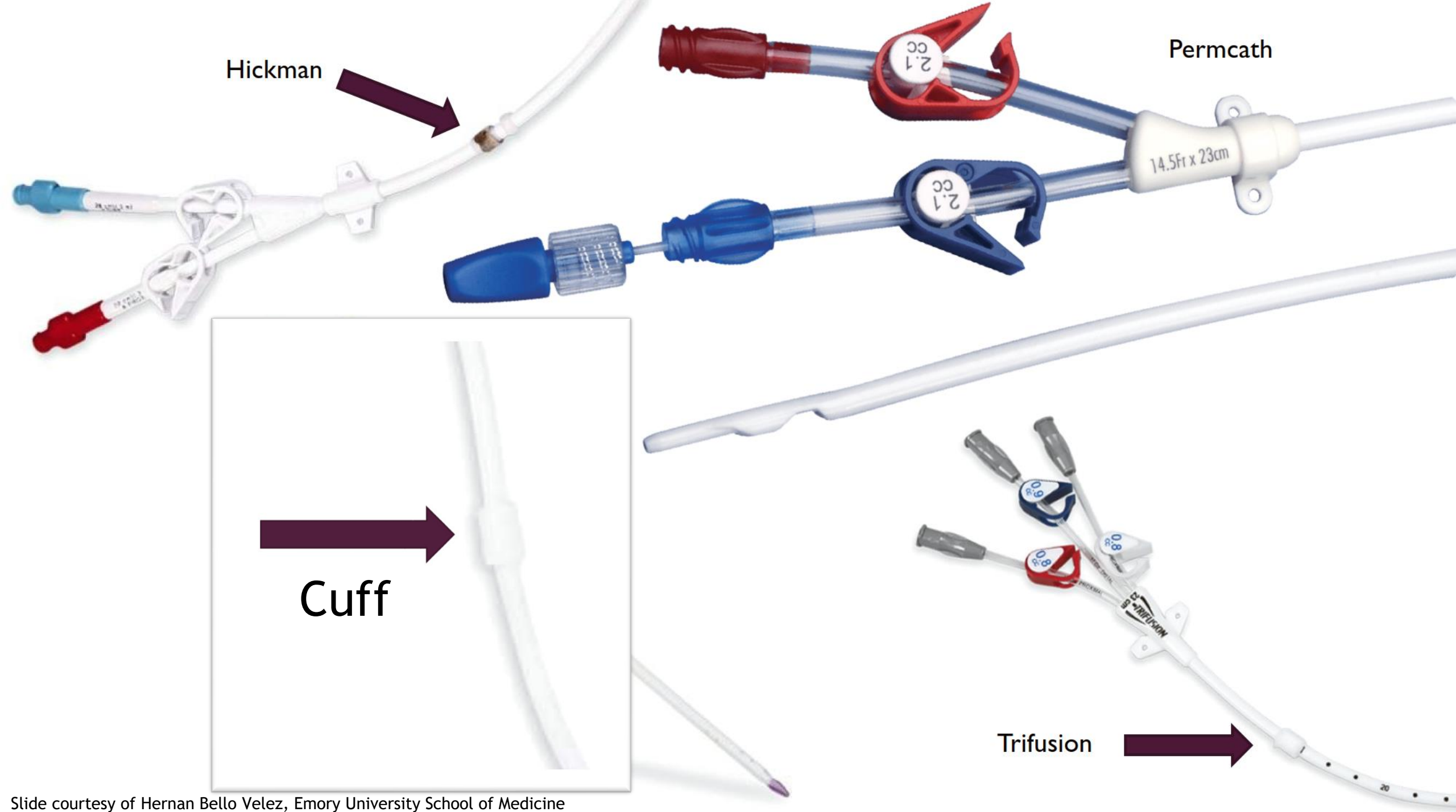
# Tunneled central venous catheter













# Tunneled catheter removal

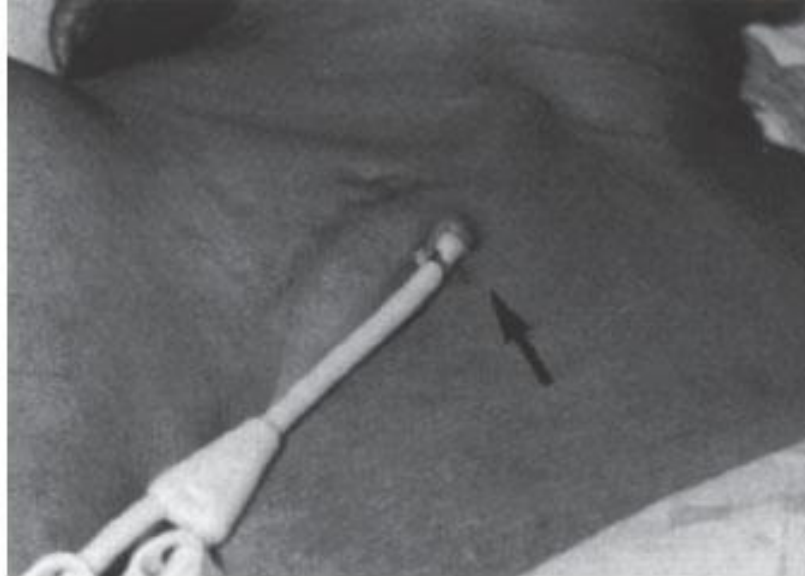
- Watch one first!
- See Residency Rotation Guide for details
- Verify indication, remaining access, need for tip culture, platelets > 10,000, INR < 3.0
- Get equipment from stockroom
  - Central venous catheter cutdown tray
  - Central venous catheter dressing kit
  - Sterile gloves
  - Mask with eye shield



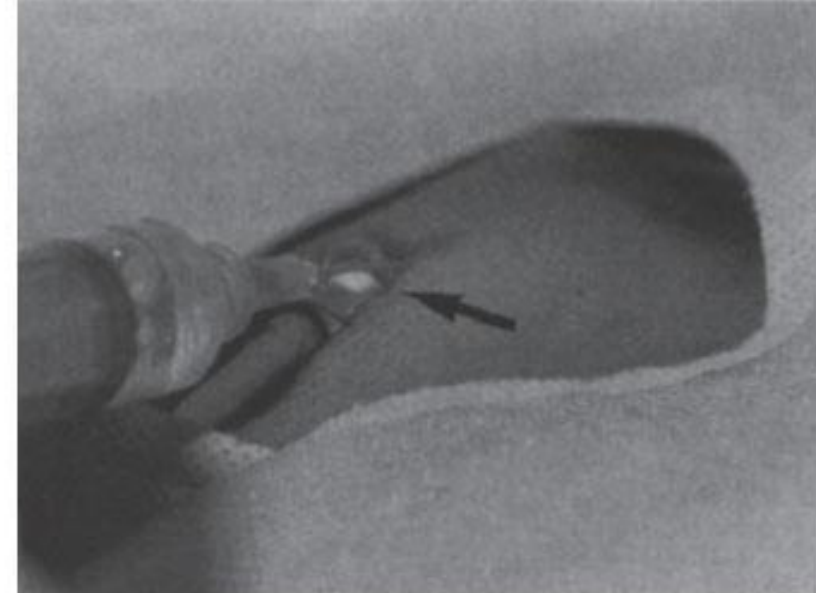
Verbal consent

Bed flat or head down

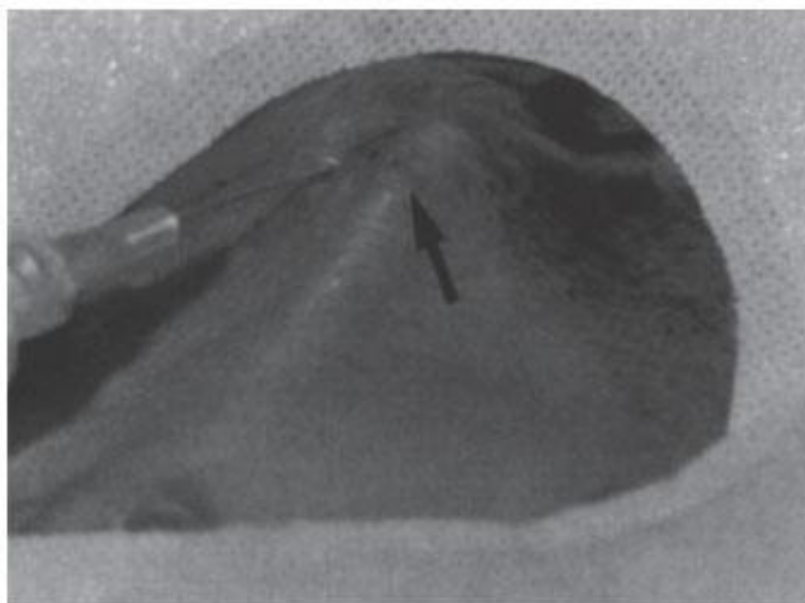
**A**



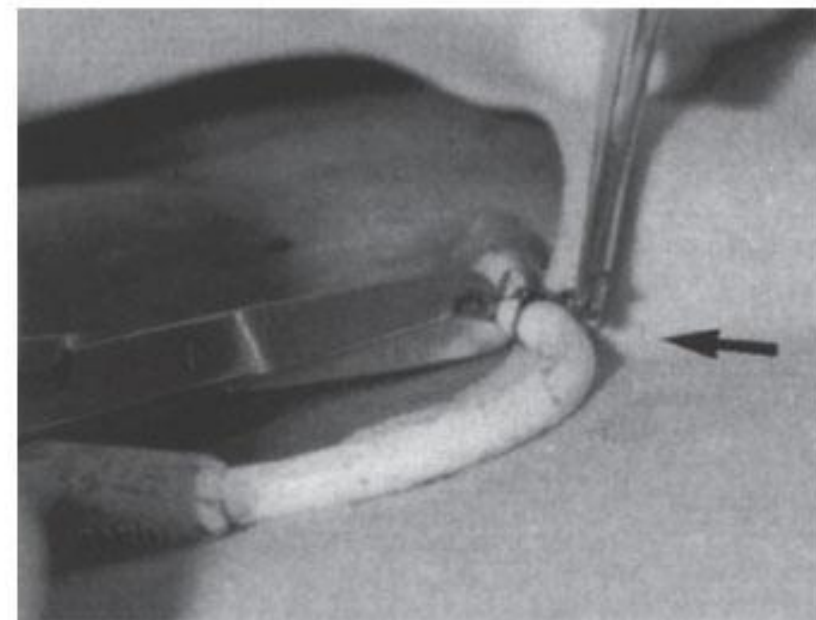
**B**



**C**



**D**



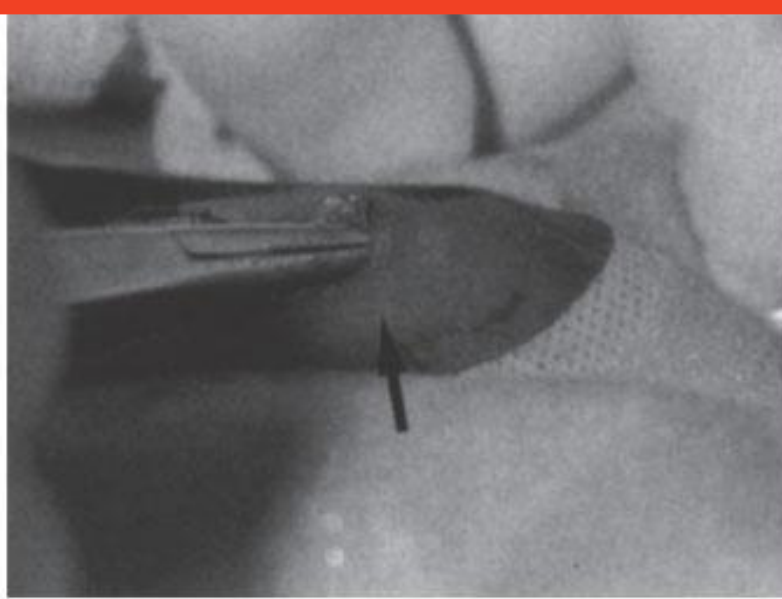
Removal of tunneled catheter. (A) Catheter exit site prepped and draped. (B, C) Exit site and tunnel infiltrated with lidocaine with 1% epinephrine. (D) The stitch holding the catheter is removed.



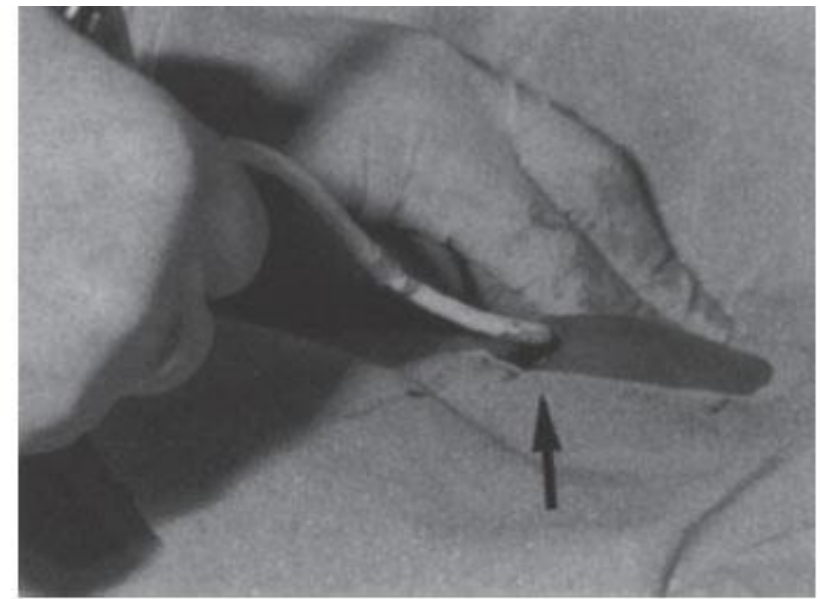
The more you dissect,  
the easier the pull

Hum when pulling

E



F

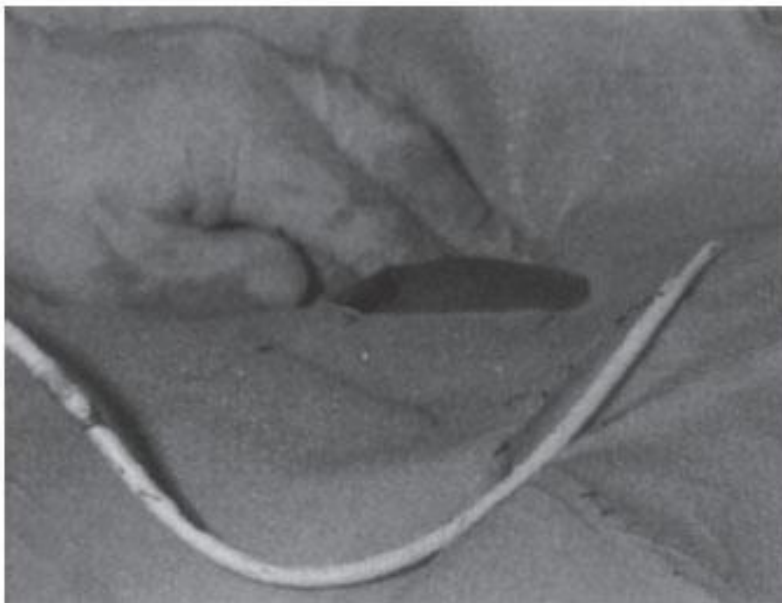


Press the venotomy site in the  
**neck**, not the tunnel exit site

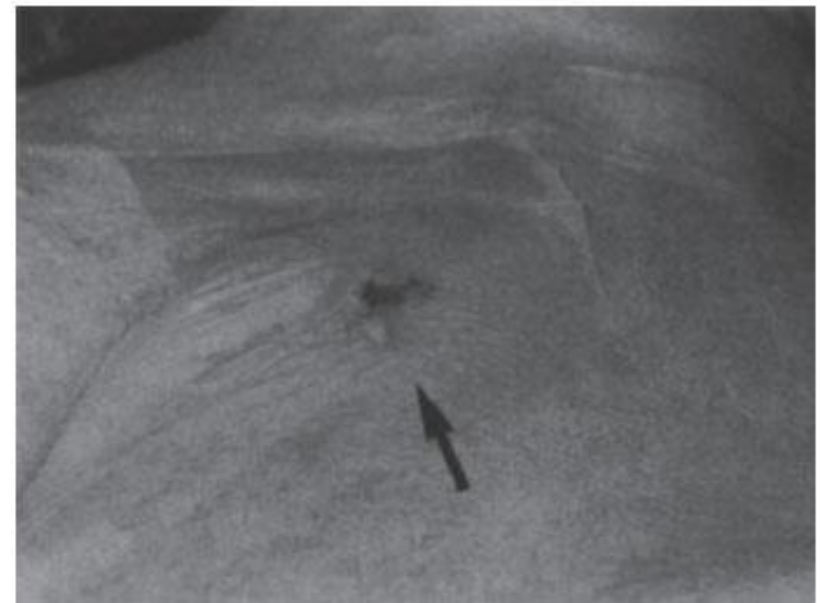
Bed head up while holding  
pressure

Stay in bed for 20 minutes  
No lying flat for 3 hours

G



H



Removal of tunneled catheter. (E) **Blunt dissection of the tunnel with a Kelly clamp.** (F) The catheter is withdrawn from the tunnel. (G) Hemostasis is obtained. (H) Dressing is applied. Patient is sent home.



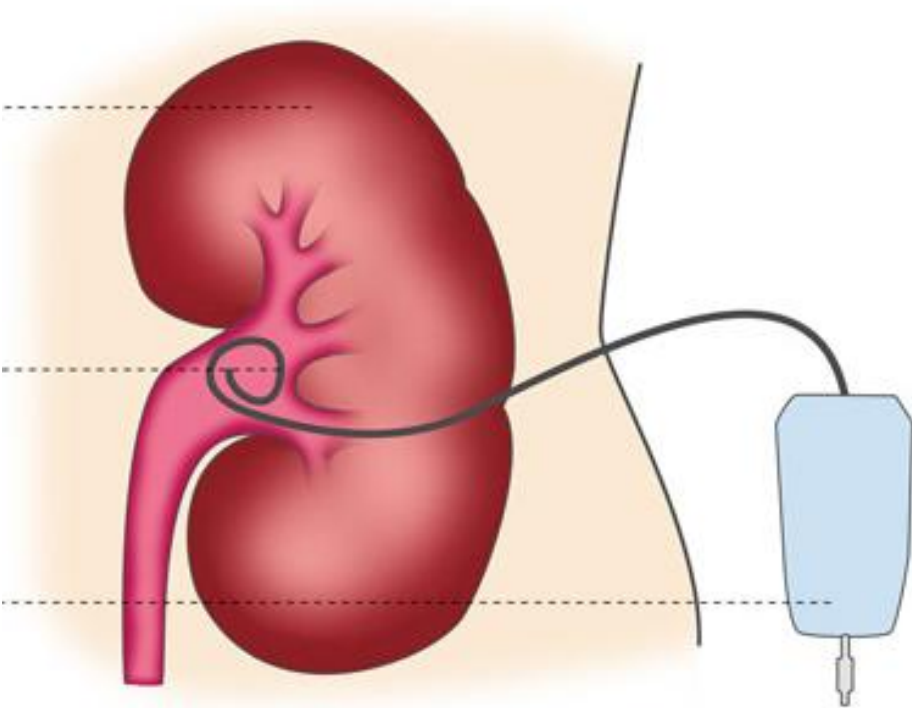
# Urinary drainage tubes

- Percutaneous nephrostomy (PCN)
- Percutaneous nephroureteral stent (PCNU)
- Double-J ureteral stent

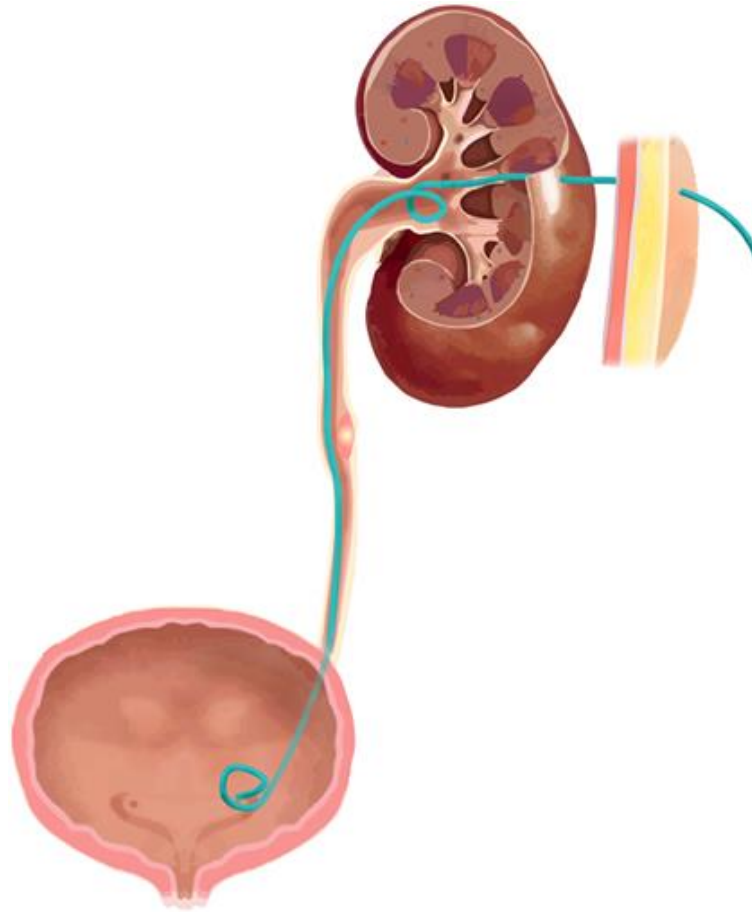




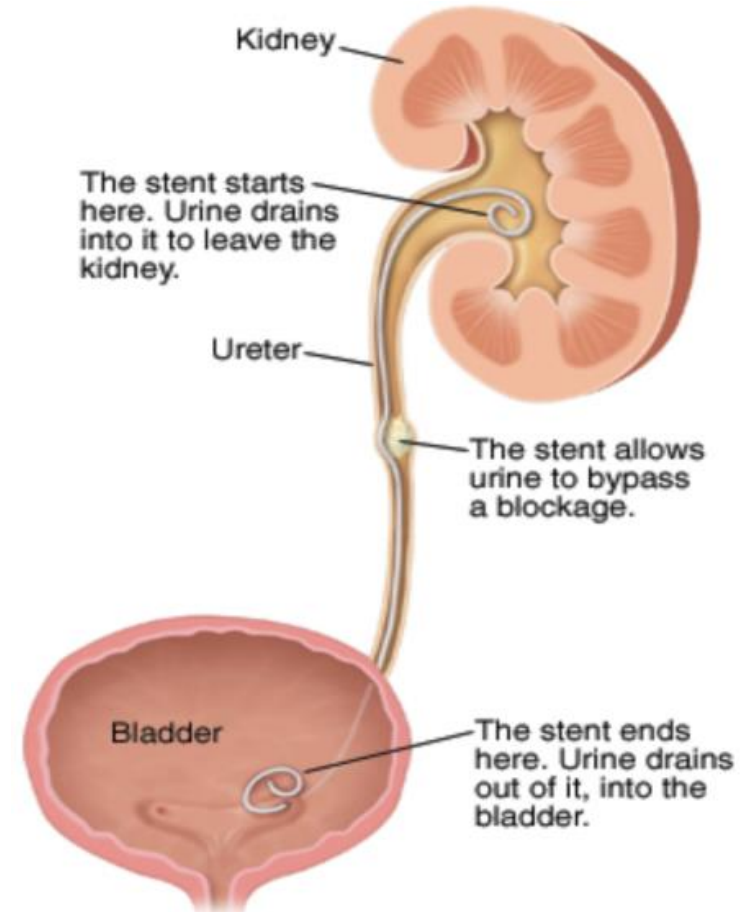
## PCN



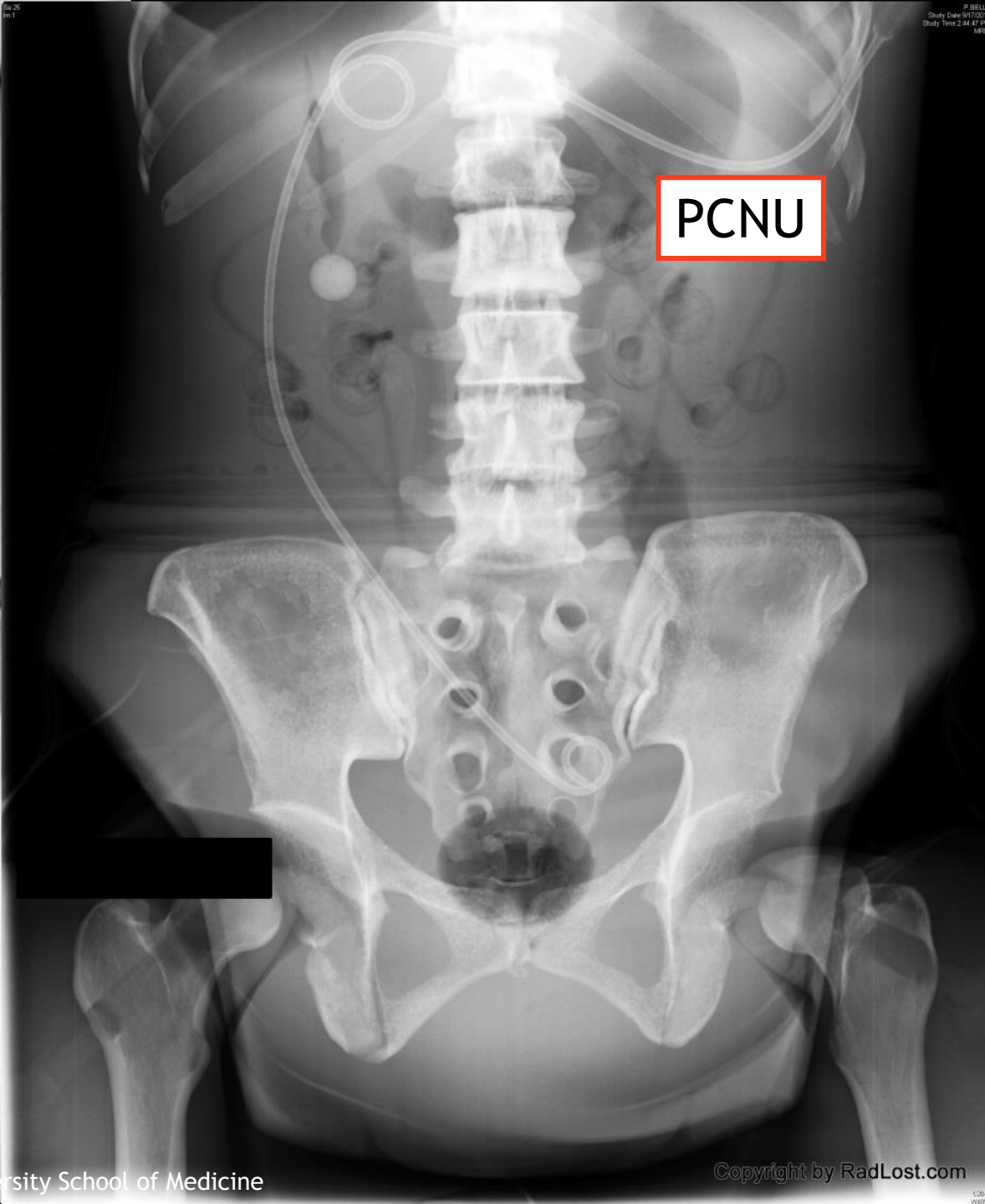
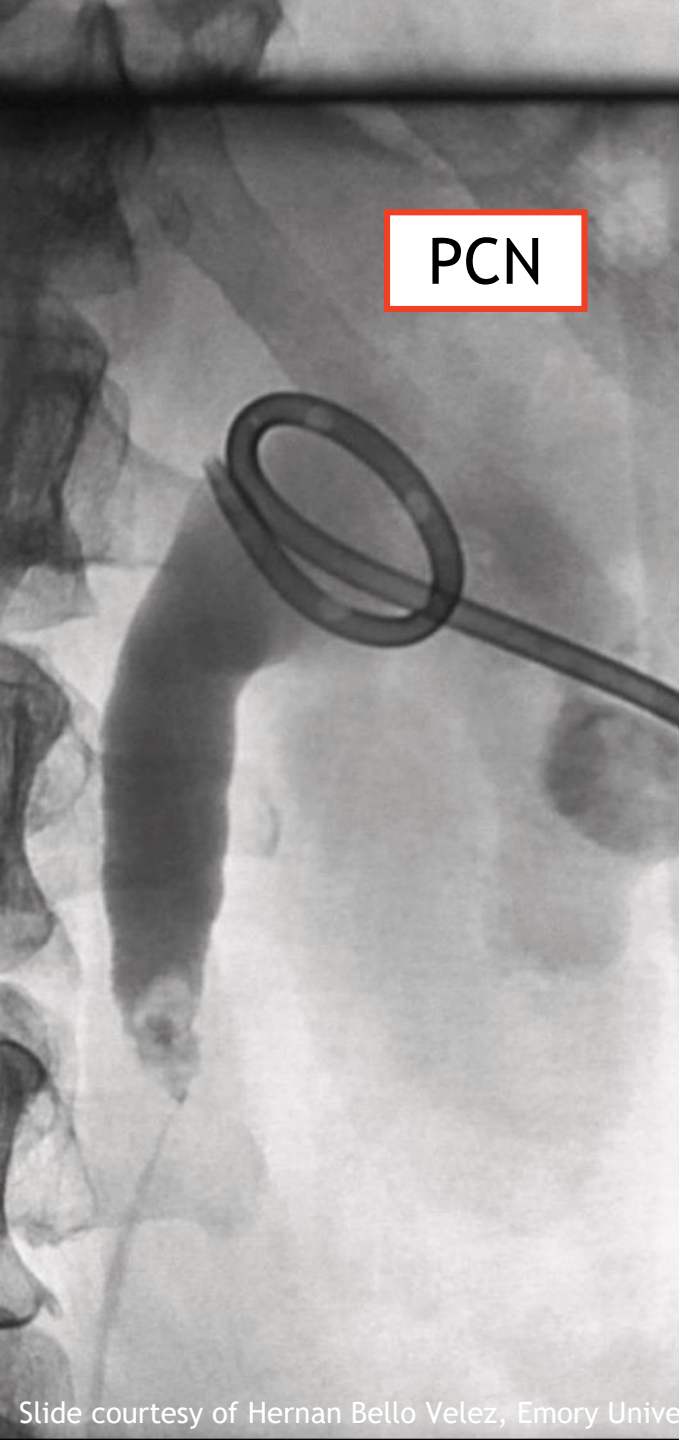
## PCNU



## Double-J









# Contrast injection lingo

20 for 30  
mL/s total mL

Aortogram (aortic arch): 20 for 30.

Abdominal aorta: 20 for 20.

Inferior vena cavogram: 20 for 30.

Mesenteric artery: 5 for 25.

Renal artery: 5 for 15.

Distal artery: 3 for 12.



# Miscellaneous tips

- Complete HealthStream course: “BWH Moderate Procedural Sedation for Non-Anesthesia Providers”
  - Email certificate of completion to Julie
- Clone Epic SmartPhrases from Yaralia Kelleher
- Go home when you can



# Additional resources

- Resident website: [bwhradresidents.org](http://bwhradresidents.org)
  - Resident Rotation Guide, Angio-IR supplement
  - IR Tip Sheet from Yaralia Kelleher
  - SIR anticoagulation guidelines
  - Wires, Catheters, and More: A Primer for Residents and Fellows Entering Interventional Radiology
- Mandell. *Core Radiology*. Interventional Radiology section
- Kandarpa. *Handbook of interventional radiologic procedures*. 5<sup>th</sup> edition (available on [hollis.harvard.edu](http://hollis.harvard.edu))



# Acknowledgments

Intro to IR lecture

Hernan Bello Velez, M.D.

Emory University School of Medicine