PCNL– Access Techniques and Exit Strategies

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Disclosures

• Consultant – Boston Scientific Corporation (BSC)

• Consultant – Karl Storz Endoscopy America (KSEA)

• Consultant – Lumenis
Learning Objectives

• As a result of participating in this activity, the participant will be able to describe 3 different techniques for renal access

• As a result of participating in this activity the participant will be able to describe 3 key data points obtained from a pre-operative CT scan

• As a result of participating in this activity the participant will be able to describe 3 key patient factors for proceeding with a tubeless PCNL
Peer reviewed references


Case based scenario

• A 27 yo otherwise healthy female presents to the ER and is found to have two large renal stones (17 mm and 18 mm). She undergoes an uneventful PCNL with single dilated tract and all stone cleared. Operative time is 47 minutes and EBL is 10 cc. There is no evidence of a collecting system tear. At the end of the procedure you place:

• Multiple Choice Answers
  • A– 20 Fr Mallecot re-entry catheter
  • B– 24 Fr Council tip catheter and inflate the balloon with 3 cc
  • C– 6 Fr x 24 cm ureteral stent ONLY
  • D– 8 Fr Nephrostomy tube
  • E– Both C & D
Renal Access

- Anatomic
- Ultrasound guided
- Fluoroscopic
- Endoscopic
- Combination
Renal Access

• Anatomic— for a “traditional” lower pole access
  • 2 cm lateral and 2 cm inferior to the tip of the 12th rib
  • Lateral to the lateral margin of the paraspinous muscles
  • Superior to the mid-axillary line
Renal Access

- Ultrasound guided
  - More prevalent in Europe and Asia
  - Equipment cost significantly less than a C-Arm
  - With experience can access specific sites
  - Many times used in combination with fluoroscopy
  - Reduces radiation exposure
  - In the United States limited use
    - Completely obstructed system—so cannot pass contrast into the collecting system
    - Urinary diversion
Fluoroscopy guided access

- Primary access modality in the United States
- Two "common" techniques
  - Bulls-eye or Eye of the Needle
  - Triangulation or Bi-Planar
Bullseye Renal Access

- C-arm rotated 30 degrees laterally (toward the surgeon)
- Align the needle as a single point over the calyx you wish to enter
- Advance the needle to the renal capsule
- C-arm back to AP or “zero” degrees
- Advance the needle into the collecting system
Accessing the Kidney 30°
Accessing the Kidney 0 degrees
Triangulation Access

• C-arm AP or “zero degrees”
• Entry point is 7 cm from the end of the calyx
• Start at 45 degrees
• Advance to the renal capsule
• C-arm to 30-degrees to check angle of entry
  • ”Pitch and Yaw” adjustment
  • Too deep/ too shallow or “just right”
• Advance at zero degrees final 2 cm into collecting system
Access planning with a CT scan

- CT – “CAT” scan when you had only axial imaging
  - Today you get multiple views and each gives you valuable information
- CT – axial
  - “Traditional” view
- CT – coronal
  - Assess the lower pole infundibular-pelvic angle
- CT – Sagittal
  - KEY to assess peri-renal anatomy
  - Upper pole – pleura, 11th and 12th ribs
  - Right side – liver
  - Left side – spleen
PCNL—drainage post-procedure

• Standard PCNL
  • Nephrostomy tube +/- ureteral stent

• Tubeless PCNL
  • Ureteral stent only

• Totally Tubeless PCNL
  • No nephrostomy tube and no stent
Historically, the “standard PNL” included placement of a large bore (20F–26F) nephrostomy tube or
Adverse Events from Nephrostomy Tube Placement is Well Documented

This is Not a Benign Process!
Figure 2 - CT showing the Foley catheter nephrostomy balloon inside the inferior vena cava
Post-Op Considerations:

• Nephrostomy Tube
  • Tamponade Bleeding?
  • Allow renal puncture healing
  • Drainage of urine
  • Access if 2nd look PNL is needed

• Tubeless PNL (only ureteral stent) remains controversial, used when no second-look PNL procedure required
Benefit of Tubeless

- decreased pain
- decreased analgesic use
- shorter hospitalization
- quicker return to normal activity
- decreased urine extravasation
- cost

 VIDEO no complication difference
Pain

Pietrow et al prospective randomized
- 22Fr pain scale 5.3l & 91mg narcotics
- 10Fr pain scale 3.75 & 78mg narcotic

Desai et al prospective randomized
- 20Fr 217mg narcotics
- 9Fr 140mg narcotics
- Tubeless 87.5mg narcotics

Agrawal et al prospective randomized
- Large Bore NT pain scale 59 & 126mg narcotics
- Tubeless pain scale 31 & 81.7mg narcotics

Feng et all prospective randomized
- 22Fr NT 52mg narcotics
- Mini PNL +22Fr NT 24mg narcotics
- Tubeless 5.25mg narcotics
Pain

Wang BJUI 2011
Urine Extravasation

Common complaint with standard PNL
• Particularly worrisome to the patient

Desai & colleagues prospective randomization
• large-bore (20-26Fr) NT - 21.4 hours
• small-bore (8-12Fr) NT - 13.2 hours
• no NT “tubeless” - 4.8 hours

Agrawal et al prospective randomized
• Large Bore NT substantial leak 7/101
• No NT “tubeless” substantial leak 0/101

Resorlu et al
• Multiple NT 6.9% prolonged leakage
• Single NT 5.8% prolonged leakage
• Tubeless no 0% (n=0) prolonged leakage
Length of Hospital Stay

Desai et al prospective randomized
• 20Fr 4.4 days
• 9Fr 4.3 days
• Tubeless 3.4 days

Agrawal et al prospective randomized
• Large Bore NT 54.2 hrs
• Tubeless 21.8 hrs

Feng et all prospective randomized
• 22Fr NT 4.1 days
• Mini PNL +22Fr NT 3.2 days
• Tubeless 1.9 days

Resorlu et al
• Mult tracts / mult NT – 4.2 days
• Mult tracts / single NT – 3.5 days
• Mult tracts / no NT – 2.1 days
Length of Hospital Stay

![Diagram showing mean difference in length of hospital stay with 95% CI]

- Favours experimental
- Favours control
Hemorrhage

Desai et al prospective randomized

- 22Fr NT – hct delta 6.8
- 10Fr NT – Hct delta 6.2

Resorlu et al

- Mult tracts / mult NT - hgb delta 2.1
- Mult tracts / single NT - hgb delta 1.9
- Mult tracts / no NT - hgb delta 1.7

Etemadian et al randomized

PNL specifically complicated with hemorrhage

- 24Fr NT – hgb delta 3.13 (+/-1.06)
- No NT “tubeless” – hgb delta 3.65 (+/- 1.20)
Hemorrhage
Patient Selection Criteria
Tubeless PNL

- Individual stones < 30mm
- Creatinine Normal range
- Solitary kidney Not present
- UTI Treated or not present
- Certain Comorbidities Not present
  - Immunosuppressed
  - Uncorrected coagulopathy
  - Renal anomalies
    pelvic
    horseshoe
    malrotation
  - Transplanted kidney
- Operative time < 120 min
- Intracorporal operative time < 60 min
- Residual stone burden Not present
- Renal access Atraumatic
- EBL < 100mL
- Collecting system tear Not present
- Wound site bleeding Minimal
- Plan for reentry Negative
- Surgeon’s clinical decision Supercedent
Decision to proceed “Tubeless”

- Visually examine renal collecting system for any evidence of disruption
- Confirm proper placement of stent
- Assess for bleeding with the sheath in place
- Remove sheath and assess for bleeding a second time
- Leave safety wire in place until all above steps are completed
Patient Selection Criteria
Tubeless PNL

- Optimal or “good” renal access
- Operative time < 120 min
- No residual stones
- Minimal EBL
- No perforations
Skin Closure
Case based scenario

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