URINARY TRACT INTERVENTION

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INDICATIONS FOR PERCUTANEOUS NEPHROSTOMY

• Relieve symptomatic obstruction
• Divert urine from fistulae/leaks
• Provide access for intervention (e.g. ureteral stones, endopyelotomy)
• Manometry
• Access for medical therapy (fungus or TCC therapy)
DRAINAGE FOR OBSTRUCTION

- Preserve renal function
  - Solitary kidney (functionally or otherwise)
  - Transplant kidney
  - Bilateral obstruction—usually drain one side

- Pyelonephritis and obstruction

- Symptomatic relief
  - Pain
  - Leakage into perinephric space
ALTERNATIVES TO PERCUTANEOUS DRAINAGE

• Cystoscopy with retrograde ureteral stent placement
  – Spinal or general anesthesia
  – Difficult when pathology involves the UVJ

• Open diversion procedures (e.g. defer PCN as patient going to have ureteral diversion surgery)
PERCUTANEOUS NEPHROSTOMY PATIENT PREPARATION

- Obtain some type of non-invasive imaging (CT, or U/S)
- Antibiotics for gram-negative bacterial coverage (pipercillin, ciprofloxin, aztreonam, gentamicin)
- Correction of hyperkalemia and coagulopathy (INR\(\leq\)1.6 and PLT\(>\)100K)
- Assess for sedation risk (lying prone)
Patient Positioning

- Prone is preferred
  - Landmarks more identifiable
  - Stable position during procedure
  - Access to both sides if needed
- Decubitis
- Supine for transplant—ultrasound essential
VISUALIZE COLLECTING SYSTEM

- Ultrasound
- Antegrade pyelogram
- Intravenous contrast
- Retrograde injection via cystoscope and ureteral cath
ANTEGRADE PYELOGRAM

- Locate transverse process L1
- 21 ga needle advanced 11cm in a normal size patient
- Aspirate as needle slowly withdrawn
- Never inject unless you are certain you are in the system
ANTEGRADE PYELOGRAM

• Best visualization of calyx
  – Preferred for non-dilated system
  – Often only option in really thick patients
• Provides detailed images prior to placement of a percutaneous nephrostomy
  – Perc litho where access site must be precise
• Difficult in non-dilated system
  – Facilitated by stone, double J, IV contrast, or U/S
ANTEGRADE PYELOGRAM
ADDING AIR TO RENAL PELVIS
PUNCTURE FOR NEPHROSTOMY

- Usually lower pole posterior calyx (Brodel’s line)
  - Avoids most renal vasculature
- Must also avoid lung, spleen, liver, and colon
- Entry site usually subcostal on the posterior axillary line
  - <3% pneumothorax subcostal
  - <10% above 12th
  - >10% above 11th
SELECTING CALYX FOR PUNCTURE
Advancing Needle

- Down the barrel under fluoroscopy
- See structures move if not down the line view
WIRE AND CATHETER ACCESS
CONTRAINDICATIONS

- Uncorrectable coagulopathy
- Chronic renal failure
- Very small kidney
- Very large perinephric collection
SUCCESS RATES

- 98% for experienced operators
  - 83% for inexperienced physicians
  - Less in non-dilated system
CAUSES OF BENIGN OBSTRUCTION

- Congenital (upj and others)
- Stone
- Post-surgical
- Post-traumatic
- RT
- Post infections (TB)
MANAGEMENT OF BENIGN URETERAL OCCLUSION

• Percutaneous nephrostomy
  – Should be temporary
  – Need to carry a drainage bag

• Nephrostents

• Internal stents

• Balloon dilatation

• Surgical bypass/diversion
ANTEGRADE PYELOGRAM
OCCLUSION IS CROSSED

Consider brush biopsy at this point
URETERAL PTA
MALIGNANT OBSTRUCTIONS

• Intrinsic
  – TCC
  – Others

• Extrinsic
  – Nodes compressing collecting system
  – Direct tumor extension (ovarian, prostate, etc.)
MANAGEMENT OF MALIGNANT OBSTRUCTION

- Nephrostomy
  - Usually for short term usage
- Nephrostent
  - Can be long term
- Convert to double J stent
- Operative diversion (ileostomy)
- Nephrectomy
BILATERAL URETERAL OBSTRUCTION
BILATERAL NEPHROURETERAL STENTS
DOUBLE J STENT

- Most placed by urology
- Can be placed antegrade through a PCN
- Must be changed every 3-6 month
URETERAL STRicture WITH DOUBLE J STENT
PERCUTANEOUS NEPHROSTOMY

- SAFETY WIRE
- LOOP SNARE
- 5 F CATHETER
INJURED DISTAL URETER CROSSED AND STENTED
MANAGEMENT OF PERSISTENT STONES

- ESWL
- Percutaneous removal
- Retrograde removal
- Percutaneous lithotripsy
PERCUTANEOUS LITHOTRIPSY INDICATIONS

- Stones > 3cm
- Failed ESWL
- Radiolucent stones (cystine)
- Pregnancy
- Associated foreign body
- Known ureteral abnormality
50 Y/O WITH FLANK PAIN
URINARY LEAK

- Secondary to obstruction
- Post surgical or other iatrogenic causes
- Trauma
- Malignancy
- Post radiation therapy
MANAGEMENT OR URINARY LEAKS AND FISTULAS

- Nephrostomy to divert urine
- Double J stent
- Nephrostomy with ureteral occlusion
- Ureteral diversion
PATIENT WITH DISTAL URETERAL FISTULA
TEMPORARY OCCLUSION
BALLOON
MANAGEMENT OF URETERAL FISTULA WITH PERMANENT OCCLUSION
ONE DAY POST LEFT ILIAC FOSSA TRANSPLANT
TRANSPLANT PERCUTANEOUS NEPHROSTOMY
FOREIGN BODY REMOVAL

- Kinked double J stents
- Fractured stone baskets
REMOVING FOREIGN BODY
WHEN A TUBE FALLS OUT

- Tract mature after 2 weeks
- Gently inject tract
- Steerable wire and angled catheter advanced to pelvis
COMPLICATIONS

- Sepsis 1-3%
- Hemorrhage 1-3%
- Vascular injury 1%
- Other viscera injury .3%
MANAGEMENT OF RENAL CYSTS

• Diagnosis
  – Ct
  – U/s
  – Cystogram

• Treatment
  – Operative
  – Percutaneous
23 Y/O WITH FLANK PAIN
ALCOHOL ABLATION

- Determine volume of cyst
- Fill ½ full with alcohol
- Dwell for 20 minutes rolling patient
- Drain
- Repeat
CALYCEAL DIVERTICULUM

• Many etiologies
  – Obstruction
  – Infection
  – Stone

• Percutaneous treatment
  – Ablation
  – Fistula creation
PAIN IN FLANK
CYSTOSTOMY

• Most performed in operating room or at bedside

• Common indications
  – Urethral obstruction
  – Urethral leak
  – S/p urethral surgery

• Ultrasound guided or cystogram guided.
ULTRASOUND GUIDED SUPRAPUBIC TUBE PLACEMENT

Tarlov cyst

Thick wall bladder
URETHERAL INTERVENTIONS

• Urethral stricture dilatation
  – Post traumatic
  – Iatrogenic
  – Post inflammatory
  – Congenital

• Urethral stenting
CONCLUSIONS

• Percutaneous nephrostomy essential tool for management of obstruction
  – Immediate relief of obstruction with ability to monitor split urine output
  – Provides access for many interventions

• Radiologists use multiple modalities to plan access and perform PCN