Laparoscopic Simple Nephrectomy: Indications and Tips

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NEPHRECTOMY FOR BENIGN DISEASE

Renovascular hypertension
Donor nephrectomy
Non-function
Urolithiasis …. 
Infectious etiology
Tuberculosis, XGP, Chronic infection
Failed pyeloplasty

Preoperative Preparation

Preoperative consent
Typically no need for blood bank processing
Bowel preparation
Infectious kidney may fistulize into bowel
Prepare patient and family
Possibility for open conversion
Typically more difficult than routine tumor case
Nephrectomy for Benign Disease

- Manohar et al, J Endo 2007
- 84 patients
- Benign inflammatory diseases
- Compared with 94 open cases

Challenges for XGP:
- Abnormal hilum (71%)
- Perihilar adhesions (86%)
- Tuberculosis:
  - Hilar adenopathy (55%)

<table>
<thead>
<tr>
<th>Indications/pathology</th>
<th>Laparoscopic</th>
<th>Open</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyonephrosis</td>
<td>24</td>
<td>20</td>
</tr>
<tr>
<td>XGPN</td>
<td>07</td>
<td>20</td>
</tr>
<tr>
<td>Calculus pyelonephritis: total cases</td>
<td>25</td>
<td>20</td>
</tr>
<tr>
<td>Long standing stone diseases (&gt;5 years)</td>
<td>23</td>
<td>18</td>
</tr>
<tr>
<td>Renal dysplasia</td>
<td>01</td>
<td>00</td>
</tr>
<tr>
<td>Kyphoscoliosis</td>
<td>01</td>
<td>02</td>
</tr>
<tr>
<td>Renal tuberculosis</td>
<td>09</td>
<td>20</td>
</tr>
<tr>
<td>ADPKD</td>
<td>19</td>
<td>14</td>
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<tr>
<td>Total</td>
<td>84</td>
<td>94</td>
</tr>
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XGPN = xanthogranulomatous pyelonephritis; ADPKD = autosomal dominant polycystic kidney disease.

Nephrectomy for Benign Disease

- Shorter hospital stay
- Less analgesia requirement
- Similar blood transfusion rates
- Complications:
  - Laparoscopy 31% vs. Open 49%
Nephrectomy for Benign Disease

Open conversion in 8 (9.5%)
Bleeding from venous injury
Non-progression

Adoption Patterns

- Morris et al, JU 2007
- National Inpatient Sample
- 53,461 patients undergoing nephrectomy
- Both benign and malignant conditions
- 1998-2003

Nephrectomy: Benign and Malignant
Nephrectomy for Benign Disease

Laparoscopy use varies by indication
Rapid growth for donor nephrectomy
Can account for some differences by patient and hospital factors
Component of surgeon factors

Laparoscopic Donor Nephrectomy

Melcher et al, Arch Surg 2005
UCSF experience
530 patients
84 right-sided

Laparoscopic Donor Nephrectomy

Currently - 830 cases
Unchanged complication profile
2 open conversions
Ureteral stricture (<5%)
Excellent graft function
Immediate and at 1 year after transplantation
Laparoscopic Donor Nephrectomy

Issue of vascular control
Length of artery / vein critical
Common method using locking polymer clip
   Hem-o-lok

CAUTION
Contraindicated for renal artery during laparoscopic donor nephrectomy
From manufacturer (Weck)
We currently use endo-TA stapler

Technique

Positioning
   Flank position - 60 degrees
   Table flexed - minimal
   No need for kidney rest elevation
   Pressure points - padded
   Axillary roll
   Pillow for upper arm
   Lateral kidney rests behind hips and scapula
Technique

Preparation
- Foley catheter
- Naso- or oral- gastric tube
- Compression stockings (lower extremity)
- General anesthetic
  - No nitrous oxide
- Assure appropriate monitor position
- Equipment availability and function

Access

First 5 minutes - most critical
Veress Needle (Closed) Technique
Location:
- 2 finger-breadths below costal margin
- Mid-clavicular line
Aspirate and saline drop test
Low initial intraperitoneal pressure

Laparoscopy: Anesthetic Issues

Don’t “chase” the urine output
- Pressure, hormonal, neural effects
CO₂ and pneumoperitoneum
- Decreased venous return
- Decreased functional residual capacity
- Hormonal and neural changes
- CVP unreliable

Nerve injury

Usually due to positioning / inadequate padding
- Abnormal stretching or compression
Brachial plexus #1
- Abduct arm > 90 degrees
- Extreme outward rotation of humerus head
- Shoulder braces during Trendelenberg (pushes clavicle into retroclavicular space)
Bowel Insufflation: Risks / Signs

- Prior surgery / Inflammation
- Aspirate succus through Veress
- High initial insufflation pressures or high pressures with minimal volume
- Uneven insufflation

Surgical Goals

- Mobilize Liver (R)
  - Incise triangular ligament
- Mobilize Spleen (L)
  - Incise lateral attachments
  - Visualize greater curvature of stomach
- Mobilize overlying colon
  - Blunt, hook or Harmonic dissection

Solid organ injury

- Liver
  - Pressure or Floseal
- Spleen
  - Cause - surgical mishap
  - Physiologic - distort/stretch adhesions with insufflation
  - Capsular tear
    - Argon Beam Coagulator
    - Floseal
    - Pressure
    - Increase insufflation pressures and recheck
  - Splenectomy

Surgical Goals

- Right Side:
  - Mobilize duodenum
  - Identify IVC
- Left Side:
  - Mobilize spleen
  - Identify and mobilize pancreas
**Surgical Goals**

**Right side**
- Identify and dissect directly on IVC
- Blunt/sharp dissection to identify hilar vessels
- Cephalad renal vein retraction facilitates identification and mobilization of artery

**Left side**
- Gonadal vein directs you to renal vein
- Mobilize and transect
  - Gonadal / Lumbar / Adrenal veins
- Posterior dissection safer over aorta

**Severe Vascular Injury**

- Loss of landmarks
- Usually trocar-related (6.6%)
  - >dissection related (0.05%)
- 2 vena cava, 1 aorta transection reported
- Difficult case (XGP, chronic pyelonephritis)
- Camera malrotated
- Retroperitoneal > Transperitoneal
Acute Blood Pressure Rise After GIA Staple Deployment

Surgical Goals

Transection of vessels
- GIA stapler
  - Staples and transects
  - Preferred for larger renal vein
  - Caution with cartridge reloads
- Weck clips
  - Preferred for renal artery
- Right angle/straight clips
  - Use with caution around hilum

Stapler Complications

Minimal use / awareness of clips around hilum
No clips within jaws
Proper placement of stapler
Suspect problems early: don’t release until proper backup plan ready
Low threshold for conversion to open
Experience mandates outcome
Educate members of OR team

Surgical Goals

Dissect superior medial attachments
- Take adrenal
  - Start dissection at takeoff of adrenal vein
  - Blunt and sharp dissection
  - Stay oriented
    - Potential injury to pancreas
**Surgical Goals**

- Final dissection - lateral renal attachments
- Hook cautery
- Harmonic scalpel
- Blunt dissection
- Premature dissection makes hilar dissection difficult

**Pleural Injury: Symptoms**

- Decreased $O_2$ saturation
- Increased end-tidal $CO_2$
- Increased airway pressures
- Hemodynamic instability
- See “floppy” “billous” diaphragm
- Loss of negative pressure

**Increased End-tidal $CO_2$**

**Specimen Retrieval**

- Introduce retrieval sac
- Place kidney into sac
- Pull sac through largest port site
- Place barriers around site to prevent contamination
**Specimen Retrieval**

- Morcellate kidney
  - Kelly
  - Placental forceps
  - Pean clamp
  - ? Morcellator
  - Contact pathologist

**Specimen Retrieval**

- Alternatively
  - Expand port site for open retrieval
  - Pfannenstiel incision - premarked
  - Lower midline incision - premarked
  - Transvaginal extraction

**Port Site Hernia: Risks**

- Malnutrition
- Steroid use
- Renal failure
- Infection
- Not closing fascia
Port Site Hernia: Risks

Traditional: close all > 5mm in adults, and all ports in children (bladed trocars)
Usually do not close ports if fascial dilating and/or blunt-tipped ports

Bowel Injury during Laparoscopy

0.13% of cases
50% - monopolar electrocautery
70% - undiagnosed at time of procedure
Can lead to rapid deterioration and death
If unrecognized

Bowel Injury: Symptoms

No “classic” signs and symptoms:
Focal trocar-site pain (#1)
Abdominal distention
Diarrhea
Leukopenia
Rhabdomyolysis

- Creatinine kinase level
- Hydrate
- Alkalize
- Diuresis
- Follow urine output, check renal function
- ARF due to ATN

Lateral decubitus position
Direct compression injury
Poor tissue perfusion
Decreased cardiac output
Long duration of surgery
Increased muscular body mass

Rhabdomyolysis

Laparoscopic Simple Nephrectomy: Indications and Tips

- Challenging cases
- Establish goals early in case
- Be prepared
- Consider open conversion when there is lack of progression
- Simple - may not be simple