Introduction to Interventional Radiology

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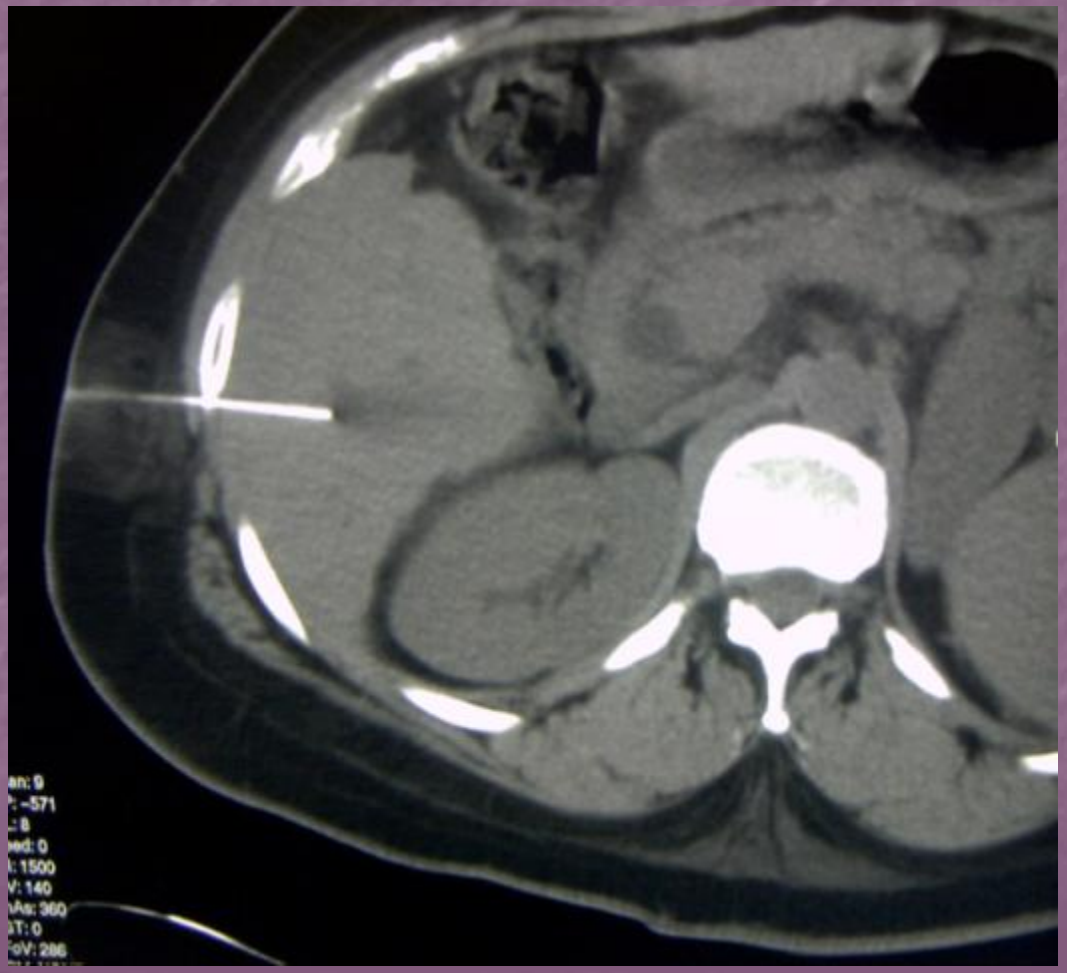
What is interventional radiology?

- Interventional radiology is a subspecialty which provides minimally invasive diagnosis and/or treatment using imaging (ultrasound, CT, or fluoroscopy) to target the intervention and show the results of the intervention.

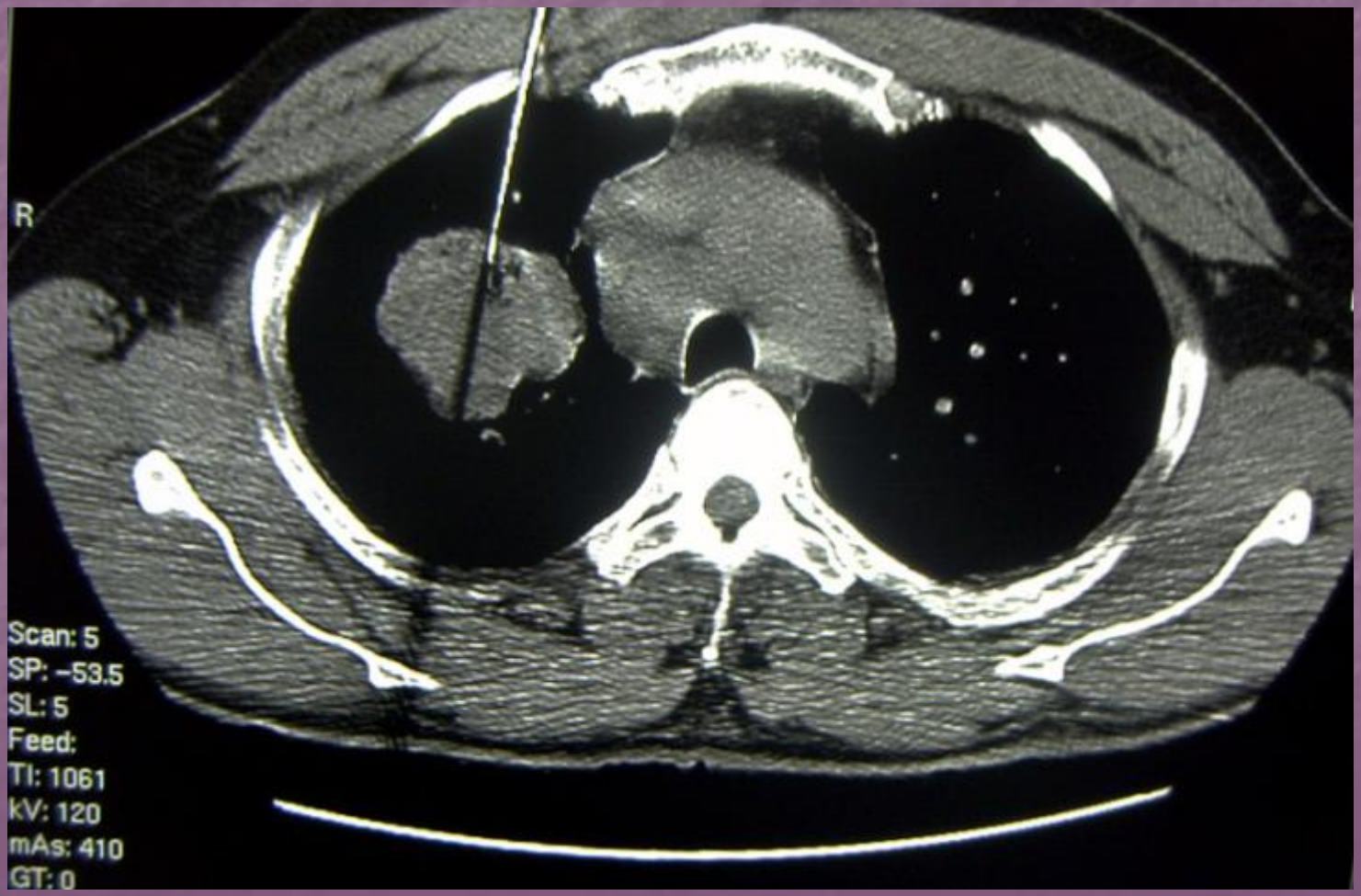
1. Percutaneous biopsy

- US, CT or fluoroscopy
- Random sampling or sampling of a mass
- Lung, mediastinum, pleura, chest wall, nodes
- Liver, adrenal gland, pancreas kidneys, lymph nodes

Liver biopsy



Lung biopsy



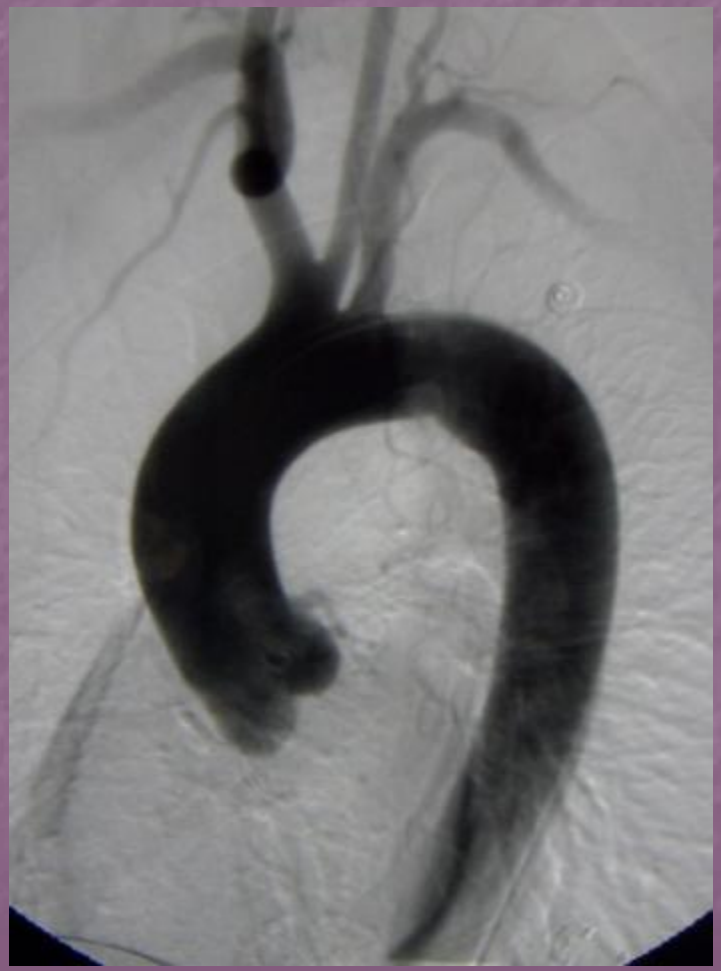
2. Percutaneous abscess drainage

- US, CT or fluoroscopy
- Aspiration or drainage tube placement
- Usually for infection
- Pleura, lung
- Hepatic (intra/sub), pericolic gutters, perisplenic, peri/intrapancreatic, pouch of Douglas, psoas, abdominal wall

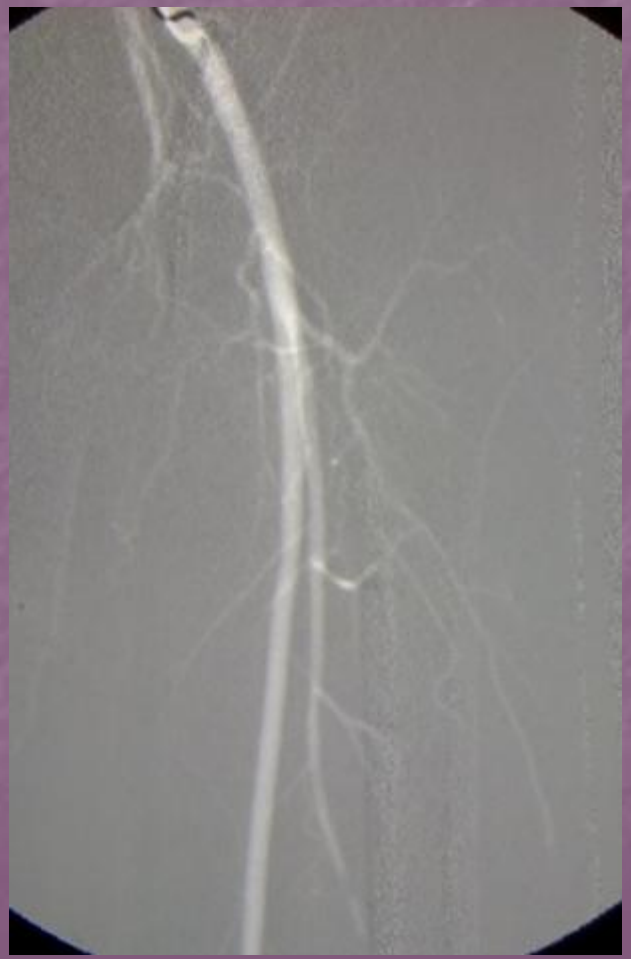
3. Arteriography

- Injection of contrast media directly into arteries and vis via fluoroscopy
- Usually immediately precedes and intervention is angioplasty, stenting, embolization, thrombolysis
- Aorta, pelvis, lower and upper extremities, kidneys, gut, lungs

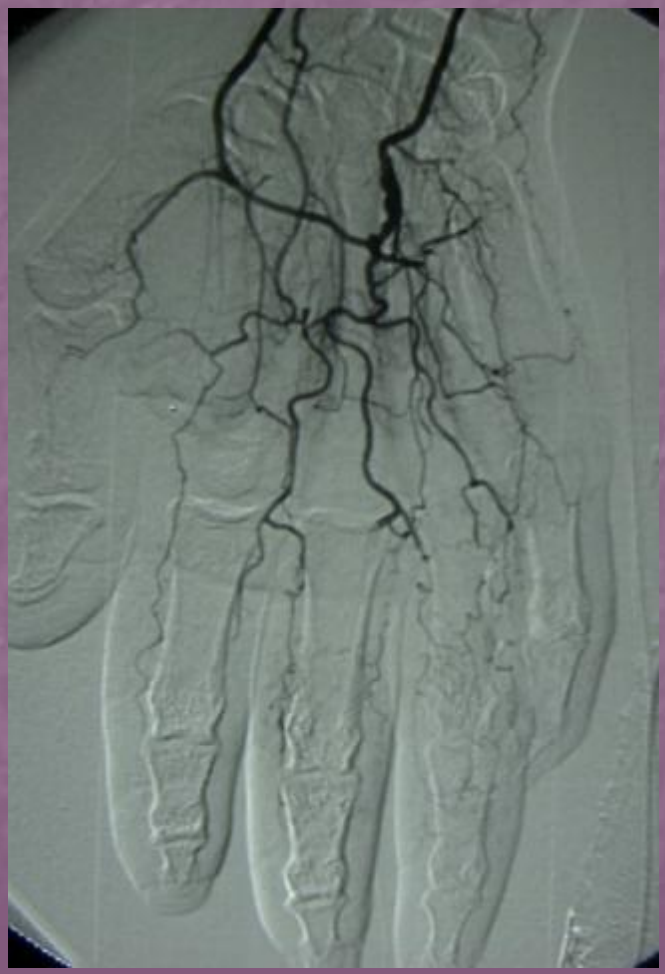
Aortic angiography



Lower extremity angiography



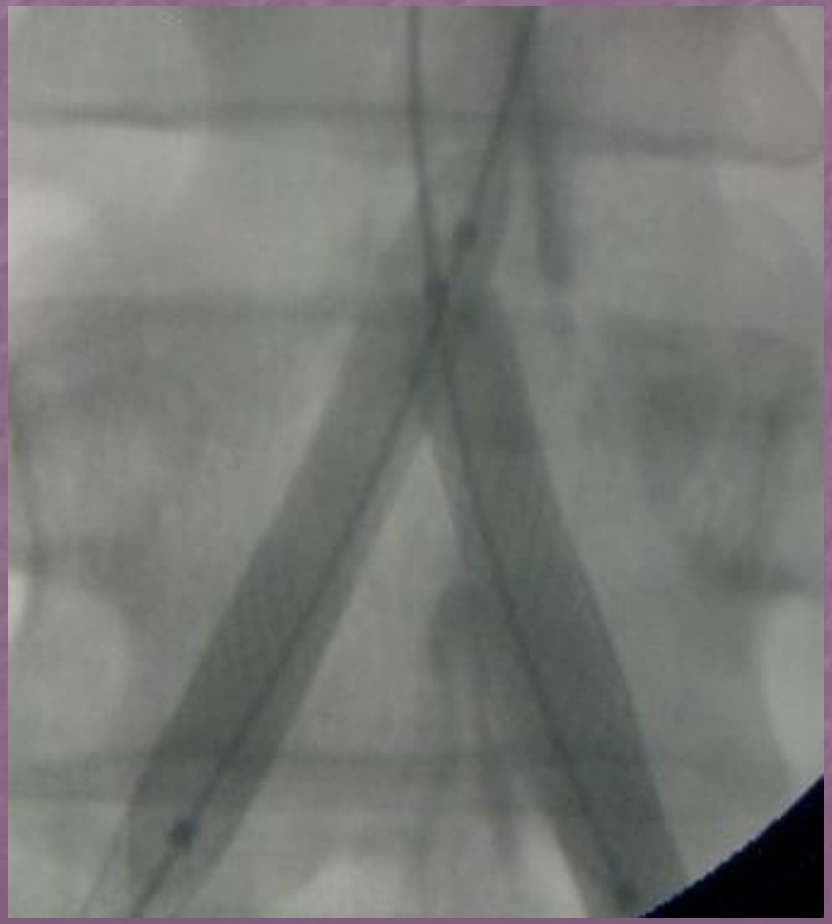
Upper extremity angiography



Mesenteric angiography

Pulmonary and bronchial angiography

4. Angioplasty

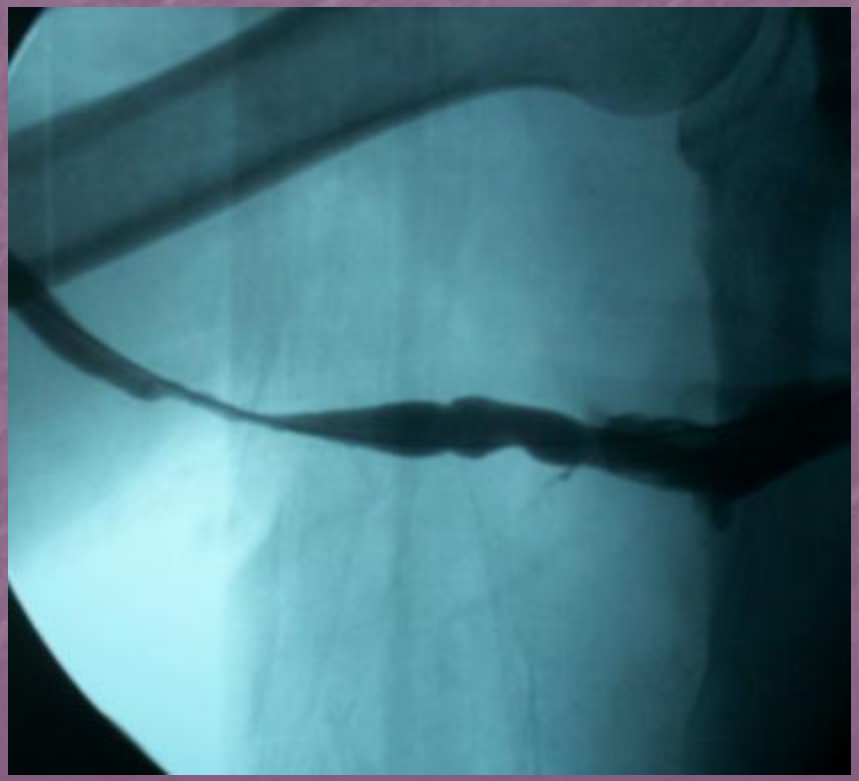


- Fluoro
- Done to relieve narrowing in a vessel (most frequently) or other tubular anatomic structure
- Balloon measurements in length and width, burst and nominal pressure
- Cutting, cryoplasty, low profile, high pressure
- Sometimes need buttressing with a stent

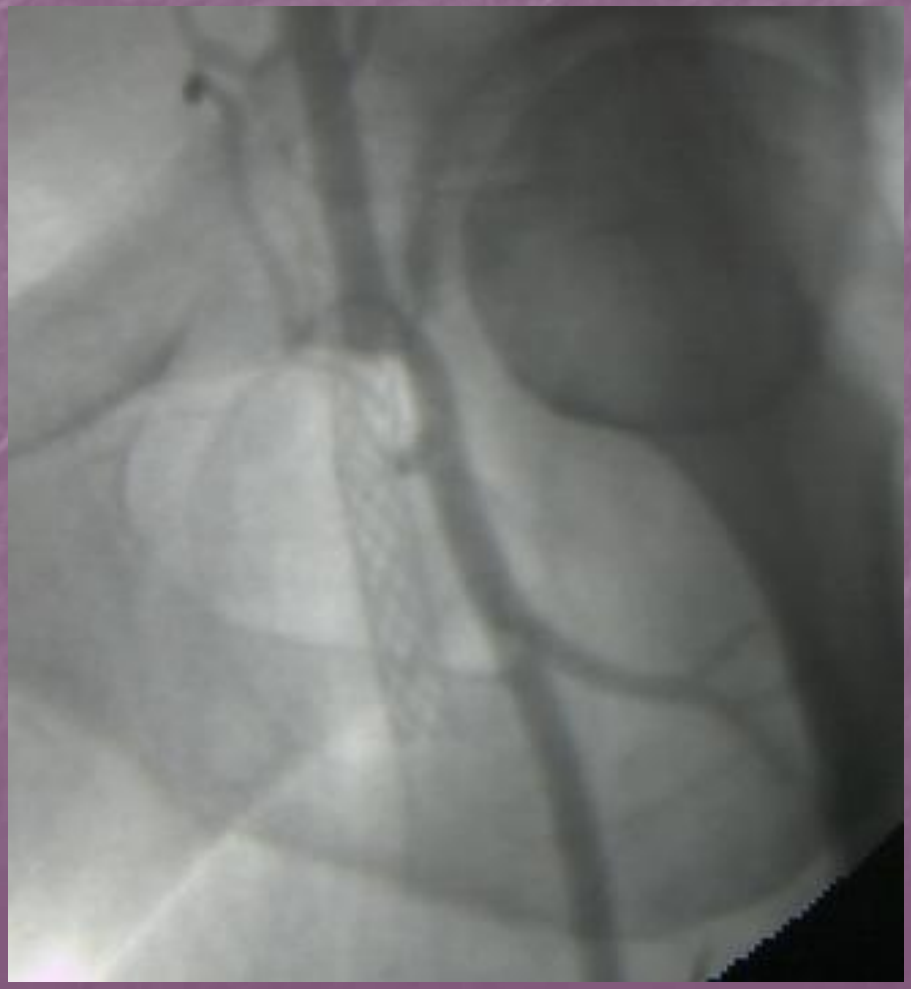
Renal angioplasty

Lower extremity arterial angioplasty

Stenosis at cephalic/axillary vein confluence pre and postangioplasty in patient with dialysis graft

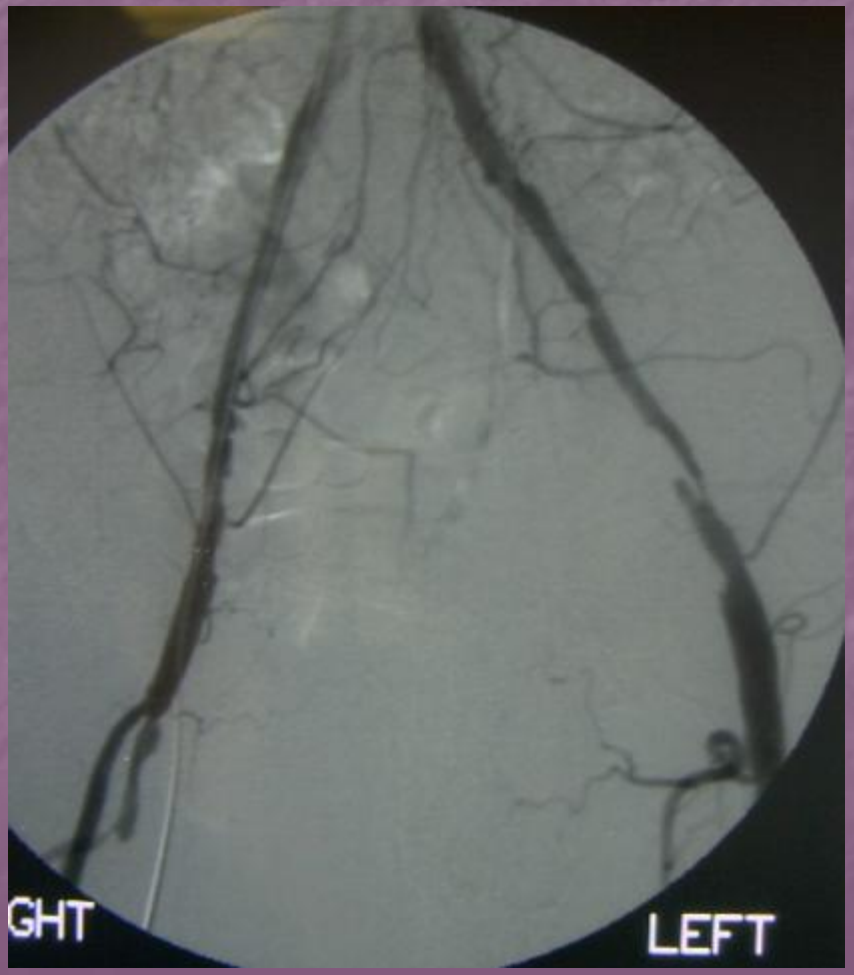


5. Stenting



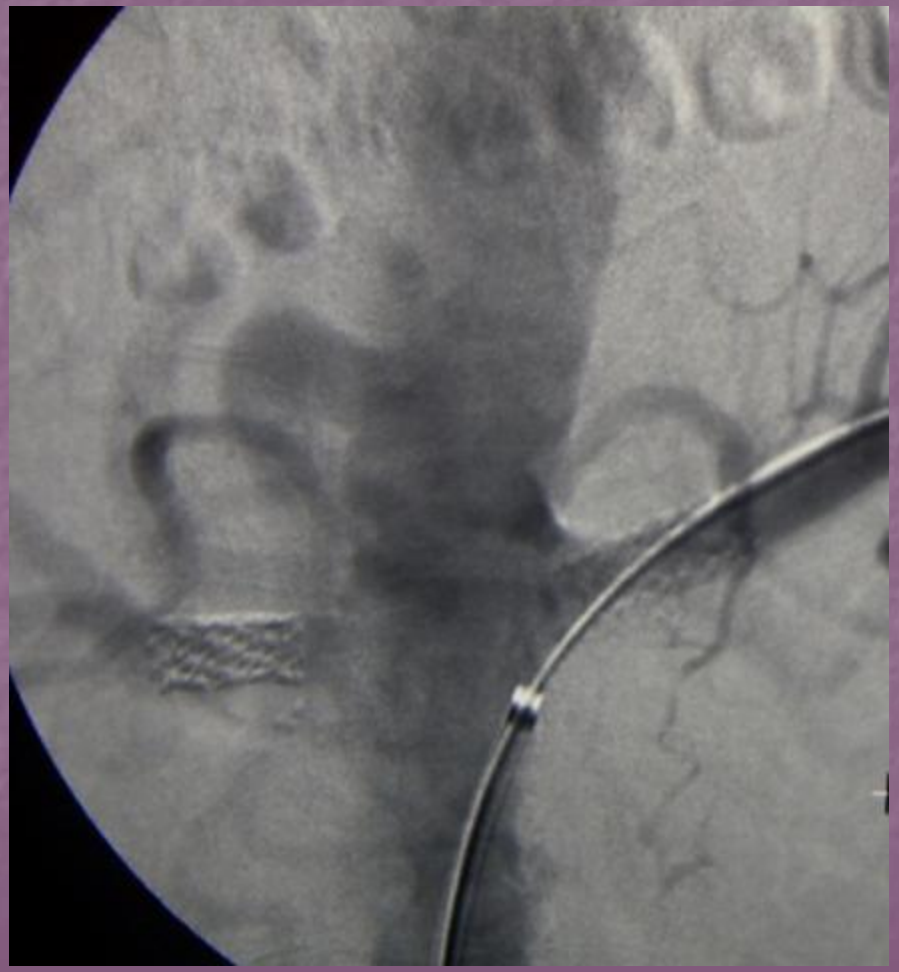
- Fluoro
- Plastic or metal tube used to buttress a tubular vascular structure prone to narrowing and occlusion
- Arterial, venous, biliary, or urinary
- Need monitoring after placement

Iliac artery stenting

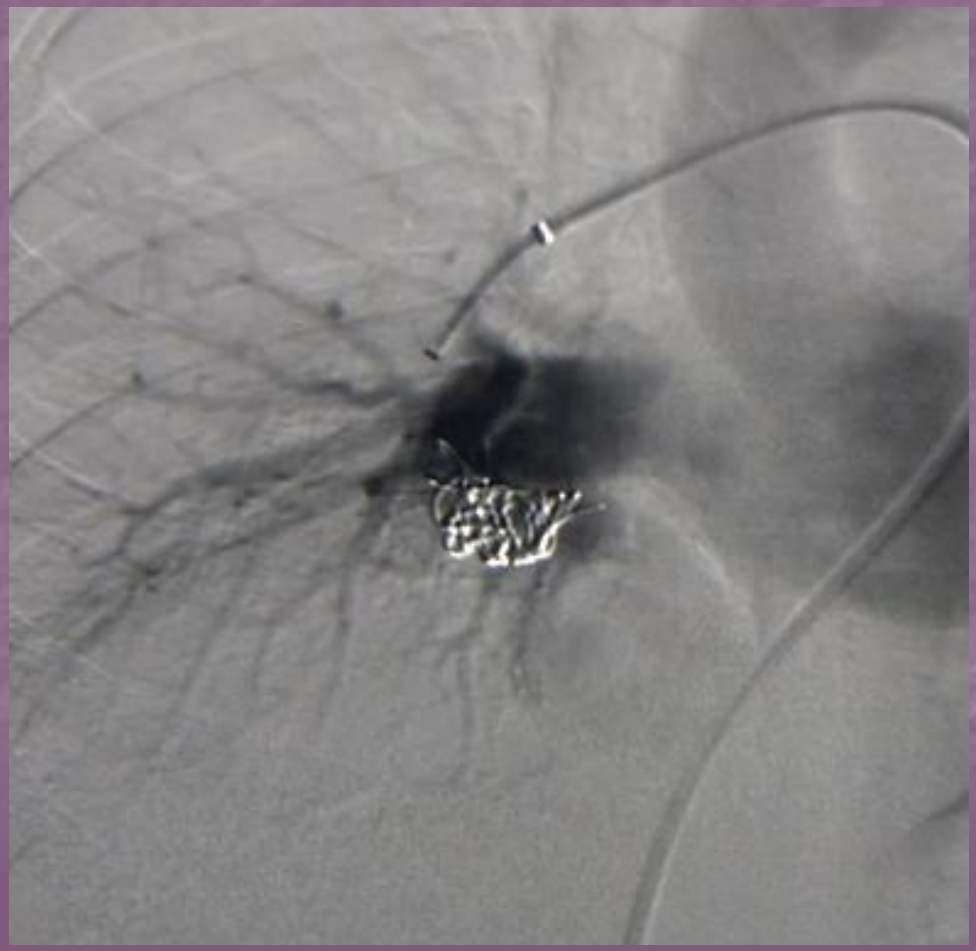


Celiac and SMA stents

Renal artery stenting

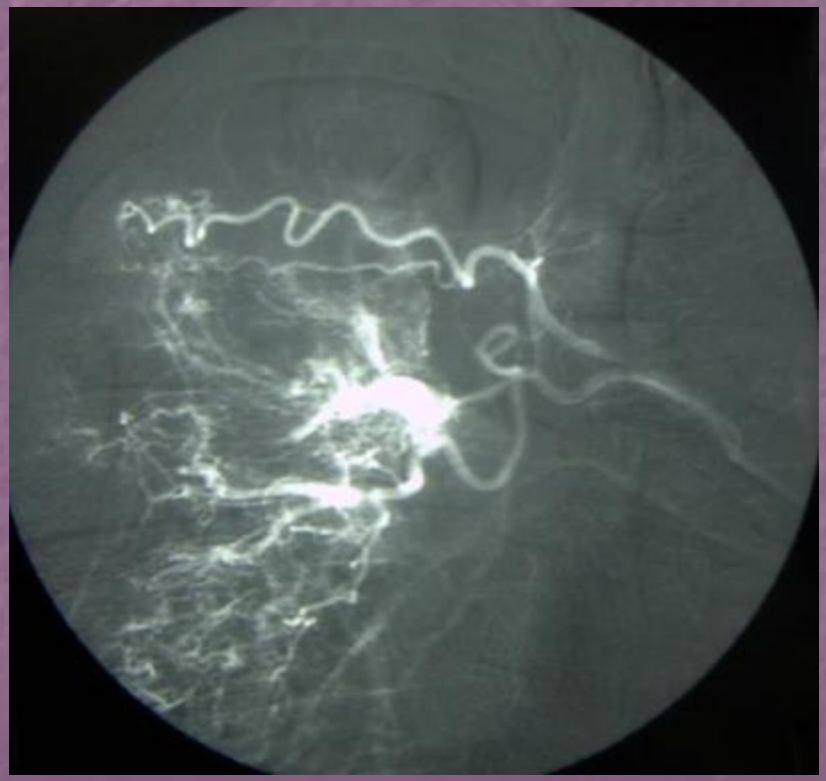


6. Embolization

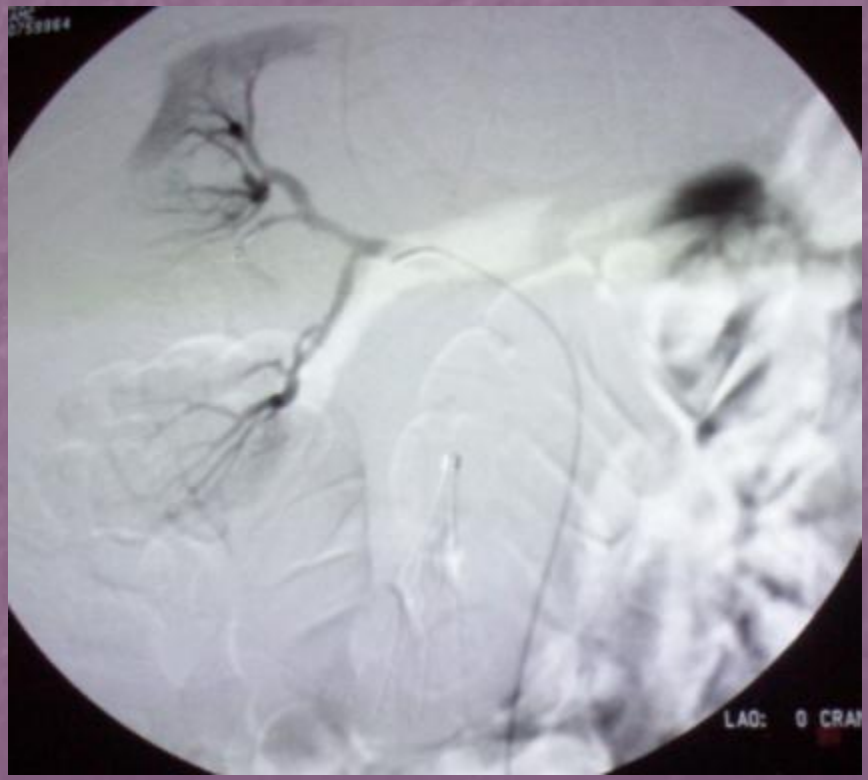


- Usually fluoro guidance
- Purpose is to "plug" a vessel that may be bleeding or hypertrophied and supplying a hypervascular structure
- Permanent or temporary agents
- Need to spare as much normal parenchyma as possible

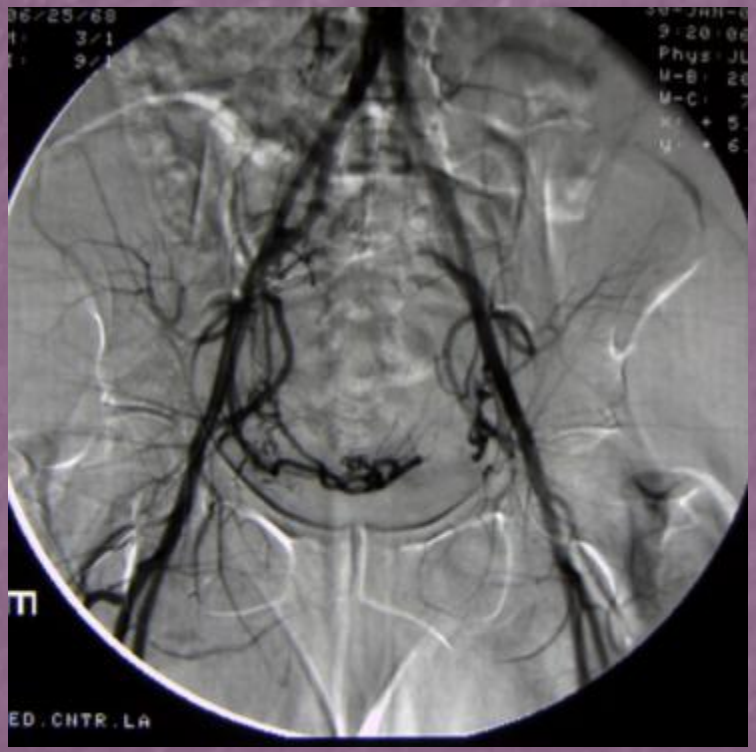
Bronchial embolization



Renal embolization

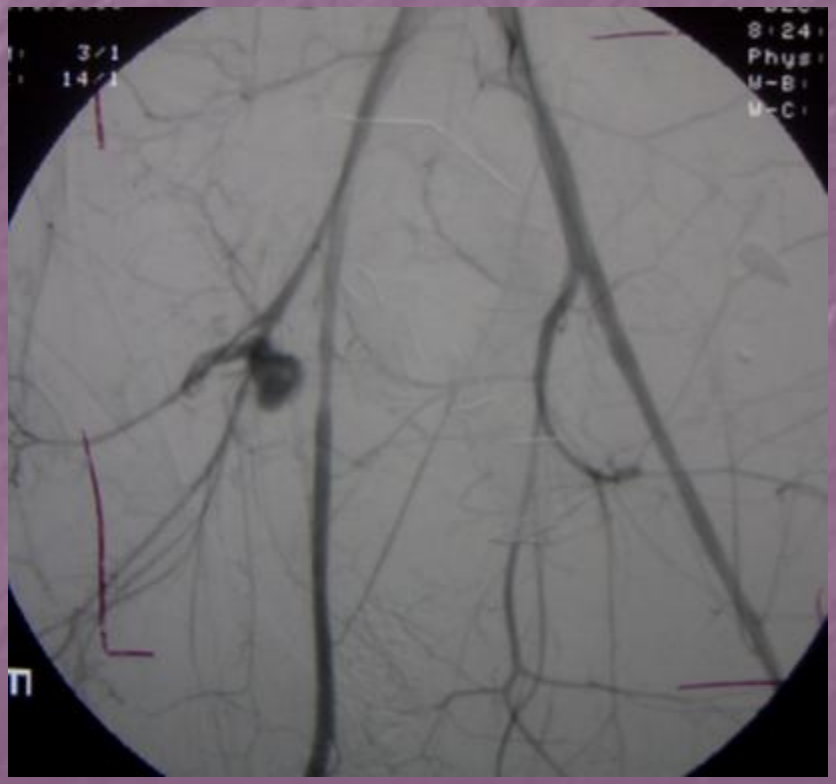


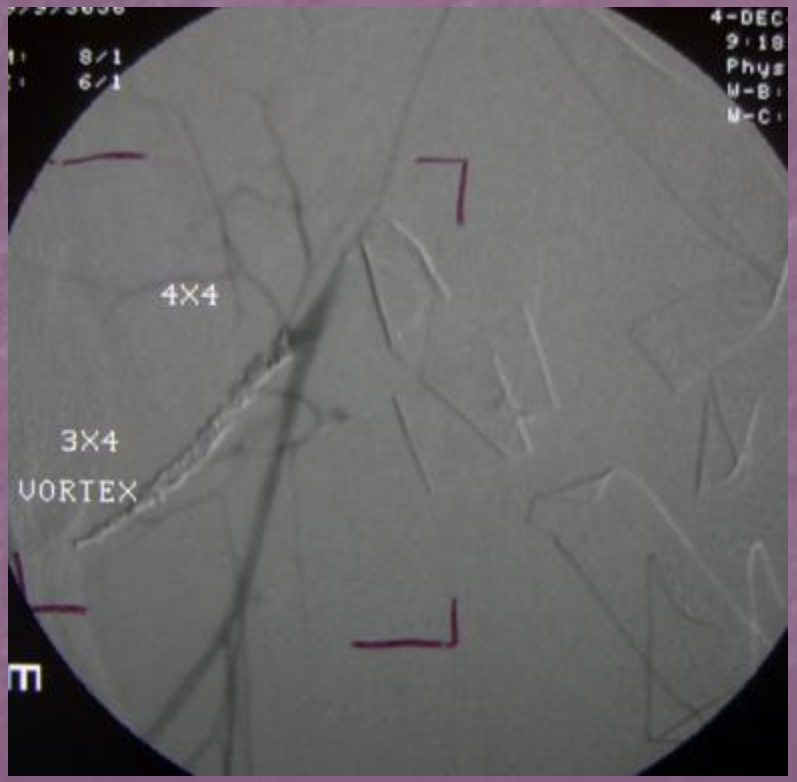
Uterine artery embolization



Varicocele embolization

Pelvic embolization post trauma





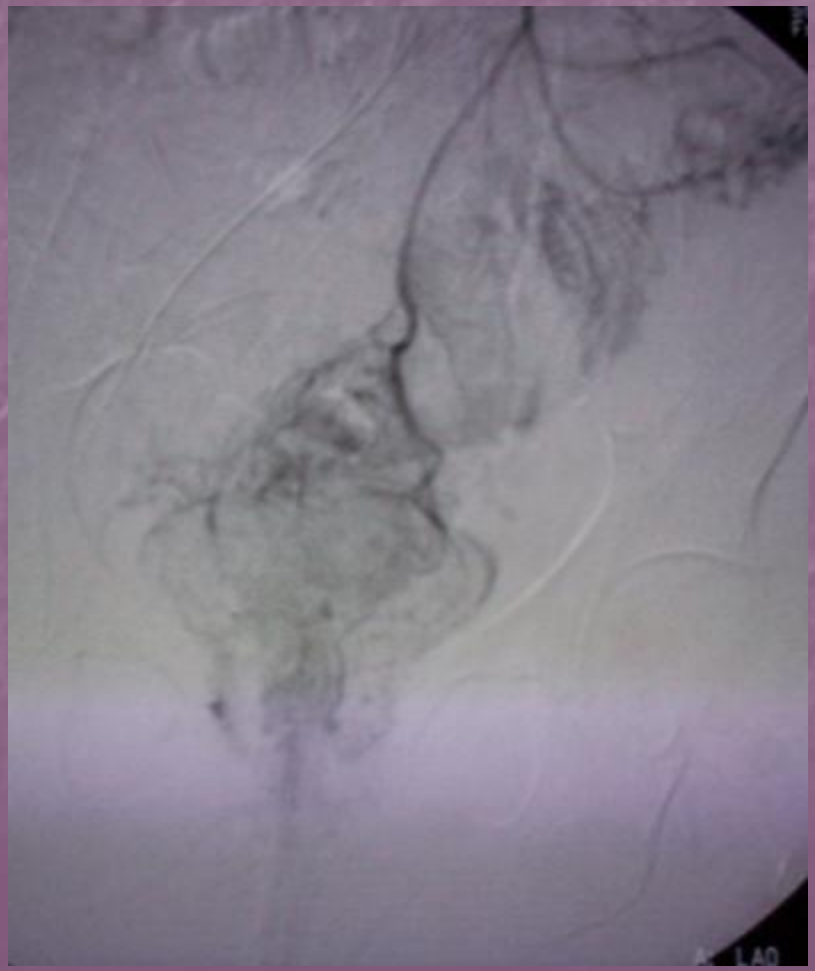
LGI bleed embolized with coils

Splenic embolization

7. Vasopressin infusion

- Fluoro
- Alternative to embolization for bleeding in the GI tract
- Acts by constricting the vessels giving the bleeding vessel time to heal
- Selective infused through catheter in affected vessel
- Not if CAD
- Starting max dose of 0.4 U/min
- Infusion never stopped abruptly; always tapered

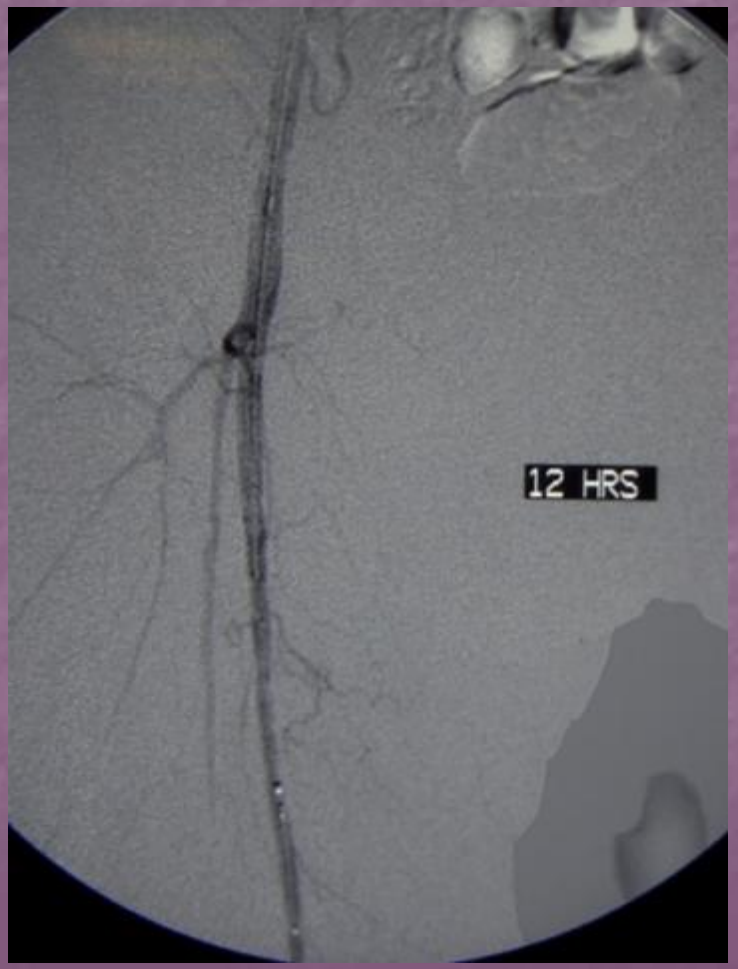
Before and after vasopressin infusion



8. Thrombolysis

- Fluoro
- TPA or UK used to break up a clot in arteries or veins
- Clots often occur if underlying coagulopathy, defect in the vessel
- Emboli located often at bifurcations
- Infuse through infusion catheter in affected vessel for several hours with f/u angio until resolved or result is static

Embolus treated with TPA for 12 hrs

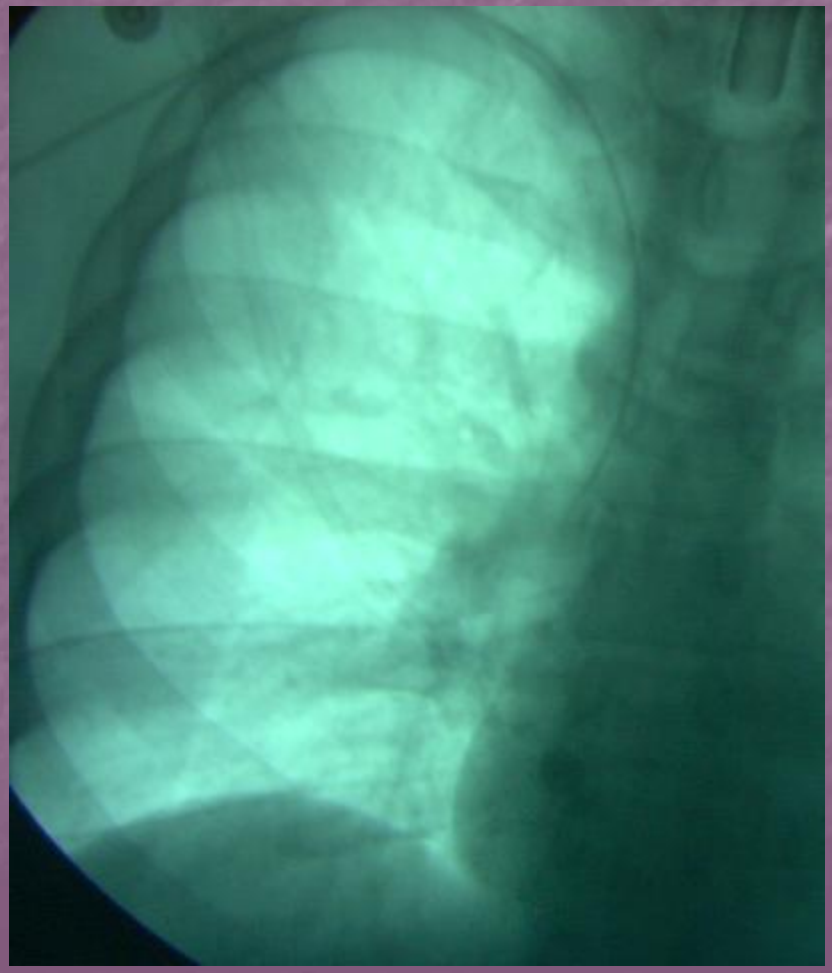


9. Venography

- Fluoro
- Contrast injected directly into vein to r/o reflux, occlusions
- Ascending venography in upper extremity
- Descending and ascending venography in lower extremity
- Usually precursor to interventions

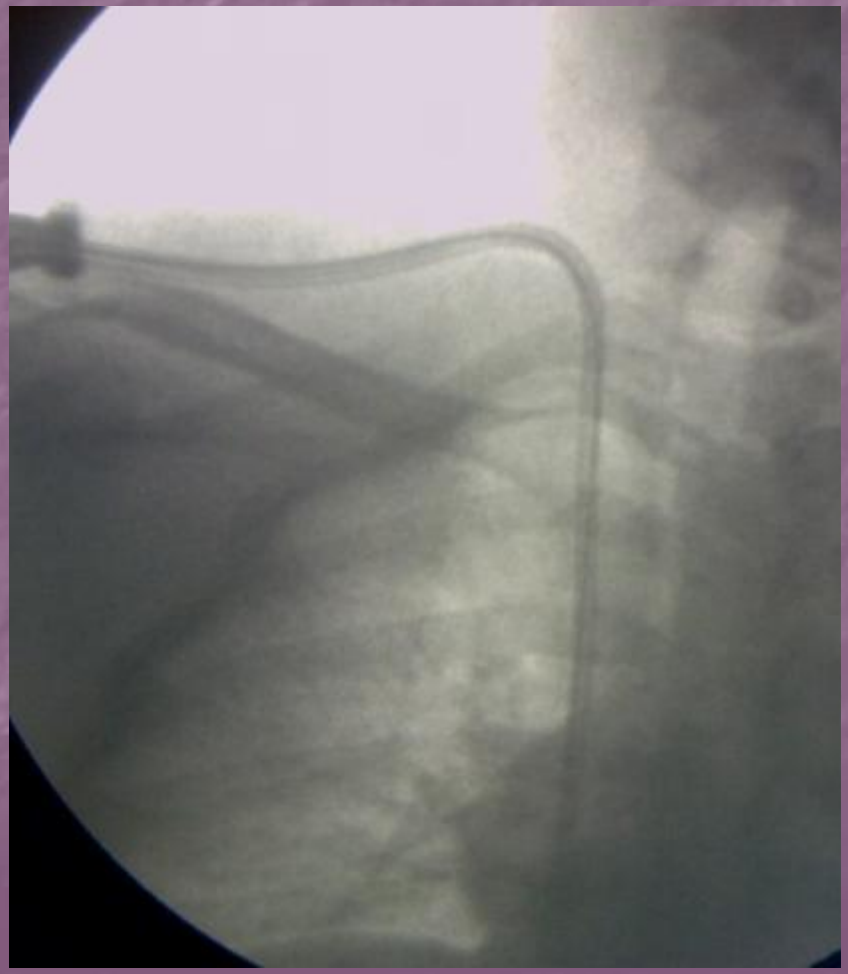
Lower extremity venogram

10. Central venous catheters

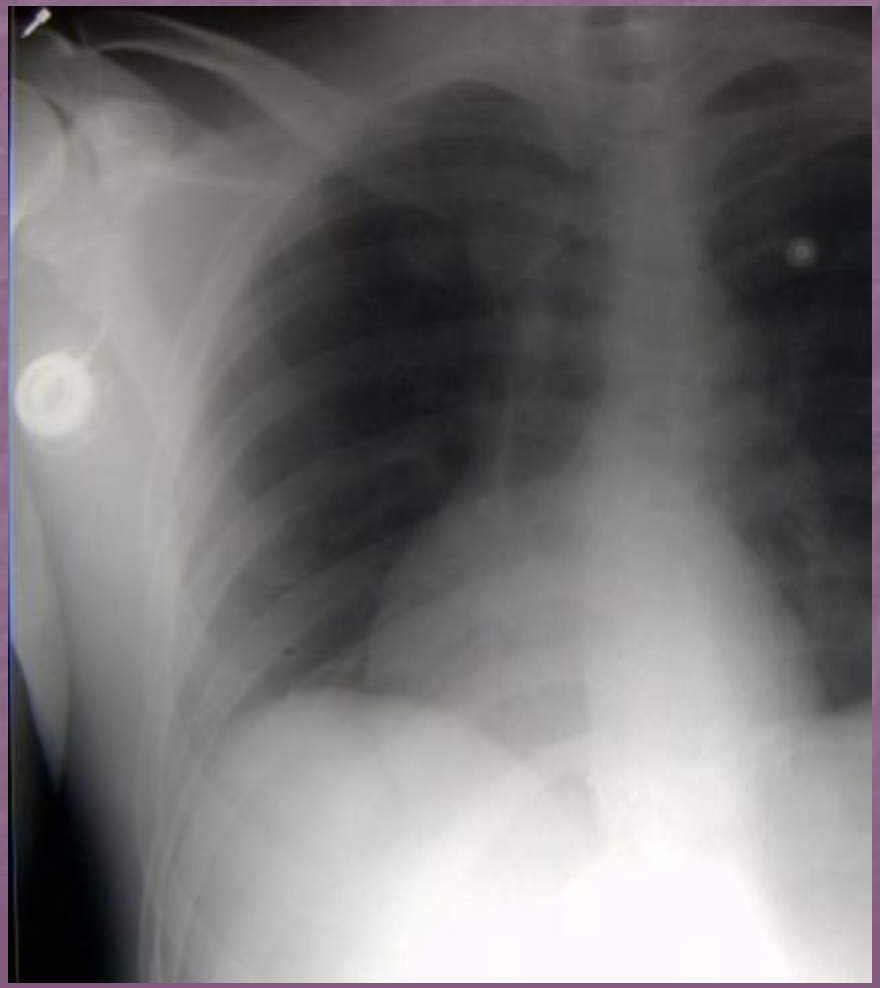


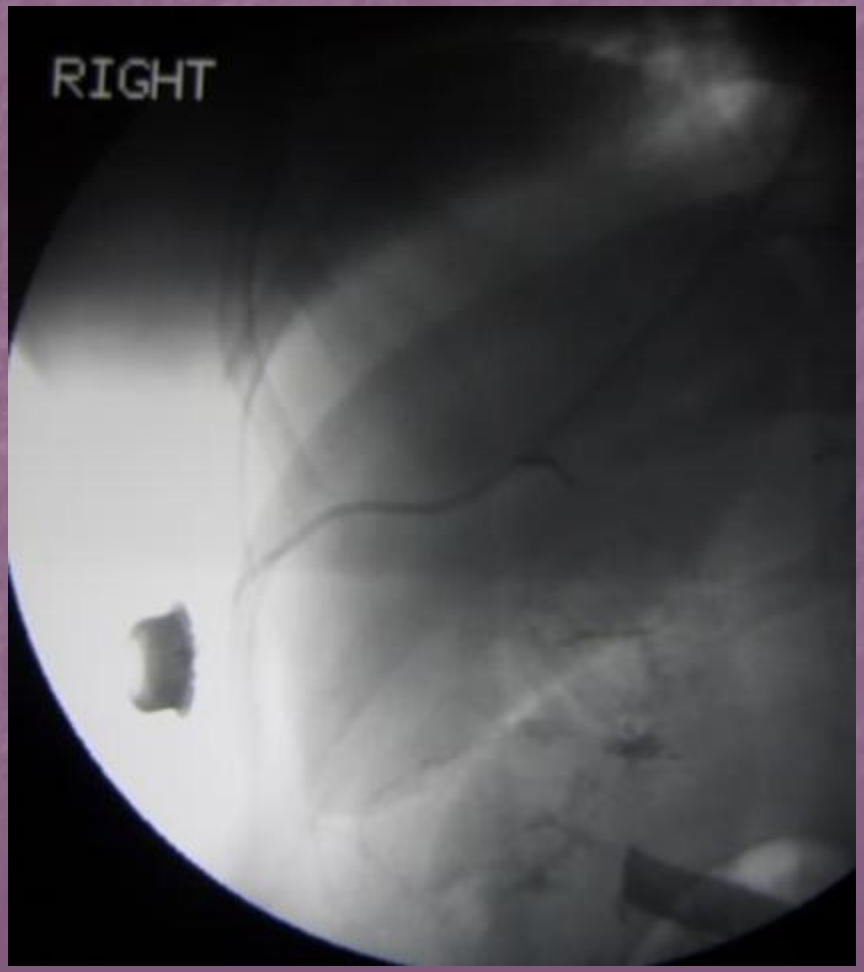
- Fluoro, US
- Tunneled and nontunneled catheters as well as ports can be placed
- IJV and CFV are most frequent sites but can also place in SCV, HV, collaterals, IVC

Hickman (L), tunneled dialysis catheter (R)



Portacath in SCV (L) and HV (R)





11. Dialysis accesses

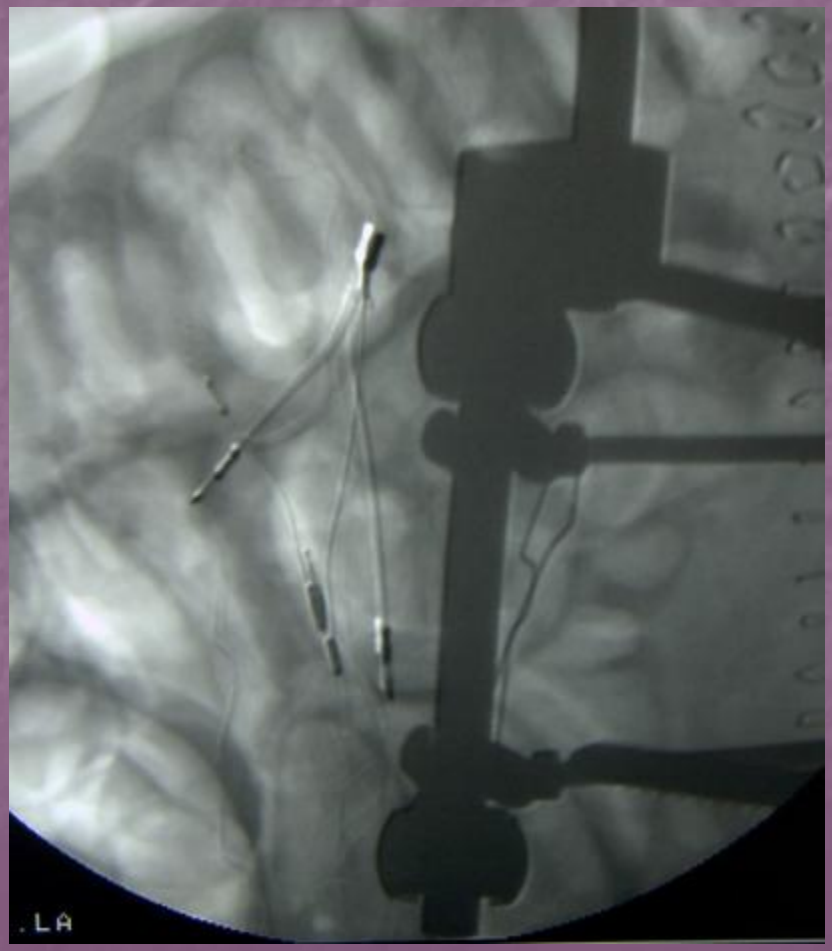
- Fistulae or grafts
- Most often in the arms, sometimes legs
- Intended to last years
- Need frequent surveillance at dialysis; if abnormal, inject under fluoro
- Better to intervene ie PTA before access clots

Dialysis grafts – upper extremity (L), lower extremity ®

12. IVC filter

- Prevents clots in the lower extremity veins from developing into a pulmonary embolism
- Infrarenal IVC
- CFV vs IJV access
- Fluoroscopic and sonographic guidance
- Retrievable and permanent varieties

Bird's nest filter (L), Trapease (R)

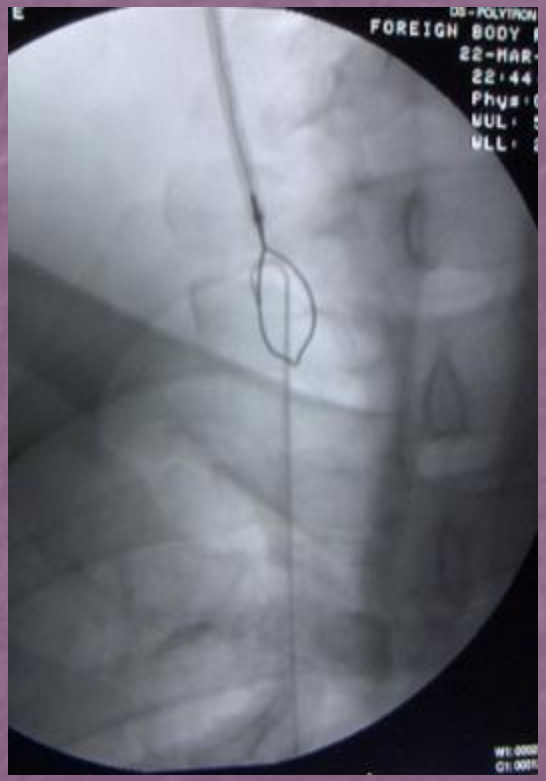


Simon Nitinol filter (L), Vena Tech (R)

Tulip (L), Recovery (R)

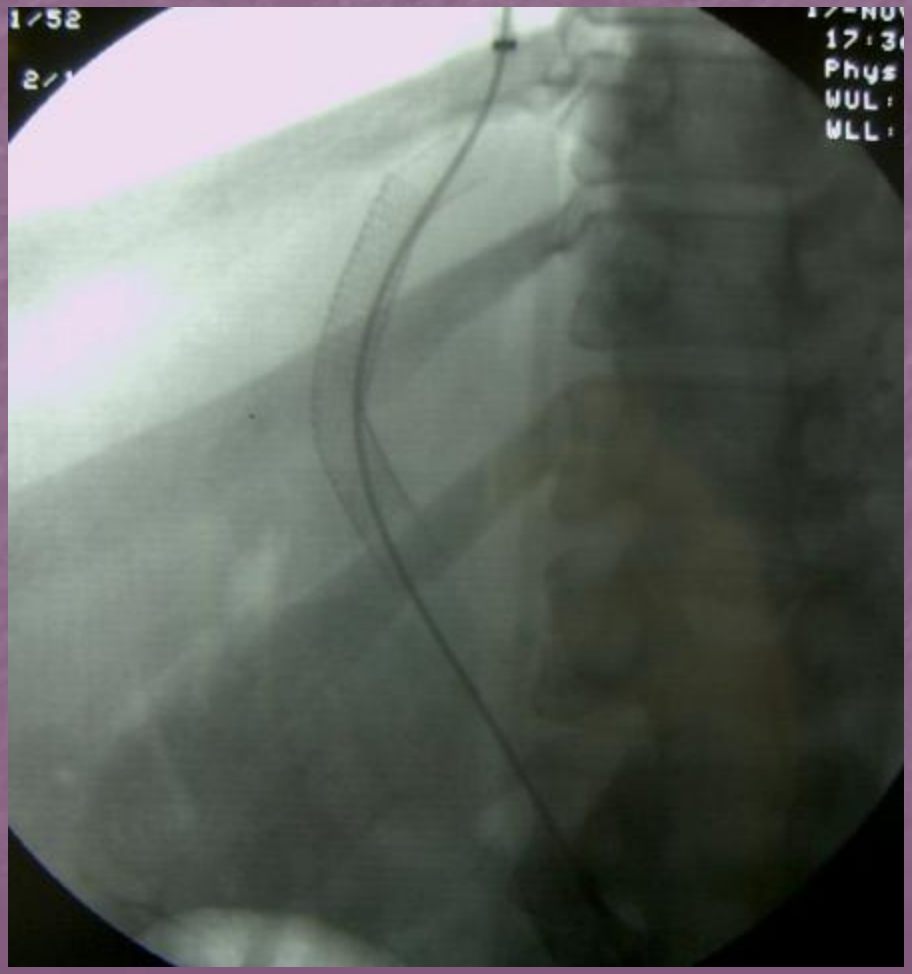
13. Foreign body retrieval

- Most frequently guidewires or catheters
- Usually in the right heart or pulmonary artery
- Retrieval under fluoroscopic guidance using snares needed given infection, arrhythmia risk



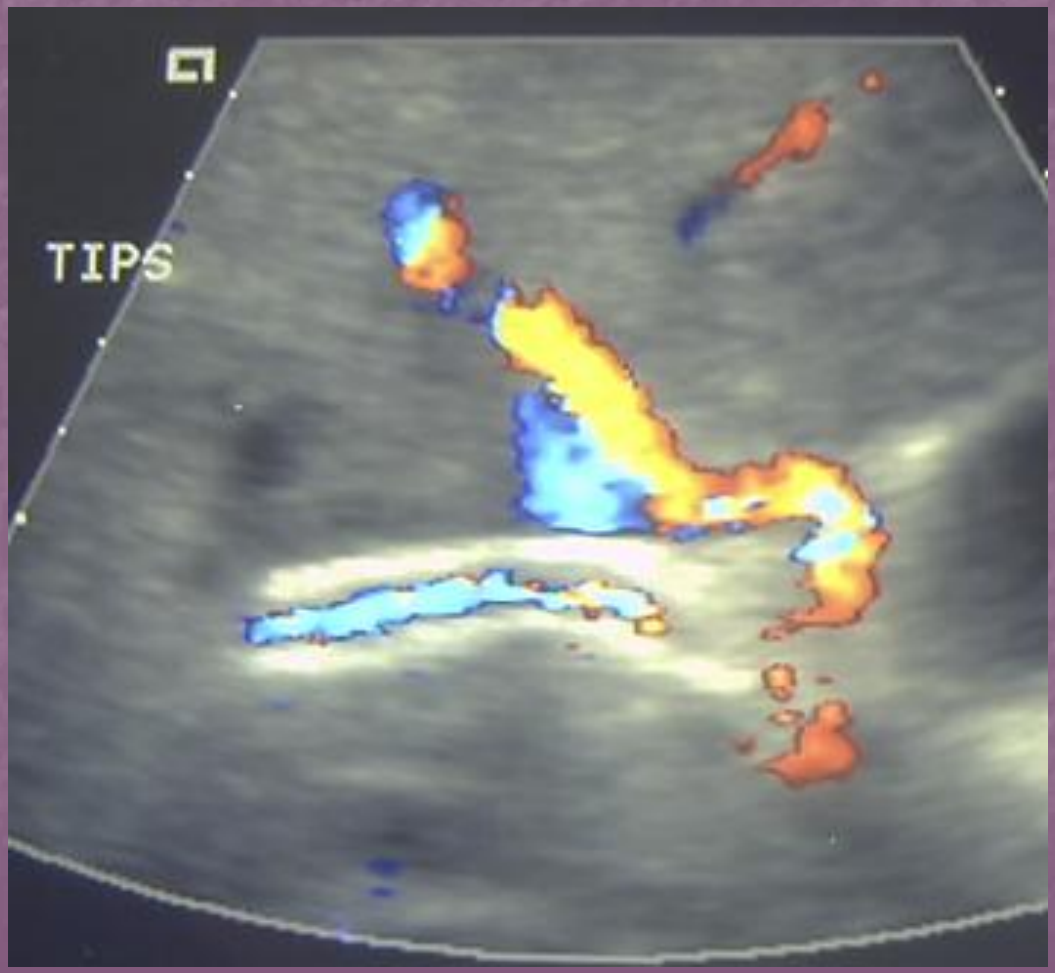
Wire looped around tricuspid valve needing open heart surgery for retrieval

14. TIPS



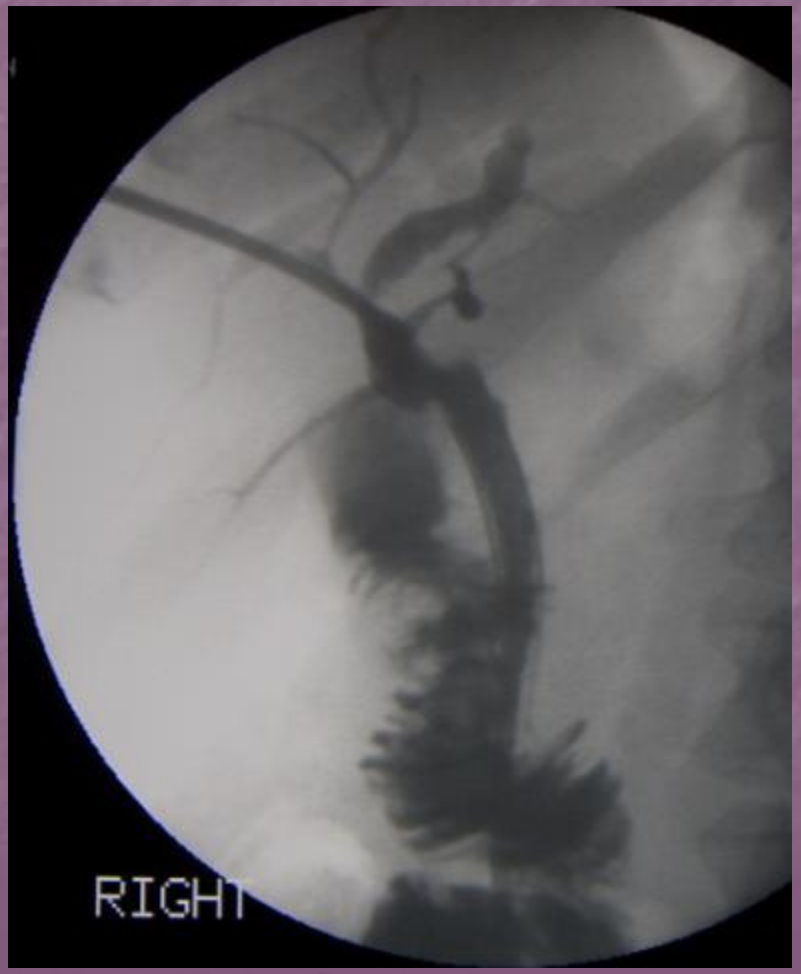
- Fluoro, US
- Transjugular (IJV) intrahepatic portosystemic shunt connecting the RHV to the RPV via Wallstents most often to relieve portal HTN and its sequelae ie intractable variceal bleeding, ascites
- Gradient 3-12
- F/u surveillance with US

TIPS US (L)



TIPS with varices and clot at PV end of stent

15. Cholangiography and biliary drainage

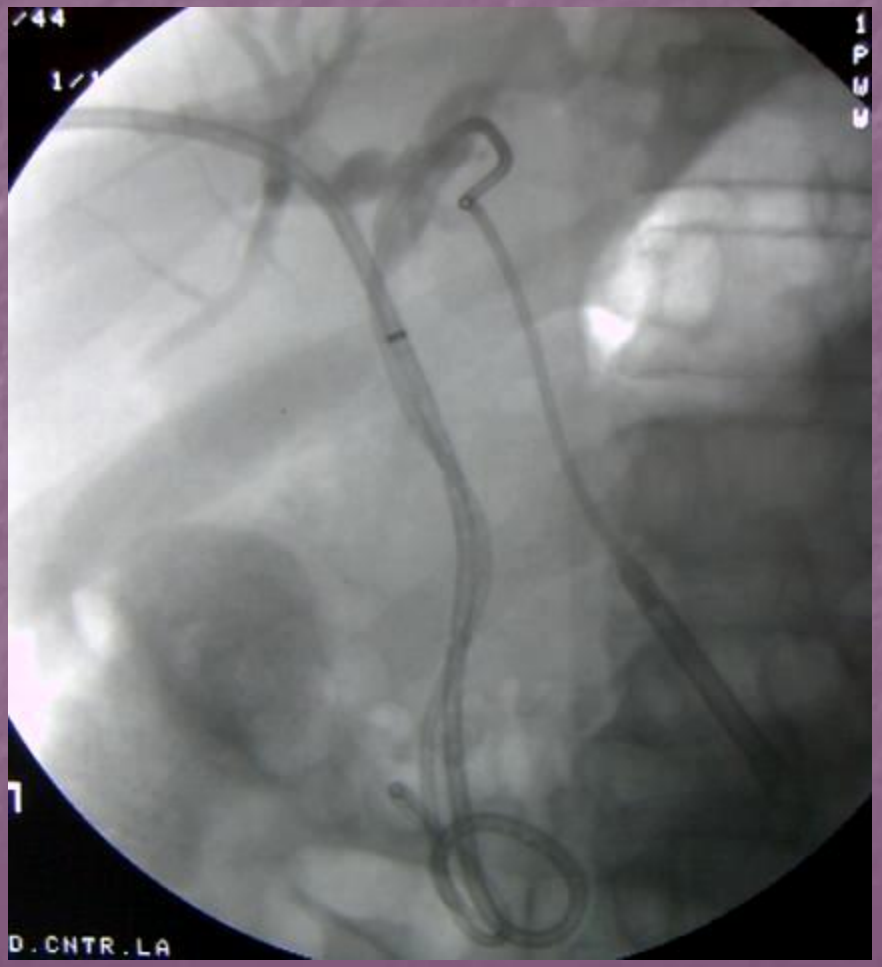


- Fluoro, US
- Cholangiogram – inject transhepatically into biliary tree and intervene with plastic or metal stents, stone removal, plasty, etc.
- Drains/stents can be internal, internal-external or external
- Interventions tend to be painful so need good anesthesia
- Often useful when GI cannot delineate lesion retrograde

Internal and external biliary stents (L), T tube cholangiogram (R)

Cholangiogram (L), internal external drainage from the L (R)

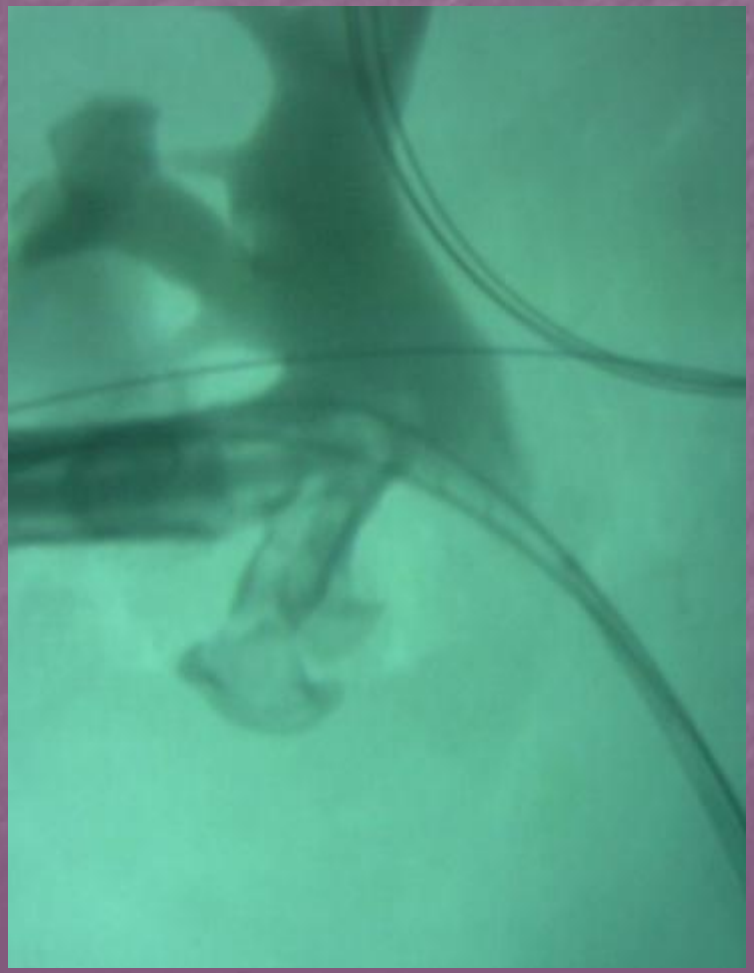
Angioplasty of biliary stricture (L), kissing biliary stents ®

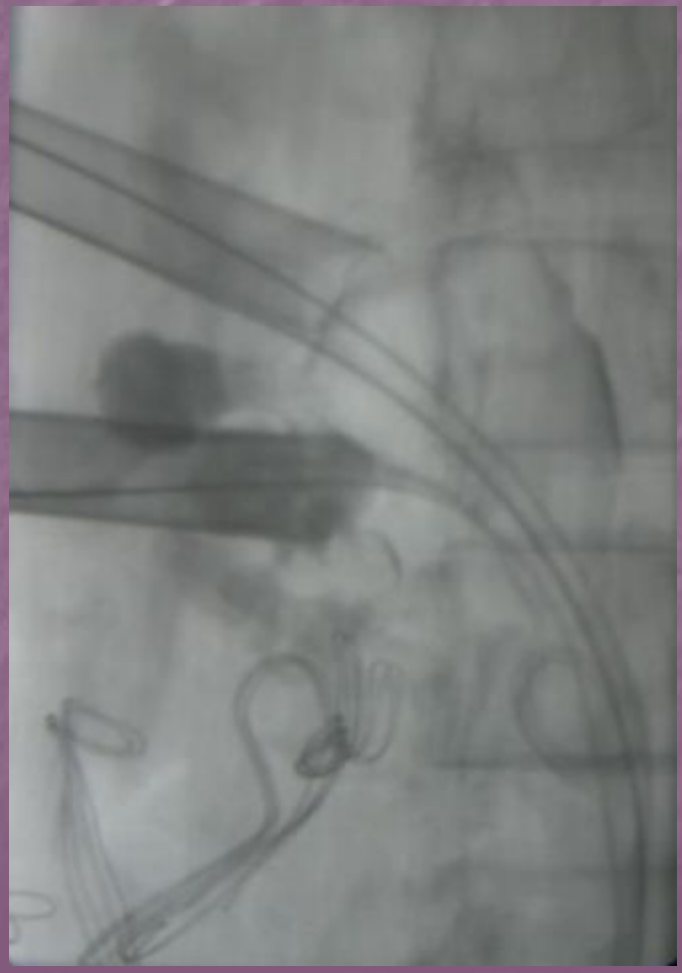


16. Nephrostogram and nephrostomy tube and ureteral stent placement

- US and fluoro guidance
- Used to check patency of collecting system and relieve obstructions putting the patient at risk for kidney failure, sepsis
- Tubes need constant monitoring after placement

PCNL (L), PCNL x 2 (R)





Nephroureteral stent (L), double J stent (R)

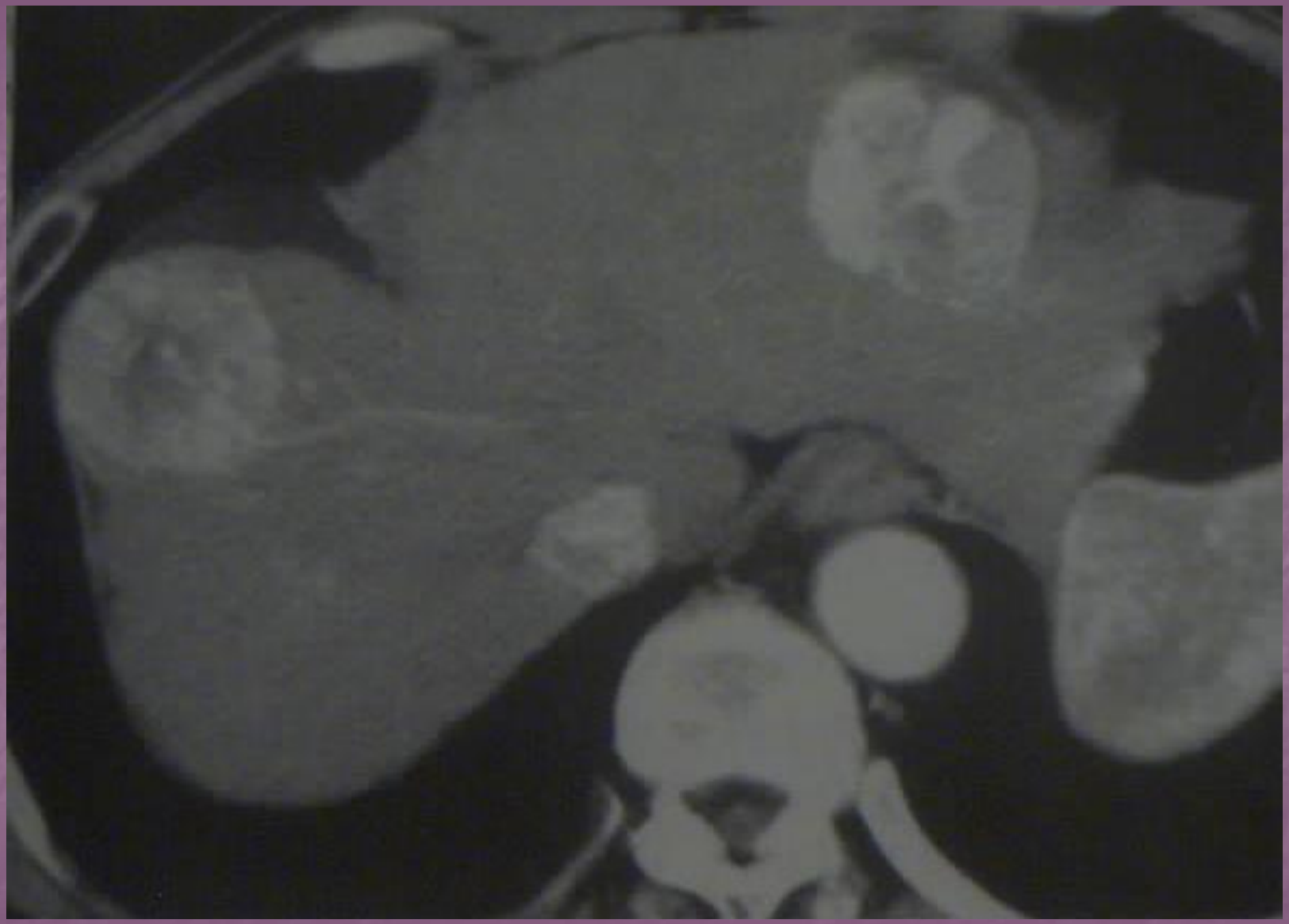
17. Gastrostomy tubes

- Fluoro guidance facilitating direct percutaneous placement of G tube into the stomach
- Indicated for pts with difficulty swallowing often due to neurological or ENT causes
- G tubes can also be placed by surgery but IR is less invasive
- GI can also place G tubes except when the esophagus is blocked by a mass

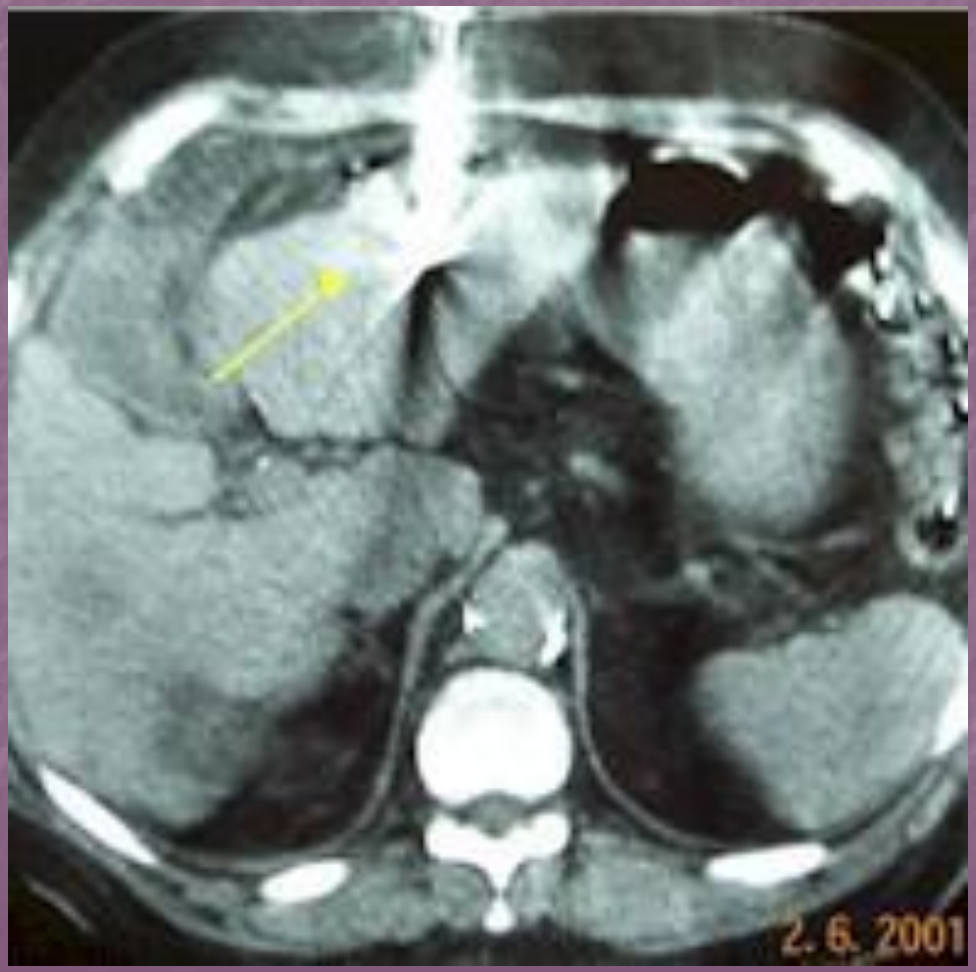
Gastrojejunostomy tube

18. Chemoembolization

- Fluoro guidance
- Agents injected selectively into the hepatic artery for palliative tx of carcinoid mets, hepatoma (most frequently)
- Patent portal vein, selective injection past gastric artery, cystic artery, GDA impt



19. Radiofrequency ablation



- CT, US
- Thermal ablation using electrodes advanced into lesion
- Most used in the liver; has been used in lung, kidney, bone
- Probe heats the tissue via rapid alternating current for a set amount of time as per tissue
- Needs imaging f/u to check tumor response
- Image from website ***http://sdihms.com/images/sdi-ablation-img3.jpg***

20. Vertebroplasty

- Fluoro guidance
- PMMA injected into vertebral body affected by osteopenia, metastases most frequently for pain relief
- Usually done in the lumbar spine through the pedicles