Complications of PCNL: 
How to avoid and manage them

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Recommendations

An exhaustive meta-analysis completed by the panel revealed a lower complication rate and higher stone free rate when PCNL was used as opposed to open, ESWL or combination of PCNL and ESWL.

Based on this the 2005 updated AUA guidelines recommends That PCNL be the first line treatment for full staghorn calculi

Management of Renal Calculi

- > 2.5 cm PCNL
- < 2.5 cm ESWL
- PCNL: 95% success rate
- ESWL: 65-75%
  - < 1 cm: 64-92%
  - 1-2 cm: 59-89%
  - > 2 cm 39-70%

PCNL

- First line treatment for large or multiple kidney stones
- Generally safe treatment
- Low but specific complication rate
Complications during PCNL

- Review of the literature:
  - Major complications
    - Bleeding requiring intervention 0.6-1.4%
    - Pleural injury 2.3-3.1%
    - Colonic injury 0.2-0.8%
    - Septicemia 0.9%-4.7%
  - Minor complications:
    - Bleeding requiring transfusions <8%
    - Insignificant bleeding
    - Fever
    - Pain

How to avoid complications

- Patient selection and preparation
- Calyceal selection and tract dilation

Patient selection

- Absolute contraindications:
  - Untreated coagulopathy
  - UTI
  - Pyelonephrites

- Relative contraindications:
  - Diabetes
  - Pulmonary disease
  - Cardiovascular disease
  - Obesity

Preparation of patients

- Definition of stone size and collecting system anatomy:
  - US + IVP
  - CTU (CT plus pyelogram)
    - Supine
    - Prone
Advantages of prone CTU

- Selecting the target calyx
- Delineates surrounding structures
  - Pleura
  - Colon
  - Duodenum
  - Liver
  - Spleen

Full Staghorn Left Calculi

Technique
Positioning of the patient

- Prone
  - Conventional position
- Oblique prone
- Prone slit-leg
  - Combined procedures (PCNL and URS)
- Supine
  - Anesthesiological advantages
  - Combined procedures (PCNL and URS)
  - Descending drainage
  - Less X-Ray exposure
  - Longer learning curve

MS Michel et al Eur Urol 2007
J.E. Lingeman A.D. Smith, Editor 1995
RM Scarpa Eur Urol 1998
Valdivia Uria JG J Urol 1998
Technique

- Target the calyx
  - Puncturing the renal pelvis or the infundibulum leads to an increased risk of vascular injury

MS Michel et al Eur Urol 2007

Consider the angle of entry

- Minimize the angle between the tract and the targeted infundibulum
- During rigid nephroscopy be wary of applied torque
  - Prior surgery

Organ Injury

- Pleura
- Duodenum
- Colon
- Spleen

How to Manage Bleeding

- Terminate procedure
- Place a nephrostomy tube
  - Clamp it for 60 minutes if bleeding does not stop
- Other option
  - Council tip catheter and balloon insufflation

- If persistent bleeding
  - Renal angiography
  - Superselective embolization
Pleura

• How to avoid pleural injury
  – Pre-planning CTU (prone)
  – Puncture under US guidance
  – Exhalation

• How to treat pleural injury
  – Pneumothorax, Hydrothorax, Hemothorax
    • Chest tube

Duodenum and Colon

• Risks of perforation up to 1%

• Risk factors:
  – Left-side procedures
  – Horseshoe kidney
  – Previous jejunoileal surgery

• How to prevent perforation
  – Pre-planning CTU (prone)
  – Puncture with US
  – Patient selection
    • Previous bowel surgery

• How to treat bowel injury
  – Intraperitoneal
    • Surgery
  – Extraperitoneal
    • Conservative treatment
      – DJ stent
      – Nephrostomy tube withdrawn into the colon
      – Antibiotics x 7-10 days
      – Colostomy tube radiogram after 7-10 days

Spleen

• Very rare
• Associated with punctures above 12th rib
• Usually ends with splenectomy

A.R. El-Nahas Urology 2006
Septicemia

- Rate from 0.9 to 4.7%
- Causes
  - Infected stones
  - Prolonged operative time
- Treatment:
  - Forced diuresis
  - Antibiotic treatment
  - Optimal kidney drainage
  - Electrolytes control

How to maximize success

- Check all instruments prior to procedure
- Balloon vs. Amplatz dilators
  - Balloon
    - Faster
    - Easier
    - Better visualization
    - Minimizes blood in the collecting system
- Minimize time between dilation and nephroscopy
  - Be prepared!
- Always prepared to urgently terminate procedure

Take-home message

- Identifying and Accessing the Target Calyx
  - Prone CTU
  - Minimize the infundibular/tract angle

High success rate

Low complication rate

Thank You