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Interventional Radiology Global Curriculum

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1.1 US-Guided FNA (for thyroid or superficial LN)

Indications

- Obtain tissue for microbiological or pathological diagnosis

Relative Contraindications

- Coagulopathy (see introduction)

Absolute Contraindications

- No safe access to lesion

Risks

- Bleeding
- Infection
- Nerve damage
- Non-diagnostic sample

Considerations

- Consider media for sample transport (this may require discussion with lab):
- E.g., formalin if pathology sample, saline if microbiology for culture, MTM fixative for solid organ biopsies or cytorich red for FNA.

Aftercare

- Observe for a short period of time prior to discharge

References

- https://link.springer.com/article/10.1007%2Fs00270-017-1658-5

Equipment

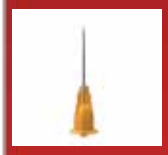

Ultrasound with usually linear probe


Skin prep


Sterile probe cover


Core Biopsy Kit


Local anesthesia


25g needle


Sample/specimen pot


Sterile skin dressing

1.2 US-Guided Core Biopsy (for solid organs)

Indications

- Obtain tissue for microbiological diagnosis to guide treatment (biopsy may be diffuse or targeted - e.g. focal lesion within liver)

Relative Contraindications

- Coagulopathy (see introduction)

Absolute Contraindications

- No safe access to lesion

Risks

- Bleeding
- Infection
- Nerve damage
- Damage to adjacent structures
- Non-diagnostic sample
- Organ specific risks (e.g. liver biopsy comes with risk of bile leak)

Considerations

- Liver biopsy in the presence of bile duct dilatation is more likely to result in bile leak and careful consideration should be given to performing biopsy in this case.
- Abdominal ascites may also increase the risk of bleeding complication and if liver biopsy is necessary this could be drained first to allow safe access.
- A continued bleed and instability may require angiography with possible embolization.
- Consider media for transport (formalin if pathology, saline if microbiology for culture)

Aftercare

- Patients rest in bed for 2 hours post procedure to reduce the risk of bleeding. Respiratory rate, blood pressure and heart rate shold be monitored to allow any bleeding to be detected.

References

- https://link.springer.com/article/10.1007%2Fs00270-017-1658-5

Equipment


Ultrasound with usually linear probe


Skin prep


Sterile probe cover


Core Biopsy Kit


Local anesthesia


Sample/specimen pot


Sterile skin dressing

1.3 Image-guided Lumbar Puncture

Indications

- CSF Analysis
- Assessment of CSF pressure
- Access for intrathecal chemotherapy infusion
- Injection of contrast material for CY myelography
- Failed bedside attempt and/or
- Unlikely bedside success (patient position, scarring, deformity)

Relative Contraindications

- Medical instability
- Infection
- Pregnancy
- Contrast allergy (for myelography)
- Elevated

Absolute Contraindications

- Uncorrected coagulopathy or anticoagulation
- Elevated intracranial pressure
- Clinical findings suggestive of CSF flow obstruction
- Low-lying conus, tethered cord and myelomeningocele.

Risks

- Cerebral herniation
- Cord compression secondary to hemorrhage into epidural or subarachnoid space
- Nerve injury
- Infection and meningitis
- Headache
- Epidermoid tumor of thecal sac

Considerations

- Review of pre-procedure imaging if available to assess level of conus
- Always advance or withdraw needle with stylet in place
- If post-procedural hemorrhage is suspected due to abnormal clinical findings, assessment for hematoma with MRI or myelography can be performed.
- Fluoroscopy (dose, field size and screening time) should be kept to a minimum in all patients, especially children and pregnant women.

Modifications

- Three standard approaches can be considered: Prone midline, prone oblique and lateral

Aftercare

- Bed rest for 1 hour (flat)
- No strenuous activity for 24 hours
- Hydration to prevent headache

References

- https://www.ajronline.org/doi/full/10.2214/AJR.14.14028
- https://www.acr.org/-/media/ACR/Files/Practice-Parameters/Myelog-Cisternog.pdf

Equipment


Standard or biplane fluoroscopy


Basic Pack


Basic LP Kit


Local anesthesia Local anesthesia


Spinal needle (typically 20-22g of appropriate length


CSF Collecting vials


Contrast (for myelography)


Sterile skin dressing

1.4 Percutaneous Image-guided drainage

Indications

- Alleviate pain/discomfort related to collection, treat infection or for sampling of infected material to direct antibiotic therapy

Relative Contraindications

- Relative – coagulopathy (target INR <1.5; Plt >50,000)

Absolute Contraindications

- No safe access to lesion

Risks

- Damage to adjacent structures depending on route used (e.g., pneumothorax; bowel perforation; biliary injury; bleeding; infection

Alternative Interventions

- Surgical washout
- Conservative management

Considerations

- Tube placement can be confirmed with the instillation of contrast. Fistulas can be identified with abscessogram.
- Fluoroscopy (dose, field size and screening time) should be kept to a minimum in all patients, especially in children and pregnant women.
- Locking or non-locking drains may be used. Non-locking drains, where used, should be sutured in place to avoid inadvertent removal.

Technique

- US guided, Fluoroscopy guided, US/fluoroscopy guided, CT guided
- SELDINGER: access to collection with dilation and insertion of drainage tube over the wire
- TROCAR (direct): Insertion of drainage tube in single pass

Aftercare

- Patients rest in bed for 2 hours post procedure to reduce the risk of bleeding. Respiratory rate, blood pressure and heart rate should be monitored to allow any bleeding to be detected
- Stitches should be removed at an agreed interval
- Twice daily tube drain rinse with 10 mL of normal saline
- Longer-term plan for drain removal or routine change should be agreed with the referring clinical team (usually when output lesse than 30 cc over two consecutive days)

References

- Kandarpa, Krishna, et al. Handbook of Interventional Radiologic Procedures, Wolters Kluwer Health, 2016. ProQuest Ebook Central, https://ebookcentral-proquest-com.eresources.mssm.edu/lib/icahn-mssm/detail.action?docID=4931416.
- https://www.acr.org/-/media/ACR/Files/Practice-Parameters/PDFAC.pdf

Equipment


Imaging - Ultrasound, fluoroscopy or CT


Basic Pack


Sterile probe cover


Access needle (18g-22g)


Guidewire


Local anesthesia


Dilators (for Seldinger)


Drainage tube (6F-12F size; pigtail, cope loop, accordion)


Sample/specimen pot


Suture or drain-fix


Sterile skin dressing


Optional : abscessogram

1.4.1 Percutaneous drain exchange

Indications

- Replacement of existing percutaneous drain

Relative Contraindications

Absolute Contraindications

Risks

- This is a low-risk procedure is done correctly, owing the drain track already being established. In friable tissue eg pancreatitis there is an increased risk of bleeding and infection.

Considerations

- Tube placement can be confirmed with the instillation of contrast.
- Fluoroscopy (dose, field size and screening time) should be kept to a minimum in all patients, especially in children and pregnant women.
- Locking or non-locking drains may be used. Non-locking drains, where used, should be sutured in place to avoid inadvertent removal. Their use and removal procedure should be clearly documented to aid clinical team at the time of removal.

Technique

- US guided, Fluoroscopy guided, US/fluoroscopy guided, CT guided
- Wire access to collection via existing drain, drain tube is removed over guidewire and replaced with a new one.

Aftercare

- Plan for drain removal or routine change should be agreed with the referring clinical team
- Consideration of definitive management of underlying condition

Equipment

Ultrasound, fluoroscopy and/or CT

Basic Pack

Analgesia - IV Analgesics, local usually not required

Guidewire

Appropriate drainage tube

Closure: Suture , drain-fix or sterile skin dressing

1.5 Percutaneous image guided aspiration

Indications

- Alleviate pain/ discomfort related to collection
- treat infection
- sampling of infected material to direct antibiotic therapy

Relative Contraindications

- Coagulopathy (target INR <2; Plt >25,000)

Absolute Contraindications

- No safe access to lesion

Risks

- Damage to adjacent structures depending on route used:
  - pneumothorax
  - bowel perforation
  - biliary injury
  - bleeding
  - infection

Alternative Interventions

- Surgical washout
- Conservative management

Considerations

- Fluoroscopy dose, field size and screening time shold be kept to a minimum in all patients (especially children and pregnant women).

Technique

- US guided, Fluoroscopy guided, US/fluoroscopy guided, CT guided
- Yueh or sheathed needle versus thin wall needle

Aftercare

- Respiratory rate, blood pressure and heart rate should be monitored to allow any bleeding to be detected.
- Clean dressings changes as needed

References

- https://www.acr.org/-/media/ACR/Files/Practice-Parameters/PDFAC.pdf

Equipment

Imaging - Ultrasound, fluoroscopy or CT

Basic Pack

Local anesthesia

Sample pot/ specimen form

Access needle (18g-22g)

Syringes

2.1 Peripherally Inserted Central Catheter

Indications

- Central venous line for medications, IV infusion or venous sampling - likely duration 7 days to 3 months

Relative Contraindications

- Patients with CKD and potential plan for AV fistula
- Coagulopathy
- Infection

Absolute Contraindications

Risks

- Bleeding, hematoma
- Infection
- Venous thrombus
- Migration or occlusion of PICC
- Injury to vasculature

Alternative Interventions

- SC or IJ CVC
- Midlines
- PIV

Considerations

- Nondominant arm preferred. Basilic vein typically chosen.

Aftercare

- Saline flush

References

- Kandarpa, Krishna, et al. Handbook of Interventional Radiologic Procedures, Wolters Kluwer Health, 2016. ProQuest Ebook Central, https://ebookcentral-proquest-com.eresources.mssm.edu/lib/icahn-mssm/detail.action?docID=4931416.

Equipment

Ultrasound/ fluoro

Basic Pack

Vascular access equipment including local anesthesia and tourniquet

PICC Line kit

Closure: Sterile skin dressing

2.1.1 Non-tunneled Central Venous Catheter

Indications

- Central venous line for medications, IV infusion or venous sampling - likely duration less than 7-14 days
- Temporary dialysis or apheresis

Relative Contraindications

- Relative - coagulopathy (target INR <2; Plt >25,000)

Absolute Contraindications

Risks

- Bleeding, hematoma
- Infection
- Venous thrombus
- Injury to vasculature

Alternative Interventions

- Peripheral venous access

Considerations

- IJ access preferred. Subclavian and femoral can be considered for alternative access.

Aftercare

- Saline flush

References

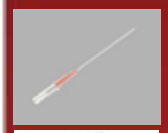
- https://link.springer.com/chapter/10.1007/978-3-319-40845-3_85

Equipment


Ultrasound/ fluoro


Basic Pack


Non-tunneled catheter kit


Vascular access equipment including local anesthesia


Sterile skin dressing

2.1.2 Tunneled central venous catheter

Indications

- Central venous line for medications, IV infusion or venous sampling - duration greater than 30 days
- Long term dialysis or apheresis

Relative Contraindications

- Relative - coagulopathy (target INR <1.5; Plt >50,000)

Absolute Contraindications

- Central venous occlusion

Risks

- Bleeding, hematoma
- Infection
- Venous thrombus
- Injury to vasculature

Alternative Interventions

- Non-tunneled central venous catheter

Considerations

- IJ access preferred. Subclavian, femoral, transhepatic and translumbar routes can be considered for alternative access.

Aftercare

- Flush with saline or heparin

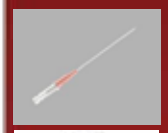
References

- https://link.springer.com/chapter/10.1007/978-3-319-40845-3_87

Equipment


Ultrasound/ fluoro


Basic Pack


Vascular access equipment including local anesthesia


Guidewire


Tunneled catheter kit


Sterile skin dressing

2.2 Inferior Vena Cava (IVC) Filter Placement

Indications

- Thromboembolic disease (Known pulmonary embolism (PE) or deep venous thrombosis (DVT) and contraindication to anticoagulation)
- Prophylaxis (Head/spine injury, pelvic/long bone fracture, intra-abdominal compression of IVC)

Relative Contraindications

- Uncorrectable severe coagulopathy
- Bacteremia/untreated infection

Absolute Contraindications

- None

Risks

- Filter fracture or migration
- IVC occlusion
- Deployment outside target area
- Bleeding, infection, and damage to adjacent structures such as nerves, arteries or veins
- Risks of sedation/anesthesia

Considerations

- Venous access options: Internal jugular veins or common femoral veins - dependent on filter type
- Cavogram utilized to assess the following before deployment:
  - -Thrombus presence in IVC,
  - -Caval diameter (typically <30mm)
  - -Number and position of renal veins,
  - -Presence of anatomic variant (eg duplicate IVC)
- Fluoroscopy (dose, field size and screening time) should be kept to a minimum in all patients, especially in children and pregnant women.

Modifications

- Suprarenal filter placement may be indicated for the following:
  - IVC thrombus precluding infrarenal placement or thrombus extension above previously-placed filter
  - Pregnancy
  - Gonadal vein thrombosis
  - Duplication/short length of infrarenal IVC
  - Extrinsic compression/intrinsic narrowing of in frarenal IVC
  - Need for intraoperative IVC mobilization
- Infrarenal IVC diameter between 30-40mm may require Bird's Nest filter, and >40mm may require bilateral iliac vein filters
- Duplicate IVC may necessitate dual filter insertion

Aftercare

- Bed rest and observation in immediate post-procedural period, with monitoring of respiratory rate, heart rate and blood pressure, typically going home in <3 hours
- Clinical reassessment for appropriateness and timing of filter removal during first 3 months

Equipment


Ultrasound and fluoro


Skin prep


Sterile probe cover


Local anesthesia


Access needle


Guidewire


Contrast


IVC Filter


Sterile skin dressing

References

- https://www.acr.org/-/media/ACR/Files/Practice-Parameters/ivc-fliterplacement.pdf?la=en
- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3036384/pdf/sir23357.pdf

2.3 Inferior vena cava filter retrieval

Indications

- Patient no longer at risk for PE / full anticoagulation possible
- Treat symptomatic IVC filter stenosis/thrombosis/penetration

Relative Contraindications

- Coagulopathy (target INR <1.5; Plt >50,000)

Absolute Contraindications

- Residual embolus within filter

Risks

- Injury (e.g. artery, IVC, nerve, viscera)
- Hematoma
- Infection

Alternative Interventions

- Various techniques including dual IVC/CFV access; filter mobilisation; endovascular forceps or lasers for complicated cases - see further reading
- Leaving the IVC filter in place

Considerations

- Fluoroscopy dose, field size and screening time shold be kept to a minimum in all patients (especially children and pregnant women).

Modifications

- PCN can often be performed entirely under ultrasound guidance to reduce screening time. Tube placement can be confirmed with instillation of agitated saline.

Aftercare

- Patients rest in bed for 2 hours post procedure to reduce the risk of bleeding.
- Respiratory rate, blood pressure and heart rate should be monitored to allow any bleeding to be detected

References

- Kuyumcu, Gokhan, and T. Gregory Walker. "Inferior vena cava filter retrievals, standard and novel techniques." Cardiovascular diagnosis and therapy 6.6 (2016): 642.

Equipment


Ultrasound and fluoro


Basic Pack


Vascular access equipment including local anesthesia


Sheath/catheter for cavogram


Contrast


IVC Filter Retrieval Kit


Sterile skin dressing

3.1 Percutaneous Nephrostomy Insertion

Indications

- Relief of renal obstruction causing urosepsis
- Renal failure
- Intractable pain
- Urinary diversion
- Diagnostic procedure
- Access for endourologic prcedure

Relative Contraindications

- Coagulopathy
- Extreme hyperkalemia
- Hypotension
- Terminal illness with imminent death

Absolute Contraindications

- No safe renal access

Risks

- Bleeding
- infection
- Nerve damage
- Damage to adjacent structures

Considerations

- Fluoroscopy dose, field size and screening time shold be kept to a minimum in all patients (especially children and pregnant women).
- Careful review of any cross sectional imaging is recommended to avoid causing damage to colon.
- A continued bleed may require embolization.
- Locking or non-locking drains may be used. Non-locking drains, where used, shold be sutured in place to avoid inadvertent dislodgment.

Modifications

- Direct puncture technique may be considered in patients with straightforward access to collecting system if guidewire/needle combination are available.
- PCN can often be performed entirely under ultrasound guidance to reduce screening time. Tube placement can be confirmed with instillation of agitated saline.

Aftercare

- Bed rest for 4 hours post procedure with monitoring of vitals for signs of bleeding.
- Removal of stitches at agreed-upon interval.
- Long-term plan established with with patient and primary team regarding drain removal or exchange.

References

- https://www.jvir.org/article/S1051-0443%2815%2901140-9/pdf?code=jvir-site
- https://www.acr.org/-/media/ACR/Files/Practice-Parameters/percutaneous-nephros.pdf?la=en

Equipment

Ultrasound with usually curvilinear probe


Skin prep


Sterile probe cover


Local anesthesia


Access needle


Guidewire


Nephrostomy tube


Suture or drain-fix


Sample/specimen pot


Sterile skin dressing

3.2 Percutaneous cholecystostomy

Indications

- Alleviate severe acute cholecystitis, empyema, pericholecystic abscess, cholangitis, biliary obstruction, cholelithiasis dissolution, or gallbladder perforation in patients deemed too high risk for surgery (e.g. age, comorbidities, malignancy, sepsis, pregnant)

Relative Contraindications

- Coagulopathy (target INR <1.5; Plt >50,000),
- Iodine allergy (e.g. fluoroscopic-guided PC),
- ascites
- severe cholelithiasis
- interposed bowel

Absolute Contraindications

Risks

- Damage to adjacent structures depending on route used:
  - pneumothorax;
  - bowel perforation;
  - biliary-cutaneous fistula;
  - bile leak > biliary peritonitis;
- bleeding
- infection

Alternative Interventions

- Endoscopic ultrasound-guided gallbladder drainage with stents
- Cholecystectomy
- Conservative management

Considerations

- Tube placement can be confirmed with the instillation of contrast.
- Fluoroscopy (dose, field size and screening time) should be kept to a minimum in all patients, especially in children and pregnant women.
- Locking or non-locking drains may be used. Non-locking drains, where used, should be sutured in place to avoid inadvertent removal

Technique

- Transhepatic (common): catheter stability, reduces bile leakage, quicker maturation for the catheter track, preferred in patients with ascites or interposed bowel | higher risk of bleeding, pneumothorax, and fistula formation
- Anterior/Anterolateral transperitoneal: preferred in patients with diffuse liver disease or coagulopathy | approach precluded by friable gallbladder
- Seldinger: access to GB with dilation and insertion of cholecystostomy tube
- Trocar (direct): Insertion of cholecystostomy tube in single pass

Aftercare

- Patients rest in bed for 2 hours post procedure to reduce the risk of bleeding. Respiratory rate, blood pressure and heart rate should be monitored to allow any bleeding to be detected
- Stitches should be removed at an agreed interval
- Twice daily tube drain rinse with 10 mL of normal saline
- Longer-term plan for drain removal or routine change

Equipment

Imaging - Ultrasound (curvlinear probe) fluoroscopy or CT

Basic Pack

Analgesics: IV and local

Sample/specimen pot

Access needle (22g-18g)

Guidewire

Cholecystostomy tube (5F-8F size; pigtail, cope loop, accordion)

Dilators (for Seldinger)

Closure: Suture or drain-fix Sterile skin dressing

Optional: Cholangiogram

should be agreed with the referring clinical team (usually 3-6 weeks).

References

- Lindemann, Steven R., et al. "Percutaneous Cholecystostomy-A Review." Seminars in interventional radiology. Vol. 5. No. 03. Copyright© 1988 by Thieme Medical Publishers, Inc., 1988.
- Venara, A., et al. "Technique and indications of percutaneous cholecystostomy in the management of cholecystitis in 2014." Journal of visceral surgery 151.6 (2014): 435-439.
- Gulaya, Karan, Shamit S. Desai, and Kent Sato. "Biliary Interventions: Percutaneous Cholecystostomy: Evidence-Based Current Clinical Practice." Seminars in interventional radiology. Vol. 33. No. 4. Thieme Medical Publishers, 2016.

3.3 Percutaneous Gastrostomy

Indications

- Enteral access for patents requiring long-term nutritional support for a variety of conditions

Relative Contraindications

- Coagulopathy (target INR <1.5; Plt >50,000)

Absolute Contraindications

- No safe access to stomach

Risks

- Damage to adjacent structures (small bowel, colon)
- Bleeding
- Infection (possible peritonitis)

Alternative Interventions

- Surgical or endoscopic placement
- Parenteral nutrition

Technique

- Fluoroscopy guided, CT guided
- Push: Common to place gastropexy (1-4) followed by 14F catheter or 16-20F MIC gastrostomy tube
- Pull: Single access and 20F mushroom type gastrostomy with long taper advanced over the wire after access out of the oral cavity through the GE junction

Considerations

- Exchange can be made once track mature (6-8 weeks) for low profile or larger caliber tube.
- Fluoroscopy (dose, field size and screening time) should be kept to a minimum in all patients.
- Balloon assisted gastrostomy can be performed instead of serial dilatation of the track.

Aftercare

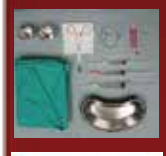
- Gastrostomy tube to remain to drainage for 6-24 hours prior to being cleared for feeds.
- Respiratory rate, blood pressure and heart rate should be monitored to allow any bleeding to be detected.
- Gastropexy should be removed at an agreed interval (7-10 days)

References

- https://www.ajronline.org/doi/full/10.2214/AJR.11.7804
- Kandarpa, Krishna, et al. Handbook of Interventional Radiologic Procedures, Wolters Kluwer Health, 2016. ProQuest Ebook Central, https://ebookcentral-proquest-com.eresources.mssm.edu/lib/icahn-mssm/detail.action?docID=4931416

Equipment


Ultrasound with usually curvilinear probe


Basic Pack


Gastropexy Kit


Medications: Analgesics, local anesthesia and glucagon


Access needle (19g or sheathed needle)


Guidewire (260cm + for pull type)


Gastrostomy tube (14F-20F; Ponsky, MIC, pigtail)


Dilators (for push type)


Sample/specimen pot

4.1 Pelvic trauma embolization

Indications

- Active bleeding after pelvic trauma
- Hemodynamic instability and pelvic fracture

Relative Contraindications

- Uncorrectable coagulopathy

Absolute Contraindications

Risks

- Rebleeding, persistent bleeding
- Non-target embolization
- Complications relating to access eg hematoma/thrombus/dissection

Alternative Interventions

- Conservative management
- Surgery

Considerations

- Empiric embolization of the internal iliac mostly used when there is diffuse bleeding, when multiple focal bleeding vessels exist, when patient is unstable, where site of bleeding not identified; however increased risk of gluteal ischemia with bilateral embolization
- Selective embolization preferred and performed for focal arterial source of bleeding

Aftercare

- Patients rest in bed post operatively with monitoring respiratory rate, blood pressure and heart rate should be monitored to allow any bleeding to be detected

References

- Martin et al. Evaluation and Treatment of Blunt Pelvic Trauma. Tech Vasc Interventional Rad. 2017;20:237-242.
- Fangio et al. Early Embolization and Vasopressor Administration for Management of Life-threatening hemorrhage from pelvic fracture. J Trauma. 2005;58:978-984.
- Ben-Menachem et al. Hemorrhage Associated with Pelvic Fractures: Causes, Diagnosis and Emergent Management. AJR. November 1991;157:1005-1012.
- Papakostidis et al. The role of arterial embolization in controlling pelvic fracture hemorrhage: A systematic review of the literature. European Journal of Radiology. 2012;81:897-904.

Equipment


Fluoroscopy


Procedure Pack


Local anesthesia


5-6 Fr Introducer sheath


4-5 Fr Diagnostic and selective catheter (optional microcatheters)


Guidewire (optional microwires)


Contrast


Embolic agents (coils, plugs, gelfoam, etc.)


Closure: Femoral Closure device, sterile skin dressing

4.2 Hepatic artery trauma embolization

Indications

- Active bleeding after penetrating or blunt trauma to the liver

Relative Contraindications

- Uncorrectable coagulopathy

Absolute Contraindications

Risks

- Rebleeding, persistent bleeding
- Non-target embolization
- Liver failure
- Complications relating to access eg hematoma/ thrombus/dissection

Alternative Interventions

- Conservative management
- Surgery

Considerations

- Important to identify hepatic arterial variants
- If diffuse bleeding, when multiple focal bleeding vessels exist, when patient is unstable can consider non-selective lobar embolization with gelfoam
- Selective embolization preferred and performed for focal arterial source of bleeding
- If active extravasation or pseudoaneurysm of proximal branch can consider stent graft if feasible

Aftercare

- Patients rest in bed post operatively with monitoring respiratory rate, blood pressure and heart rate should be monitored to allow any bleeding to be detected
- Monitor liver function tests

References

- Martin et al. Evaluation and Treatment of Blunt Pelvic Trauma. Tech Vasc Interventional Rad. 2017;20:237-242.
- O'Dell et al. Emergent Endovascular Treatment of Penetrating Trauma: Solid Organ and Extremity. Tech Vasc Interventional Rad. 2017;20:243-247.

Equipment


Fluoroscopy


Procedure Pack


Local anesthesia


5-6 Fr Introducer sheath


4-5 Fr Diagnostic and selective catheter (optional microcatheters)


Guidewire (optional microwires)


Contrast


Embolic agents (coils, plugs, gelfoam, etc.)


Closure: Femoral Closure device, sterile skin dressing

4.3 Renal artery trauma embolization

Indications

- Active extravasation, pseudoaneurysm, AVF or enlarging perinephric hematoma after penetrating or blunt trauma to the kidney
- Refractory hematuria

Relative Contraindications

- Uncorrectable coagulopathy
- Hemodynamic instability

Absolute Contraindications

Risks

- Rebleeding, persistent bleeding
- Non-target embolization
- Renal failure
- Complications relating to access eg hematoma/thrombus/dissection

Alternative Interventions

- Conservative management
- Surgery

Considerations

- Important to identify renal arteries including accessory and capsular branches
- Selective embolization needed to spare as much renal parenchyma as possible
- If active extravasation or pseudoaneurysm of proximal branch can consider stent graft if feasible

Aftercare

- Patients rest in bed post operatively with monitoring respiratory rate, blood pressure and heart rate should be monitored to allow any bleeding to be detected
- Monitor kidney function tests

References

- Martin et al. Evaluation and Treatment of Blunt Pelvic Trauma. Tech Vasc Interventional Rad. 2017;20:237-242.
- O'Dell et al. Emergent Endovascular Treatment of Penetrating Trauma: Solid Organ and Extremity. Tech Vasc Interventional Rad. 2017;20:243-247.

Equipment


Fluoroscopy


Procedure Pack


Local anesthesia


5-6 Fr Introducer sheath


4-5 Fr Diagnostic and selective catheter (optional microcatheters)


Guidewire (optional microwires)


Contrast


Embolic agents (coils, plugs, gelfoam, etc.)


Closure: Femoral Closure device, sterile skin dressing

4.4 Splenic Artery Trauma Embolization

Indications

- Active bleeding after splenic trauma
- Prevent delayed splenic rupture

Relative Contraindications

Absolute Contraindications

- Hemodynamic instability requiring operative intervention

Risks

- Rebleeding, persistent bleeding
- Splenic infarction / abscess
- Non-target embolization
- Bleeding
- Complications relating to access eg hematoma/ thrombus/dissection

Alternative Interventions

- Conservative management
- Surgery

Considerations

- Proximal embolization mostly used when there is diffuse splenic bleeding, when multiple focal bleeding vessels exist, when patient is unstable, where site of bleeding not identified
- Distal embolization sometimes performed for focal arterial source of bleeding
- Pay attention to location of collateral supply to spleen to preserve splenic arterial supply and function (eg. left gastric artery; dorsal pancreatic artery

Aftercare

- Patients rest in bed post operatively with monitoring respiratory rate, blood pressure and heart rate should be monitored to allow any bleeding to be detected

References

- Van der Vlies, Cornelis H., et al. “Literature review of the role of ultrasound, computed tomography, and transcatheter arterial embolization for the treatment of traumatic splenic injuries.” Cardiovascular and interventional radiology 33.6 (2010): 1079-1087.

Equipment


Fluoroscopy


Procedure Pack


Local anesthesia


Introducer sheath


Diagnostic Catheter (optional microcatheters)


Guidewire (optional microwires)


Contrast


Embolic agents (coils, plugs, gelfoam, etc.)


Suture or drain-fix


Sterile skin dressing

4.5 Bronchial Artery Embolization

Indications

- Massive hemoptysis: >300 mL/24 hours
- Recurrent bouts of moderate hemorrhage: >100 mL three times per week
- Chronic/slowly increasing hemoptysis
- Poor surgical candidates

Relative Contraindications

- Presence of spinal artery arising from bronchial artery
- Respiratory compromise (inability to lie flat)

Absolute Contraindications

Risks

- Spinal cord ischemia/transverse myelitis
- Chest pain
- Non-target embolization of esophagus
- Bleeding, infection, and damage to adjacent structures such as nerves, arteries or veins
- Inherent risks of sedation/anesthesia

Considerations

- Chest x-ray, CT scan and bronchoscopy can be utilized pre-procedurally to help determine likely location of hemorrhage and arterial anatomy
- Angiographic findings:
  - Active extravasation (only in ~10% of cases)
  - Vascular hypertrophy/tortuosity
  - Neovascularity/hypervascularity
  - Aneurysm formation
- Thoracic arterial contributions to the anterior spinal artery must be assessed to prevent spinal cord infarction

Aftercare

- Bed rest and observation in immediate post-procedural period, with monitoring of respiratory rate, heart rate and blood pressure
- Assessment for recurrence of hemorrhage

References

- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3140255/pdf/sir28048.pdf
- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3036206/pdf/sir21043.pdf

Equipment


Fluoroscopy


Procedure Pack


Local anesthesia


Introducer sheath


Diagnostic Catheter (optional microcatheters)


Guidewire (optional microwires)


Contrast


Embolization particles >500-700µm, or other suitable embolic agent


Suture or drain-fix


Sterile skin dressing

4.6 Inferior epigastric artery embolization

Indications

- Active bleeding

Relative Contraindications

- Coagulopathy (target INR <1.5; Plt >50,000)

Absolute Contraindications

Risks

- Rebleeding, persistent bleeding
- Non-target embolization
- Complications relating to access eg hematoma/ thrombus/dissection

Alternative Interventions

- Conservative management
- Surgery

Considerations

- Can consider ipsilateral approach or contralateral approach depending on origin of the inferior epigastric artery.
- Avoid reflux of embolic into the common femoral artery

Aftercare

- Patients rest in bed post operatively with monitoring respiratory rate, blood pressure and heart rate should be monitored to allow any bleeding to be detected

References

- Sobkin et al. Massive abdominal wall hemorrhage from injury to the inferior epigastric artery: a retrospective review. J Vasc Interv Radiol. 2008 Mar;19(3):327-32.

Equipment


Fluoroscopy


Procedure Pack


Skin prep


Local anesthesia


5-6 Fr introducer sheath


4-5Fr diagnostic catheter (optional microcatheters)


Guidewire (optional microwires)


Contrast


Embolic agents (coils, plugs, gelfoam, etc.)



Closure: Suture/ drain-fix; Sterile skin dressing

4.7 Pre-operative bland embolization

Indications

- Hypervascular lesion prior to surgery to limit blood loss

Relative Contraindications

- Coagulopathy (target INR <1.5; Plt >50,000)

Absolute Contraindications

Risks

- Non-target embolization
- Infection
- Complications relating to access eg hematoma/ thrombus/dissection

Alternative Interventions

- Surgery without embolization

Considerations

- Isolate as many branches that supply lesion as possible with goal to obtain stasis.
- Recommend particle sizes between 300-900 microns

Aftercare

- Patients rest in bed post operatively with monitoring respiratory rate, blood pressure and heart rate should be monitored to allow any bleeding to be detected.

References

- Riling et al. Preoperative Embolization. Semin Interv Radiol. 2004 Mar; 21(1): 3–9.

Equipment


Fluoroscopy


Procedure Pack


Skin prep


Local anesthesia


5-6 Fr introducer sheath


4-5Fr diagnostic catheter (optional microcatheters)


Guidewire (optional microwires)


Contrast


Embolic agents (coils, plugs, gelfoam, etc.)



Closure: Suture/ drainfix; Sterile skin dressing