Common Procedures in IR

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Disclosures

• None
Objectives

• Review common IR procedures
  • Dialysis line
  • Fistulograms
  • PICC line
  • Abscess Drain Placement
  • Percutaneous gastrostomy tube placement
  • Nephrostomy tube placement
  • Cholecystostomy tube placement
  • IVC filters
Who is Interventional Radiology and what do they do?

- Subspecialty of Radiology
  - Traditional pathway do 4 year radiology residency and a 1 year fellowship in IR
  - New pathway is can match directly into an IR program, where complete 3 years diagnostic radiology and 2 years in IR
- Constantly evolving field. Work across all specialties
- Vascular access: dialysis lines, port, picc, fistulograms
- CT and US guided procedures: biopsies, abscess drain placement
- Angiography: diagnostic, trauma, GI bleeding, renal artery stenting
- Biliary: cholecystostomy tubes, transhepatic biliary drains, TIPS
- Urological: nephrostomy tubes, ureteral stents
- Oncologic procedures: ablation procedures, Y-90 radioembolization
Dialysis lines

• Indication: access for dialysis
  • Short term need: non-tunneled
  • Long term need: tunneled

• Contraindications
  • Bacteremia or sepsis
  • Allergy to catheter material
  • Uncorrectable coagulopathy
    • INR less than 2, will have a higher threshold for non-tunneled lines vs tunneled
    • Platelets >50K
  • Central venous occlusion
    • IJ, EJ, subclavian, femoral (increased infection risk), translumbar, transhepatic
    • Side Note: Think twice before pulling a line in patient with difficult access
Anticoagulation

• Follow SIR consensus guidelines
  • Low risk procedures- central line placement, venous procedures, paracentesis, thoracentesis, exchange of catheters, etc
    • Routine checking of PT INR or platelets not necessary but recommend INR less than 2-3 and transfuse platelets <20k
    • Anti-platelets do not need to be held
  • High risk procedures- angiography, solid organ biopsies, deep drain placements, nephrostomy tubes, cholecystostomy tubes, gastrostomy tube placement
    • Check PT/INR and platelets INR less than 1.5-1.8, platelets greater than 50k
    • ASP 3-5 days, Plavix 5 days, Brillinta 5 days, Bivalirudin 2-4 hr, heparin SQ 6 hrs IV 4-6hr, Lovenox prophylactic 12hr therapeutic 24hr, Apixaban 4 doses CrCl >50 or 6-8 CrCl<50
Dialysis lines

• Procedure
  • Done under local anesthesia, rarely use moderate sedation
  • Keep patients NPO for 6 hours
  • Periprocedural antibiotics controversial, not given here
  • Use sterile technique in IR suite with chlorhexidine and drapes
  • Use ultrasound to visualize IJ
Dialysis lines

• Procedure
  • Prefer to use right IJ, more of a straight shot to the heart, work better
  • Advance wire down to measure length needed
  • Measure length of catheter needed
  • If tunneled will make the tunnel from anterior chest
    • This can be most uncomfortable part procedure for the patient
    • If patient has significant breast tissue will see tunnel shorter or go more lateral
    • Position tip in right atrium
Dialysis lines
Dialysis lines
Dialysis Line
Dialysis lines

• Complications
  • Infection: 10.8 per 1000 CVC-days\(^1\)
    • Usually requires pulling the line, but think twice if a difficult access patient
  • Malposition- poor flow rates during dialysis can be too short or too long of a catheter, possible side wall of catheter-change flow directions
  • Cuff exposed-requires exchange
  • Fibrin sheath around catheter- will not aspirate requires balloon disruption and exchange
Fistulograms/Shuntogram

• Number of patients in the US with end stage renal disease: 746,557 in 2017\textsuperscript{2}
• Total Medicare spending on both chronic kidney disease and ESRD patients was in excess of $120 billion in 2017\textsuperscript{2}
• KDOQI- Kidney Disease Outcome Quality Initiative
  • Update in 2019
  • Still recommend AV access (AVF > AVG) over central line for long term dialysis use given better outcomes and lower infection risk, given have poor quality of data to base recommendation off of.
Fistulograms/Shuntograms

- Need regular assessment of AVF to detect hemodynamically significant stenosis, as this has been proven treating stenosis in fistulae reduces incidence of access thrombosis and improves patency\(^3\)
  - Physical exam: arm swelling, collateral veins, prolonged bleeding, pulsatile fistula- perform on monthly basis
  - Can preform ultrasound to further evaluation, but not a requirement.
  - More likely to be successful if treat a stenosis vs having to perform a declot
Fistulograms/Shuntograms

- **Indications**
  - Failure of the AVF to mature- possible stenosis, need ligation competing veins
  - Failing AVF- such as in stenosis
  - Clotted AVF

- **Contraindications**
  - Uncorrectable coagulopathy
  - Fistula infection- more common in grafts
  - Right to left cardiopulmonary shunt in declotting procedures, paradoxical emboli
  - Contrast reaction- can use CO2
  - Severe cardiopulmonary disease-in declot break up clot of pulmonary emboli
Fistulograms/Shuntograms

• Procedure for stenosis
  • Access fistula in direction of draining veins (most common) or toward anastomosis if think problem at anastomosis
  • Inject contrast and find stenosis
  • IV moderate sedation
  • Balloon angioplasty stenosis
  • Reflux contrast to see anastomosis
  • Pull access sheath and hold pressure
  • Use fistula right away
Fistulograms/Shuntograms
Fistulograms/Shuntogram
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Fistulograms/Shuntograms

• Procedure for declot
  • Access in direction of draining vein
  • Advance wire and catheter central past clot, make sure central veins are widely open, if narrowing treat stenosis that caused clot
  • IV heparinize patient and moderate sedation
  • Use mechanical disruption of clot, use teratola device
  • Need to pull clot from AV anastomosis as don’t want clot going into hand
  • Two access sites removed
Fistulogram/Shuntogram Declot
Fistulogram/Shuntogram Declot
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Fistulogram/Shuntogram Declot
Fistulogram/Shuntogram Declot
PICC

• Indications: secure IV access in patients with difficult access, home going antibiotics/short term TPN
  • If patient has long term TPN consider placing tunneled low flow catheter ie Hickman

• Contraindications: very low risk procedure if patient coagulopathic consider reversing, upper extremity SVT or DVT
  • If patient has CKD or possible patient will need dialysis in the future, consider placing a tunneled PICC line
PICC

• Procedure
  • Quick procedure, takes about 5 minutes
  • Sterile with draping, use tourniquet on the arm
  • Use ultrasound to identify veins
    • #1 choice is basilic vein, cephalic usually too small
    • Brachial vein need to watch nerve
  • Run wire up vein and measure appropriate length
  • Place a peel-away sheath and place catheter over the wire
  • Patients can develop thrombus from, so watch for upper extremity swelling
PICC

basilic brachial vein and brachial nerve ultrasound – Bing images
Abscess Drain Placement

• Can use ultrasound or CT guidance, we mainly use CT guidance

• Indications:
  • fluid for cultures
  • treatment of sepsis
  • relief of symptoms

• Contraindications:
  • Lack of safe pathway to collection
  • Coagulopathy
  • Tumor abscess-drain may be life long
Abscess drain placement

- Abdominal drain placement
  - Avoiding crossing the pleura
    - Work out of plane and come below
  - Bowel
    - Hydro dissection
    - Patient positioning
    - Pressure
  - Vasculature
    - Ultrasound have doppler
    - CT done with non-contrast
Abscess drain placement

• Pelvic
  • Bowel
    • Positioning
    • Hydro dissection
  • Lumbosacral plexus
    • Transgluteal need to be close to mid-line and below
• Transrectal or transvaginal drains
Abscess drain placement

- Percutaneous drain placement in necrotizing pancreatitis
  - Usually a bad idea
  - Need necrosectomy by GI-axios stent placement drain internally
  - Need time to mature and make a wall

- Percutaneous drain placement in liver abscesses
  - Simple abscesses drains work well
  - Complex multiloculated-drains less effective
Abscess drain placement

• Drain Management
  • Usually leave to bulb suction
  • Thicker material may require larger diameter drain
    • Usually place 10-12, can upsize as track matures
  • Flush drain with saline in and out to keep drain clear
    • Make sure appropriate amount flushed
  • If collapsed cavity around drain and persistent fistula, stop flushing drain to allow fistula to close

• Timing of drain checks
  • Different theories, some check every 7-10 days, others just check if drain output rapidly changes, or leaking around drain
    • As output decreases sign drain can be removed, like less than 10 cc a day
Abscess drain placement
Abscess Drain Placement
Sinogram
Percutaneous gastrostomy tube placement

• IR places percutaneous gastrostomy tubes
• GI places PEG- Percutaneous endoscopic gastrostomy
• Prior studies have not shown one method superior to the other
  • Retrospective study at tertiary referral center of 297 patients no statistically significant difference in complications within the first 30 days (PEG 6.8% vs PRG 8%). Type of complications observed varied between the two groups, such as superficial wound infections and buried bumpers were more common in the PEG group, bleeding was more common in the PRG group⁴.
Percutaneous gastrostomy tube placement

• **Indications:**
  - Nutritional support for patients with inadequate oral intake due to dysphagia, risk of aspiration, or obstruction
  - Diversion of feedings from esophageal leaks caused by recent surgery or trauma
  - Decompression of gastroenteric contents

• **Contraindications:**
  - Unsatisfactory anatomy- nothing between stomach and anterior abdominal wall
  - Uncorrectable coagulopathy
  - Massive ascites- due a paracentesis and gastropexy
  - Gastric or abdominal wall varices due to portal hypertension
  - Inflammatory, neoplastic, or infectious involvement of the gastric wall
Percutaneous gastrostomy tube placement

• Procedure
  • Moderate sedation is given
  • Ultrasound liver edge
  • Need to be able to place an NG tube to inflate the stomach
  • Give glucagon to slow down intestine peristalsis
  • Inflate stomach with air
  • Place T-fasteners to keep stomach against abdominal wall
  • Access stomach, dilate up to 22F peel away sheath and place 18F tube
  • Retention balloon
  • Usually just cut T-fasteners at end of case
Percutaneous gastrostomy tube placement
Nephrostomy tube placement

• Indications:
  • Obstructive uropathy
  • Urinary diversion in setting of urine leak or vesicovaginal or vesicocolic fistula
  • Access for percutaneous intervention-percutaneous nephrolithotomy

• Contraindications:
  • Uncorrectable coagulopathy
Nephrostomy tube placement

• Procedure
  • Patient placed prone
    • Can work some with patient positioning
  • Moderate sedation
  • Ultrasound and fluoroscopic guidance
  • Access into a calyx
    • Go through Brodel avascular line
  • Pull-back tracktogram make sure not through any bowel
  • Dilate track and place 10F pigtail drain
  • Patient at high risk of developing sepsis
Nephrostomy tube placement
Nephrotomy tube placement

stent-diagram.jpg (600×800) (kidneystoner.org)
Cholecystostomy tube placement

• Indications:
  • Decompress gallbladder in setting of infection when patient not a good surgical candidate

• Contraindications
  • Uncorrectable coagulopathy
Cholecystostomy tube placement

- Procedure
  - Moderate sedation
  - Can use US or CT
  - Depending on anatomy can go transhepatic vs transperitoneal
    - Studies have not proven a benefit one over the other
  - Access, put in a wire, dilate track, place 10F pigtail drain
  - Patient at high risk of developing sepsis
  - Risk of developing bile peritonitis
    - Self limited
  - Tube need to stay in place for 6 WEEKS or surgery
Cholecystostomy tube placement
Cholecystostomy tube placement
IVC Filter Placement

• Intravascular devices designed to prevent PE by trapping venous emboli.
• Do not prevent formation of new thrombi, or existing PE
• Three types
  • Permanent filters: can not be repositioned or retrieved. The oldest class with the most experience
  • Optional filters: permanent filters designed to provide option for percutaneous removal, but can be permanent. Most common used
  • Temporary filters: uncommonly used, no fixation to wall of vena cava
IVC filter placement

- Indications: Can be controversial, and evolving
  - Accepted indications: documented venous thromboembolism (VTE) with one or more of the following
    - Contraindication to anticoagulation ie such as GI bleeding (not fecal occult blood), recent intracranial hemorrhage or surgery, vascular brain mets
    - Documented progression or recurrent of VTE while on “adequate” anticoagulation. Ie 7 days of continuous anticoagulation at therapeutic levels.
    - Complication of anticoagulation, ie massive retroperitoneal hemorrhage, that requires interruption of anticoagulation
    - Inability to achieve or maintain therapeutic anticoagulation
IVC filter placement

• Indications:
  • Relative:
    • Documented VTE with one or more of the following
      • Limited cardiopulmonary reserve
      • Massive life-threatening PE that requires thrombolysis or surgical thrombectomy
      • Chronic PE treated with thrombendarterectomy
      • Poor patient compliance, risk of falling
      • Large residual burden of thrombus (iliocaval DVT) in IVC
      • Thrombolysis for iliacaval DVT
    • Prophylactic- no documented current VTE and:
      • Severe trauma patient with high risk of VTE
      • Closed head injury, spinal cord injury, multiple long bone or pelvic fractures
      • High-risk patients with prolonged immobilization
IVC filter placement

- Prophylactic use of IVC filters in trauma patients
  - NEJM article July 2019 Kowk et al
  - Multicenter Trial of Vena Cava Filters in Severely Injured Patients
  - RCT of 240 severely injured patients who had contraindication to anticoagulant agents were randomized to IVC filter placement within first 72 hours of admission or no filter.
  - “Early placement of a vena cava filter did not result in a significantly lower incidence of symptomatic pulmonary embolism or death than no placement of a filter (13.9% in the vena cava filter group and 14.4% in the control group; hazard ratio, 0.99; 95% confidence interval [CI], 0.51 to 1.94; P=0.98)”.6
IVC filter placement

- Contraindications:
  - Total thrombosis of the vena cava
  - Inability to image during filter placement
  - Vena cava too small or too big - most filters go up to 3.2 cm IVC diameter

Can Place filter in setting of sepsis or if further DVT is not seen in lower extremities in setting of PE.
IVC filter placement

• Patients still have a 5% risk of recurrent PE after filter placement
• 1-5% risk of symptomatic caval thrombosis
• 1% risk of filter embolization, fracture, or malposition
  • Improved filter design, laser cut from single piece of metal
• <1% risk of symptomatic perforation by a filter element
• 2% of pericardial tamponade for SVC filter placement
IVC filter placement

• Procedure
  • Can place from right IJ or from femoral approach
    • Patient in C-collar with spine protection will go femoral
  • Do cavogram to confirm IVC patient, size
• Anatomic variants
  • Duplicated IVC <1%- place filter both infrarenal IVCs or place supra-renal
  • Circumaortic left renal vein 3-4% patients-pathway of thrombus bypassing filter, thus place filter above
  • Mega-cava- measuring >28 mm, have VenaTech filter up to 35 mm or Bird’s nest filter up to 40 mm.
IVC filter placement

• Supra-renal vs infrarenal placement?
  • No compelling data either way. Theory of place infrarenal as prevent thrombus to propagate into renal vein and possible renin from kidney’s help dissolve clot, but nothing really proven
  • Accepted practice to place infrarenal, but can place suprarenal
    • Pregnancy place suprarenal to decrease radiation to fetus
    • Severe compression of IVC from thrombus, may need to place suprarenal
    • Anatomic considerations such as circumarctic left renal vein, duplicated IVC
IVC filter placement
Summary

• IR is a diverse subspecialty of radiology that works across all specialties
• Reviewed common IR procedures
  • Dialysis line
  • Fistulograms
  • PICC line
  • Abscess Drain Placement
  • Percutaneous gastrostomy tube placement
  • Nephrostomy tube placement
  • Cholecystostomy tube placement
  • IVC filters
References


Questions?