Avoiding and Managing Urologic Injury

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Objectives

- Review anatomy related to identification and dissection of the ureter and bladder
- Identify and manage urologic injury
- Review stenting, cystoscopy, and ureteral repair
- Show ureterolysis and resection of endometriosis from ureter
- Demonstrate cystotomy repair & stent placement

Importance of the Ureter

- 19% of unplanned consults to Gyn Onc were for inability to identify the ureter
  - Overall: 0.73%
  - Bladder injury: 0.05 - 0.66%
  - Ureteric injury: 0.02-0.4%

Aviki EM Gynecol Oncol 137(1):93-97, 2015
Learning curve during TLH

• Learning curve reaches significance at 30 cases


Improvement: 1996 compared with 2006 in all hospitals in Finland

• Incidence of urinary tract injury fell
  • 1996: 2.6% (n = 58 / 2434)
  • 2006: 0.7% (n = 22 / 1679) (p<0.001)

Improvement: 1996 compared with 2006 in all hospitals in Finland


- 1.3 to 1% (ns)
- 1.1 to 0.3% (p<0.005)

Ureteric injury: always a guilty verdict?

- International legal issue:
  - 2005-10: 95% of 130 iatrogenic ureteric injury claims in New Zealand settled in favor of plaintiff
  - Basis for claim: “res ipsa loquitur” = “the thing speaks for itself”

Review anatomy related to identification and dissection of the ureter and bladder

Pelvic Ureter

Ovarian vessels are tortuous & ALWAYS close to the ureter - must differentiate! Can always find at the pelvic brim - make the incision higher if you are struggling!
Types of Ureteral Injury
Review of 70 reports in 2,491 cases of laparoscopy

- Transection: 28%
- Laceration: 5%
- Obstruction: 8%
- Stenosis: 5%
- Fistula: 5%
- Burn: 1%
- Unknown: 48%

Ostrazenski A, Obstet Gynecol Surv 58:793, 2003
Identify the ureter

- Remember the course of the ureter
- Open the retroperitoneum in a safe, lateral location – remember the “triangle”
- Always safe to go lateral and cephalad
- Higher is better
- Adherent to the medial leaf of the peritoneum
- Use more suction, less (no) irrigation

Right Pelvic Sidewall
Ureter and Appendix

Ureter Under the Uterine Artery
Ureter Under the Uterine Artery

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The Triangle (Right Side)

- Round Ligament
- Fallopian Tube
- Iliac Vessels
Identify the ureter

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- **Always safe to go lateral and cephalad**
- **Higher is better**
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Identify the ureter

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Identify the ureter

- Lyse adhesions as needed to identify the course of the ureter
- Important at the level of the IP
- Important at the level of the uterines
- At the level of the IP, stay lateral! Lateral is safe
Path of the Ureter

DANGER ZONES!

Prevent Injury at the Pelvic Brim
Finding the Ureter

Prevent Injury at the Uterine Artery and Pelvic Sidewall
Prevent Injury at Uterine Artery

- Do NOT go below Koh ring
- Have strategies to deal with bleeding from uterine artery
  - Seal vessel WITHOUT tension
  - Hemostatic agents
  - Ligation of uterine artery at origin
- Isolation of ureter in difficult cases

Prevent Injury at the Vaginal Cuff
Cross Sectional Anatomy

The Koh Ring and Ureter Position
Ways to Injure the Ureter at the Cuff

Ureter enters bladder at the edge - BE CAREFUL!
Identify and manage urologic injury

The Road to Recovery: How to Manage Injuries

Ureteral Injury

• Detection
  – Intra-operative dye injection
  – Intra-operative ureteral catheterization
  – Ureteral jet ultrasonography
  – IVP
  – Dissection of the ureter
  – Retrograde ureteral dye study

• Cannot always detect crush injuries; partial obstruction; delayed thermal injuries

Hurt WG, Gynecologic and Obstetrical Surgery (Nichols DH ed), Baltimore, Mosby, 1993
Benefit to early detection

• 15 patients with ureteral injuries
  • 7 patients detected by intraop cystoscopy or early postoperative ureteral jet US
  • 5 patients detected by signs or symptoms
  • 3 patients developed injury despite normal cysto/US
• Diagnosed earlier (1.7 vs. 19.9 days)
• OR of 10 for more conservative treatment - 1/7 early patients required preimplantation vs. 5/8 late diagnosis patients

Wu HH, JMIG 13:403, 2006

Injury Documented with Methylene Blue
Intra-operative Recognition

- What if a clamp is placed across the ureter?
  - Remove clamp
  - Inspect for integrity
  - Stent (2-6 wk)
  - Drain (7-10 d)
  - Close Peritoneum

Drain for Urinary Injury

- Output should be less than 50 ml per day
- Check creatinine prior to removal - should be same as serum value
- Might leave longer if worried about necrosis or devascularization injury
Early Diagnosis

- Flank pain/CVA tenderness
- Unexplained fever
- Persistent ileus
- Lower abdominal mass
- Urinary discharge from vagina
- Decreased urinary output
- Unexplained hematuria

Urinoma, Urinary Ascites

- Normally urine/plasma creatinine is 30:1 to 100:1
- However, may equilibrate fast
- May be as low as 2:1
- Non-urine ascitic fluid would be 1:1

Review stenting, cystoscopy, and ureteral repair

Google “repair”

This is the only female repair image you get....
Review stenting, cystoscopy, and ureteral repair

Indications for ureteral stents
Stents

• Stents can be placed prior to difficult procedures
  – Make identification of ureter easier
  – They have not shown a reduction in injury
    • Lighted stents cannot often be seen when field is illuminated during surgery
  – May decrease unrecognized injury

Stents: Routine use is controversial

Wood: 7/92 stented patients had olig/anuria compared with 0/400 unstented patients

Merritt: Successfully placed in 313/397 patients
  • Placement time = 5.4 min for experienced surgeon; 8.4 min for inexperienced surgeon
  • Complications:
    • UTI 1.5%
    • ARF 0.6%
    • Ureterovaginal fistula 0.3%

Wood EC, JAAGL 3(3):393, 1996
Cystoscopy

A Case for Universal Cystoscopy?

- 471 hysterectomies in 3 centers - Prospective study
- 24 urinary tract injuries (5.3%)
  - 8 ureteral (1.7%)
  - 17 bladder (3.6%)
- Ureteral injury associated with prolapse surgery
  (7.3% vs 1.2%; P = 0.03)
- Bladder injury associated with incontinence surgery
  (12.5% vs 3.1%; P = 0.05)
- Only 12.5% of ureteral injuries and 35.3% of bladder injuries were detected before cystoscopy

Vakili B, Am J Obstet Gynecol 192, 1599, 2005
Universal cystoscopy?

- Peristalsis and detection of ureteral caliber are insufficient to detect ureteral injury
- 839 hysterectomy cases
- Prospective study, universal cystoscopy
- 97.4% ureteral injuries detected
- Negative cystoscopy did not exclude all cases due to partial obstruction or injury with residual patency (Burn injury)

Ibeanu et al, Int Urogynecol J Pelvic Floor Dysfunct 2003

Universal cystoscopy?

- Retrospective study compared 140 cases with and 109 cases without routine cystoscopy after robot assisted gynecologic surgery
- No difference in groups - incidence of urologic injury in both groups was zero
  
  Hard to show a benefit with a rare complication

Nguyen ML, JSLS 18(3), 2014
Universal cystoscopy?

- Retrospective study compared
- 1982 patients, hysterectomy 2009-2010
- No intraoperative ureteral injuries detected whether cystoscopy was used or not
- 5 patients (0.25%) had a ureteral injury detected postoperative
  - All were MIS cases
  - None had cystoscopy at time of surgery
- Recommended selective cystoscopy with low threshold - low volume surgeons, complex cases


Indications for ureteral repair
Ureterolysis

Bladder Injury

- Two layer closure
  - Monofilament on mucosa
    - 3-0 suture
  - Can use braided on muscularis
    - 2-0
- Barbed suture is ok
- Catheter for 7-10 days
Closure of cystotomy

Thank you!