Cystoscopy and Ureteral Stents for the Gynecologic Surgeon (Didactic)

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Cystoscopy and Ureteral Stents for the Gynecologic Surgeon (Didactic)

Paul D. Pettit, Chair
Faculty: Anita Chen, Robert G. Ferrigni, Barry K. Jarnagin

Course Description

Cystoscopy, like laparoscopy, is a technology that should benefit our patients and not isolate a specialty. Cystoscopy should be a component of any pelvic surgery when the lower urinary tract is at risk for injury. The cystoscope has become essential for patient safety with increased utilization of laparoscopy and robotic surgery. The cystoscope is not a substitute for surgical technique or judgment. This course is designed to give the participants the cystoscopic means to be sure of technique, allow adjustment for distorted anatomy and to correct potential or actual surgical injury at the primary operation. The morning session will be a didactic discussions; including basic and advance information necessary to carry out the technical challenges of cystoscopy.

Course Objectives

At the conclusion of this course, the participant will be able to: 1) Review relevant lower urinary tract anatomy; 2) identify bladder landmarks and common benign findings; 3) identify bladder pathology that should be referred to a urologist; 4) assemble and perform ridged and flexible cystoscopy; 5) select and utilize the four basic types of stents (open end, single j, double j, acorn tip); 6) recognize bladder and ureteral injury Intraoperatively; 7) place stents during laparotomy via cystotomy; 8) select appropriate pre-op and post-op diagnostic testing to define preoperative anatomy and know when it is safe to remove stents; and 9) manage postop complication of ureteral and bladder injury.

Course Outline

8:00 Welcome, Introductions and Course Overview  P.D. Pettit
8:05 Importance of Cystoscopy in Gynecologic Surgery  P.D. Pettit
8:45 Basics of Cystoscopy  B.K. Jarnagin
9:15 Common Benign Cystoscopic Findings  A. Chen
9:45 Questions & Answers  All Faculty
10:00 Break
10:15 Normal Cystoscopic Findings and Reasons for Referral to Urology  R.G. Ferrigni
10:45 Surgical Management of Gyn Surgical Injury to Ureter and Bladder  R.G. Ferrigni, P.D. Pettit
11:15  Post-Surgical Management and Stent Complications – PowerPoint Case Presentations  All Faculty
11:45  Questions & Answers  All Faculty
12:00  Course Evaluation
PLANNER DISCLOSURE
The following members of AAGL have been involved in the educational planning of this workshop and have no conflict of interest to disclose (in alphabetical order by last name).
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Paul D. Pettit*
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Robert G. Ferrigni*
Barry K. Jarnagin
Grants/Research Support: Coloplast
Asterisk (*) denotes no financial relationships to disclose.
Objective

This lecture will highlight how cystoscopy is a valuable safeguard for all pelvic surgery!

Unrecognized Urinary Tract Injury

- Fistula
- Obstruction
- Loss of renal function
- Any combination

Genitourinary Fistulas- Etiology

- Radiation Therapy: 8%
- Trauma: 4%
- OB: 8%
- 85% GYN Surgery

Should be a part of all GYN surgery when unable to ensure the integrity of the lower urinary tract.

Disclosure

- I have no financial relationships to disclose.
Genitourinary Fistulas

- Reason for Surgery
  - Malignant: 14%
  - Benign: 74%

Vesicovaginal Fistula

- Surgery benign conditions (70% TAH)

Surgical Etiology of Fistula

- Unrecognized gross injury
- Inadvertent placement of suture
- Necrosis from hematoma, infection or devascularization

Pelvic Surgery Safeguards

- Identification and mobilization of all contiguous structures
  - Sharp dissection
  - Traction and counter traction
  - Retroperitoneal spaces
  - Intentional cystotomy
  - Ureteral catheters
  - Suction drainage
  - Antibiotics
  - Foley
  - Cystoscopy

Specific Abdominal Surgery Safeguards

- Identify ureters above level of pathology
- Identify and protect throughout their course
- Sharply dissection with scissors, the avascular space between bladder/rectum and cervix (2cm below resection line)
Traditional Abdominal Safeguards Fall Short in Vaginal Surgery

- 5,379 major benign GYN operations
- 18 obstructions discovered - 0.33%
  - 16 following vaginal surgery
  - 2 following abdominal surgery

Stanhope et al. AJOG 164:1513, 1991
Robotic and Laparoscopic Issues- Must Respond!

- Loss of ability to palpate
- Compensate by improving visibility
  1-opened ended stents on all Robotic and Laparoscopic procedures,
  2-cystoscopy for distortions or injury at the end of the procedure

Insertion of Open Ended Stents

Cystoscopy Technique

- Know the pre-surgical anatomy
- Give one amp of IV indigo carmine 5-10 minutes before cysto, ? Sulfa allergy
- Use a 17F or 21F(stents) cystoscope
- 70 degree lens for the bladder, 30° lens for stents, 0° for the urethra
- Look at completion of at risk procedures
- Teleoscopy is alternative for abdominal cases, requires a cystotomy and two way catheter

Indigo Carmine/ Transurethral View

Teleoscopy View

Not A Substitute For Technique
Make adjustments for distorted anatomy

Correct actual or potential injury (primarily)

Cysto after Correction

Correct actual or potential injury (primarily)

Correct actual or potential injury (delayed)

Know What the End Results Should Look Like
Contrast In Right

Contrast Out Right

Contrast In Left

Contrast Out Left

Intraoperative Cystoscopy

Conclusions

- Cannot distinguish which distortion or injury will spontaneously resolve
- Can exclude all but ischemic necrosis
- Cystoscopy, like laparoscopy, is a tool that should benefit our patients and not isolate a specialty

Final Word

- Cystoscopy should be a part of ALL pelvic surgery when the integrity of the lower urinary tract cannot be assessed!
- *Faith can move mountains, but someone still needs to bring a shovel*
Your anesthesiologist reports a drop in Oxygen saturation after injection of IV indigo carmine, you should:

1. Treat as an allergic reaction
2. Have anesthesia reposition the endotracheal tube
3. Obtain a set of blood gases
4. There is a nl transient monitor fluxuation following the injection of indigo carmine and can be ignored

You find there is no efflux of urine – bilaterally, you would:

1. Get intraoperative urology consult
2. Hydrate and give the patient 5ccs of lasix and re-cysto
3. Remove all offending sutures and re-cysto
4. Assume you could not be so unlucky and ignore the situation

After Hydration and Lasix you find the left ureter is still none functioning – you should:

1. Remove the suspect sutures and recysto
2. Obtain an intraoperative urology consult
3. Do a retrograde cystogram
4. Give additional Lasix and indigo carmine

You remove the lower anterior repair sutures and there is now efflux of clear blue urine from the left ureteral opening, you should:

1. Stent the left ureter and complete the surgery
2. Get a urology consult, prior to completing the surgery
3. Do an intraoperative IVP, prior to completing the surgery
4. Replace your anterior repair sutures and re-cysto, then complete the surgery
INDICATIONS and BASICS for CYSTOSCOPY IN GYNECOLOGY

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Disclosure

- Grants/Research Support: Coloplast

Objectives

- Indications
- Risk of urinary tract injury during Gynecologic surgery
- Cost-Effectiveness
- Prevention
- “How to”
- Summary

Indications

- Evaluation of urogynecologic conditions
- Assess bladder and ureteral involvement by gynecologic malignancies
- Intra-operative guidance
- Assess proper placement of suture, slings, mesh, and other implants after pelvic reconstructive procedures
- Diagnosis, evaluation, and prevention of urinary tract injuries

Risk of Urinary Tract Injury

- True rate of urinary tract injury is uncertain.
- Rates of bladder injury range from 0.2-1.8%.
- Rates of ureteral injury range from 0.03-1.5%.
- Many injuries go unrecognized.
- Rate of urinary tract injury typically higher when the study includes routine cystoscopy.
- Many urinary tract injuries result in serious morbidity and medical-legal action if not recognized at the time of initial hospitalization.

Anatomy
Anatomy

Common sites of ureteral injuries
- Level of the infundibulopelvic ligament
- Distal uterosacral ligament as ureter courses under uterine artery and before its insertion into the urinary bladder

Risk of Urinary Tract Injury

- Prospective study
- Diagnostic cystourethroscopy performed on all patients who underwent hysterectomy for benign disease.
- Enrolled 839 patients.

Risk of Urinary Tract Injury

- Hysterectomy for benign disease.
- Included cases with concomitant pelvic organ prolapse or urinary incontinence procedures.
- Compared intra-operative identification of urinary tract injury to identification at the time of cystoscopy.
- Rigid cystoscopy was performed at the end of the procedure with the administration of IV indigo-carmine dye.

Risk of Urinary Tract Injury

- 2.9% rate of urinary bladder injury (24/839).
  - Vaginal hysterectomy with concomitant prolapse repair was associated with the highest number of cystotomies (2.2% compared to 0.4%).
- 1.8% rate of ureteral injury (15/839).
  - 1.7% in TAH
  - 2.6% in VH
- 4.3% incidence of urinary tract injury associated with hysterectomy for benign disease (39/839).

Risk of Urinary Tract Injury

- Detection rate with visual inspection was 25.6%.
- Detection rate with Cystoscopy was 97.4%.
  - Detected all injuries except one. Patient developed a vesicovaginal fistula several weeks after discharge.

Cost-Effectiveness

- Determine the cost-effectiveness of universal cystoscopy for identifying unsuspected ureteral injuries at the time of hysterectomy.
- Decision-analysis model
Cost-Effectiveness

- For TAH, routine cystoscopy was cost-saving above a threshold ureteral injury rate of 1.5%.
- For VH, routine cystoscopy was cost-saving above a threshold ureteral injury rate of 2%.
- For LAVH, routine cystoscopy was cost-saving above a threshold ureteral injury rate of 2%.
- Ibeanu et al
  - 1.7% ureteral injury rate for TAH
  - 2.6% ureteral injury rate for VH

Prevention Strategies

- Gynecologic surgery is responsible for approximately 50% of iatrogenic ureteral injury.
- Pre-operative ureteral stenting has been proposed as a prophylactic measure to prevent ureteral injury.
- Proponents argue that catheters aid in visualization and are most useful in cases that are anticipated to be difficult and complex.
- Dissidents argue that catheterization increases the risk of injury by reducing pliability and by moving the ureter to an ectopic location.

Prevention Strategies

- What is the evidence?
  - The quality of evidence is poor—only one randomized trial.

Prevention Strategies

- Randomized 3141 patients.
  - 1558 did not undergo catheterization
  - 1583 underwent prophylactic ureteral catheterization
  - Ureteral injury occurred in 1.20% (19/1583) of the patients who underwent prophylactic catheterization
  - Ureteral injury occurred in 1.09% (17/1558) of the patients without catheterization.
  - No statistically significant difference (p=0.774)
  - Did not use lighted ureteral stents.

Prevention Strategies

  - Retrospective review of 151 patients who underwent complex laparoscopic pelvic surgery.
    - Stage IV Endometriosis
    - Ovarian remnant
    - Chronic pelvic pain with adhesive disease
    - Diverticular disease
    - Sigmoid/rectal cancer
    - All underwent placement of lighted ureteral stents.
    - There were no ureteral injuries.

Prevention Strategies

- Authors concluded that prophylactic placement of lighted ureteral stents was safe and cost-effective.
Instrumentation

- A rigid cystoscope - telescope, bridge connector, sheath, and obturator
- A flexible cystoscope - a fiberoptic telescope and irrigation, no working channels
  - less pain and postoperative morbidity than rigid cystoscopes, but flow rate of irrigation fluid is less and visualization is not as clear
  - requires more extensive training than a rigid scope
  - no anesthesia, topical anesthetic, or conscious sedation

- Less pain and postoperative morbidity than rigid cystoscopes, but flow rate of irrigation fluid is less and visualization is not as clear.
- Requires more extensive training than a rigid scope.
- No anesthesia, topical anesthetic, or conscious sedation.

- For gynecologic procedures, 17 to 24 French pediatric scope (8 French) may be useful in some cases, such as compromise of the urethral lumen
- Irrigating fluid is attached to the sheath via tubing to distend the bladder and improve visibility
  - Usually normal saline, but water or glycine is required when electrocautery is used
  - Water is preferred in cases with bleeding
- Lenses - 0, 30, 70, and 120 degrees
  - 30 or 70-degree scope for most gynecologic procedures
  - 0-degree is better for urethroscopy

Pre-Operative Preparation

- Can be done as an outpatient, in office, or as part of gynecologic procedure
- Recent urine culture, treat symptomatic and asymptomatic bacteruria
- Informed consent
- For local anesthesia, 1 cc of 2% lidocaine jelly is slowly inserted from a syringe into the mid-urethra using additional gel as a lubricant

Antibiotics

- Recommendations summarized from ACOG and AUA
- Give prophylactic antibiotics for women at high risk for infection
  - Preoperative bacteruria
  - Indwelling catheter or stents
  - Neutropenia
  - Procedures with manipulation (e.g., biopsy, stents)
  - Fistulae
  - Urolithiasis
  - Recent surgical procedures
  - Infected pelvic tumor

- The American Heart Association does not recommend endocarditis prophylaxis for cystourethroscopy
- If antibiotics are used, a single dose of ciprofloxacin (oral 500 mg or intravenous 400 mg) or trimethoprim-sulfamethoxazole (1 DS tablet orally) is sufficient
- Active UTI is a contraindication to cystoscopy
Operative Procedure

- Dorsolithotomy
- Vulva, vagina, and periurethral area prepped in a sterile fashion
- Open periurethral area with one hand
- Hold sheath vertically at the urethra and gently introduce with curve upward
- Remove obturator
- Introduce cystoscope with light source and attach to collar that provides a locking mechanism
- Slant of the scope should point down
- 150 to 250 mL of distending medium

Anatomy

- Trigone
- Ureteral orifices
- Dome
- Urethra

Examination of the LUT

- Urethra
  - Is there erythema, pallor, exudate, polyps, condylomata, or diverticulae?
  - Exudate suggests the presence of a diverticulum
  - Urethrovaginal junction is also examined for polyps

Examination of the LUT

- Bladder
  - Perforation, suture or mesh, adhesions, lesions, or masses?
  - Dome - air bubble
  - Papillary growths or shaggy, necrotic tissue and should be biopsied
  - Can see subtle injuries from gyn surgery

Examination of the LUT

- Ureteral orifices
  - Base of trigone
  - Angled lens down and slight turn with camera head in either direction
  - If bladder is distorted, place finger in the vagina
  - IV indigo carmine (20 mg) is administered
  - Methylene blue is not used IV - methemoglobinemia

Examination of LUT

- Flow excludes complete ureteral obstruction; lesser degrees of blockage will still allow dye
- Marked delay or obvious differences in the amount - partial obstruction
- Blood - ureteral injury and must be investigated
- Ureters that have been devascularized may appear intact, yet develop fistulas later
Placement of Stents

- Stents - hollow tubes with multiple side-holes
  - A 24 or 26 cm stent is typical, diameter ranges from 4 to 7 Fr
  - Markings on the stent identify the length
  - Ureters approx. 22 to 30 cm in length
  - 3 areas of narrowing
    - proximally at the ureteropelvic junction
    - ureter crosses the iliac arteries
    - distally at ureterovesical junction
  - Antibiotics are given - fluoroquinolone, TMP-SMZ, aminoglycoside plus/minus ampicillin, or 1st or 2nd generation cephalosporin
  - Stents aid in GYN cases with difficult anatomy, such as endometriosis, tumor, large uterus/fibroid, prolapse, and can be lighted

Complications

- A small amount of post-procedure hematuria is normal and should clear within 3 voids
- Potential complications include
  - sepsis
  - hemorrhage from urethral injury or tumor
  - perforation of the bladder
  - post-procedure dysuria

Summary

- Cysto, Cysto, Cysto!

References

Thank You!
Common Benign Cystoscopic Findings

Anita H. Chen, M.D.
Mayo Clinic Florida

I have no financial relationships to disclose.

At the conclusion of this activity, the attendee will be better able to:
- Identify the bladder landmarks
- Assess and categorize benign cystoscopic findings
- Recognize post-operative changes
- Describe cystoscopic treatments for urinary incontinence

Cystourethroscopy

- Direct visualization of the anterior and posterior bladder urethra, bladder neck, and bladder
- Diagnosis of lower tract disease
- Provides access to the upper urinary tract

Gynecologic Indications for cystoscopy

- Irritative voiding symptoms in the absence of urinary tract infection
- Post void dribbling
- Fistula evaluation
- Suspected urinary tract involvement by gyn malignancy
- History of recurrent urinary tract infection

Gynecologic Indications for cystoscopy

- Verification of suprapubic catheter placement
- Suspected operative urinary tract injury
- Injection of therapeutic agents for urinary incontinence
Nonpathologic abnormalities

Squamous metaplasia

Ureteral cyst

Bladder cyst

Trabeculations, mild

Trabeculations, moderate
Petechial hemorrhages

Interstitial cystitis glomerulations

Interstitial cystitis with hemorrhages

Cystitis cystica

Cystitis cystica

Inflammation
Post operative pathology

Suture

Suture in the bladder

Screws

Screw in bladder

Mesh
Mesh in the bladder

Mesh in the bladder

Mesh in the urethra

Mesh in the urethra

Urethral Vesical Fistula

Cystoscopic procedures
Transurethral injection of bulking agent

Which of the following is a contraindication to cystoscopy?
A. Urinary urgency and frequency
B. Acute urinary tract infection
C. Incontinence after sling procedure
D. Evaluation after abdominal hysterectomy

Cystoscopic Findings Warranting Urologic Referral

Robert G. Ferrigni, MD
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Disclosure

- I have no Financial relationships to disclose.

Objectives

- To become competent with normal endoscopic anatomy of the female lower urinary tract
- To enhance recognition of endoscopic pathologic conditions of the ureters and bladder and ureters warranting referral to a Urologist.

CYSTOSCOPY

Technique

- Inspect urethral meatus
- Inspect urethral channel/bladder neck
- Systematic inspection of bladder
  - 30-70° lens

NORMAL FEMALE URETHRA

- 5-6 cm long, 8-10 mm diameter
- Longitudinal ridges: Urethral crest
- Periurethral glands just proximal to meatus
- Distal urethra: Stratified squamous epithelium
- Proximal urethra: Transitional urothelium
**BLADDER EXAM**
- Vesical neck
- Trigone/ureteral orifices
- Lateral walls
- Dome
- Posterior wall
- Anterior wall (manual suprapubic pressure)

**NORMAL FEMALE BLADDER**
- Capacity of 250-400 cc
- Transitional epithelium
- Trigone with squamous epithelium
- Interureteric ridge
- Mucosa appearance changes with filling
- Variable ureteral anatomy
URETHRAL PATHOLOGY

- Pseudopolyps
- Caruncle
- Diverticulum
- Ectopic ureteral insertion
- Urethral carcinoma
URETHRAL CARUNCLE

- Post menopausal female
- Red, polypoid growth from inferior urethra
- Nonspecific symptoms
- Treatment: Observation, topical estrogen, excision

URETHRAL DIVERTICULUM

- Mean age at diagnosis: 45 years
- Etiology: Periurethral gland abscess → diverticulum
- Diverticulum may be associated with:
  - Infection
  - Stone
  - Malignancy
- Adenocarcinoma most common cancer in diverticulum
- Presenting symptoms: Dysuria, PV dribbling, dyspareunia
- Cystoscopic finding: 0-30° lens, look for ostia while massaging urethra
ECTOPIC URETER/URETEROCELE
• Most common location: Urethra 35%, vaginal vestibule 34%
• Often is the upper pole ureter in a duplicated system
• Symptom: Constant incontinence, recurrent UTI in girls
• Endoscopy: Look for ostium ± indigo carmine

URETHRAL CARCINOMA
• Most common in postmenopausal female
• Etiology: Chronic irritation, infection
• Symptoms
  – Irritative/obstructive voiding
  – Anterior vaginal wall mass
• SCCa 60%, TCCa 20%, Aca 10%, Sarcoma 8%, Melanoma 2%

INFLAMMATORY BLADDER DISORDERS
• Nonspecific bacterial cystitis
• Interstitial cystitis
• Tuberculous cystitis
• Cystitis cystica
• Cystitis glandularis
• Radiation cystitis
• Catheter trauma
  (Cannot be differentiated from CIS endoscopically)
NONSPECIFIC BACTERIAL CYSTITIS

- Diagnosis confirmed by urine culture
- Cystoscopic appearance: Normal to severe hemorrhagic inflammation
- Treat infection and reinspect bladder in severe cases

INTERSTITIAL CYSTITIS

- Chronic vesical inflammation of unknown etiology
- Symptoms: Frequency, pain with bladder filling
- Peak incidence in middle age women
- Endoscopic findings
  - Glomerulations after distention
  - Classic Hunner’s ulcer
- Bladder biopsy confirming mast cell proliferation useful
TUBERCULUS CYSTITIS

- Bladder manifestation of genitourinary tuberculosis
- Endoscopic findings
  - Inflammation starts near ureteral orifice but progresses
  - Ulcer with central redness and outer granuloma
- Diagnosis
  - Early morning urine AFB culture or biopsy
  - Upper tract imaging of infundibular stenosis
RADIATION CYSTITIS

• Etiology: Pelvic irradiation
• Cystoscopic findings: Telangectasias alternating with pale mucosa
• Diagnosis: Bladder biopsy
• Symptoms: Irritative voiding, hematuria

CYSTITIS CYSTICA

• Etiology
  – Unknown, ?chronic infection, present in 60% of normal bladders at autopsy
• Cystoscopic appearance
  – Clear or yellow cysts proliferating in bladder
• Diagnosis
  – Bladder biopsy, or resolution following prolonged antibiotic course
CYSTITIS GLANDULARIS

- Etiology: Unknown, chronic inflammation?
- Associated with pelvic lipomatosis
- Precursor of adenocarcinoma of bladder
- Cystoscopic findings: Proliferative red growth with neoplastic appearance
- Diagnosis: Bladder biopsy, needs serial follow-up

TRANSITIONAL CELL CARCINOMA

- Papillary transitional cell carcinoma (75-85%)
- Sessile or invasive transitional cell carcinoma
- Carcinoma in situ
- Transitional cell carcinoma and diverticula
- Calcific granuloma of bladder after intravesical chemo/immunotherapy
MISCELLANEOUS BLADDER PATHOLOGY

- Pseudomembranous trigonitis
- Trabeculation/diverticulum
- Fistulae
- Ureterocele
- Vesical edema from external inflammation
- External tumor invasion of bladder

PSEUDOMEMBRANOUS TRIGONITIS

- Normal variant
- Urothelium replaced by stratified squamous epithelium
- Cystoscopic appearance
  - Thick, whitish, raised tissue replacing trigone

BLADDER FISTULAE

- Enterovesical
  - Etiology: Benign (diverticulitis, Crohn's etc.), malignant
  - Location: Posterior wall, dome, trigone
  - Symptoms: Pneumaturia, multiorganism UTIs
- Vesicovaginal
  - Etiology: Benign (75% after gynecology procedures), malignant
  - Location: Posterior trigone
  - Symptoms: Incontinence, UTIs
- Vesicouterine
  - Etiology: Benign or malignant
  - Symptoms: Hematuria, incontinence
URETEROCELE

- Cystic dilation of terminal ureter
- May be associated with:
  - Duplication
  - Obstruction
  - Reflux
- In adults most are insignificant
- Upper tract studies warranted
URINARY CALCULI

- Urethra
  - Rare in women
  - Associated with diverticulum
- Bladder
  - Etiology: Stasis, infection, foreign body
- Ureteral orifice
CONCLUSIONS

• Any urethral mass warrants evaluation
• Benign bladder inflammatory conditions cannot be differentiated from CIS endoscopically
• Any bladder mass needs evaluation
• Any fistula or calculus needs evaluation
• Any ureteral abnormality needs upper tract investigation

CYSTOSCOPY

• History
• Instrumentation
• Technique and normal anatomy
• Atlas of endoscopic pathology
HISTORY OF UROLOGIC ENDOSCOPY

1806  Candle light cystoscope  Bozzini
1877  Lens and telescope system  Nitze
1883  Incandescent lamp cystoscope  Newman
1950  Nephroscopy  Leadbetter
1954  Fiber optics  Hopkins/Capenni
1960s  Rod lens system  Hopkins
1970s  Endourology, percutaneous access  Hopkins
1980  Ureteroscopy  Lyon/Perez Castro

RIGID CYSTOSCOPE

- Sheath
- Obturator
- Telescope
- Bridge

FLEXIBLE CYSTOSCOPE

- Standard diagnostic tool for males
- Fiberoptic image bundles
- Soft, compliant
- Two way active deflection
- Working channel
- Learning curve

CYSTOSCOPY

**Technique**

- Antibiotics
- Position
- Anesthetic
- Irrigant
- Urethral dilation
- Introduction of scope
Evaluation and Management of Gynecologic Iatrogenic Injuries of the Ureter and Bladder

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Disclosure

- I have no financial relationships to disclose.

At the conclusion of this activity, participants will be better able to:

- Identify areas where critical information is lacking and specify needs for future studies.

Incidence of Ureteral Injuries During Gynecologic Surgery

- 0.2-2.5% Routine benign gynecologic procedures
- 2-30% Radical hysterectomies
- 0.1% C-sections
- 75% Ureteral injuries occur during benign hysterectomy

Gynecologic Injuries to Urinary System (Open or Laparoscopic)

- Bladder most common injury 1.5%/cases
- Ureteral injuries
  - 70% recognized postoperatively
  - >80% involve distal ureter
  - 5% recognized much later as hydronephrosis/nonfxn

Incidence Of Urinary Tract Injury During GYN Laparoscopy (N=953 Cases)

Total urinary injury: 15/953 (1.6%)*
Ureteral injury: 4/953 (.4%)
Bladder injury: 11/953 (1.2%)

*Half of these recognized intraop and repaired laparoscopically
Saidi et al OB GYN 87(2);1996
Incidence Of Urinary Tract Injury During GYN Laparoscopy (N=953 Cases)

- Total urinary injury: 15/953 (1.6%)*
- Ureteral injury: 4/953 (0.4%)
- Bladder injury: 11/953 (1.2%)

*Half of these recognized intraop and repaired laparoscopically
Saidi et al OB GYN 87(2);1996

Location of Ureteral Injury During GYN Procedures

- Same for open or lap procedure
- >80% at level of uterine arteries
- Between ovarian and uterine arteries
- Level of iliac bifurcation

Predisposing Factors for Iatrogenic Ureteral Injury

- Uterine size >12 week gestation
- Ovarian cyst >4 cm
- Endometriosis
- PID
- Prior intra-abdominal surgery
- Prior radiation therapy
- Advanced malignancy
- Anatomic anomalies

Gill et al AUA Update Series X111(32) 1994

Classification of Ureteral Injury

- Transection (complete or partial)
- Ligation (complete or partial)
- Angulation
- Crush
- Devascularization

Anatomy of the Ureter

- Artery
- Venous plexus
- Neurovascular bundles
- Adipose sheath
- fascia
- Dorsal nerve
Intraoperative Identification of Ureteral Injury

- Vascular compromise
  - Discoloration/absent peristalsis
- Obstruction
  - Proximal dilation
- Transection
  - Increased fluid in operative field (IV indigo carmine)

Signs of Ureteral Injury (Post-Op)

- Flank/abdominal pain
- Ileus/fever
- ↑ vaginal or wound drainage
- Path report

Signs and Symptoms of Ureteral Injury from Surgical Injury (29 Patients)

<table>
<thead>
<tr>
<th>Patients, No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal pain</td>
<td>16</td>
</tr>
<tr>
<td>Abdominal tenderness</td>
<td>12</td>
</tr>
<tr>
<td>Abdominal mass</td>
<td>2</td>
</tr>
<tr>
<td>Fever</td>
<td>9</td>
</tr>
<tr>
<td>Anemia</td>
<td>1</td>
</tr>
<tr>
<td>Vaginal leakage</td>
<td>3</td>
</tr>
<tr>
<td>Wound leakage</td>
<td>3</td>
</tr>
<tr>
<td>None</td>
<td>1</td>
</tr>
</tbody>
</table>

Diagnostic Tests for Post-op Recognition of Ureteral Injury

- EXU: 95% diagnostic
- Retrograde ureterogram: Identifies site
- CT: 95% diagnostic shows urinoma
- Cystogram, cystoscopy: R/O vesicovaginal fistula
- Lab: Fluid creatinine level
- IV Indigo +/- oral Pyridium

Intra-Op Treatment of Ureteral Injury (Open or Laparoscopic)

- release ligation ± stent (2-6 weeks)
- Closure of hole + stent
- Ureteral re-implant
- 1st ureteroureterostomy
- Transureteroureterostomy
- Ileal ureter
- Autotransplant
- Nephrectomy
**Delayed Recognition of Ureteral Injury (Obstruction or Fistula)**

- 1st retrograde attempt at stent ± ureteroscope
- 2nd percutaneous nephrostomy, later antegrade attempt at stent
- If stent is placed, 60-95% of ureterovaginal fistulae will heal in 6 weeks

Aronson AUA Updated Series X(22) 1992

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**Treatment of Short Ureteral Strictures (<1 cm)**

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Success Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balloon dilation</td>
<td>50%</td>
</tr>
<tr>
<td>AccuSieze balloon</td>
<td>60%</td>
</tr>
<tr>
<td>Endoureterotomy</td>
<td>75-95%</td>
</tr>
</tbody>
</table>

Delucchio et al AUA Update x(32) 2000

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**Surgical Repair of Late Presentation Ureteral Injury**

- Injury below pelvic brim
  - Ureteral re-implant
  - ± Psoas hitch (gain 3-5 cm)
  - ± Boari flap (gain 14 cm)
- Injury above pelvic brim
  - 1st ureteroureterostomy ± kidney mobilization (gain 8 cm)
  - TUU
  - Ileal ureter
  - Autotransplant or nephrectomy

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**Ureteroureterostomy: Techniques to Maximize Luminal Diameter**

- A) Spatulation of ureteral margins
- B) Oblique anastomosis
- C) Z-plasty technique


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**Management of Ureteral Injury: Depending on Location**

- Injury below pelvic brim
- Injury above pelvic brim

Orkin LA: Trauma to the Ureter: Pathogenesis and Management. Philadelphia, Penn, FA Davis Co, 1964

---

**Bladder Hitch**

- Placement of absorbable sutures for bladder hitch (left) and completed repair (right)

Guerriero WG, Urologic Injuries. East Norwalk, Conn; Appleton & Lange, 1984
**Modified Boari Flap**

A) High pelvic ureteral injury  
B) Creation of bladder flap  
C) Complete repair  

---

**Transureteroureterostomy**

A) Abbreviated ureter pulled across to contralateral ureter  
B) Anastomosis  
C) Completed repair  

---

**Prevention of Ureteral Injury**

- Exposure and anatomic understanding  
- Identify ureter prior to taking uterine and ovarian vessels  
- Pre-op stent placement (controversial)  
- Pre-op imaging if dealing with large mass  

---

**Algorithm of Management for Ureteral Injury**

- If recognized intra-op → immediate stent or repair  
- Delayed recognition:  
  - 1st endoscopic attempt at stent  
  - 2nd percutaneous nephrostomy/antegrade attempt at stent  
- If 1 or 2 not successful → definitive repair  
  - timing controversial  

---

**Bladder Injuries**

- Paul Pettit
Gynecologic Iatrogenic Urinary Injuries

Summary

- Incidence ~1-2% of gynecologic procedures
- ↑ risk with complex surgery
- The same injuries that occur open, occur with laparoscopic surgery
- Prevention and intra-op recognition is key

39 y/o 1 month s/p TVH with Rt flank pain and hydronephrosis, attempted stent placement on POD 2 unsuccessful now with indwelling nephrostomy tube.

Preferred Treatment

- A. Antegrade placement of stent
- B. Retrograde placement of stent
- C. Ureteral reimplantation
- D. Nephrectomy
60 y/o 3 days s/p TAH with Lt flank pain fever and ileus

Preferred Treatment

- A. Transureteroureterostomy
- B. Nephrectomy
- C. Primary ureteral repair
- D. Ureteral reimplantation
75 y/o 3 days s/p Rad Hystx and Lt colon resection with fever, ileus and loose stool.

Preferred Treatment

• A. Primary ureteral repair
• B. Transureteroureterostomy (Lt to Rt)
• C. Ileal ureter
• D. Nephrectomy

65 y/o s/p Rad Hystx and Rt Colon resection, postop Rt flank pain and hydronephrosis, Failed attempt at stent placement Rt nephrostomy tube indwelling.

Preferred Treatment

• A. Transureteroureterostomy (Rt to Lt)
• B. Boari flap ureteral reimplant
• C. Primary ureteral repair
• D. Nephrectomy
Preferred Treatment

- A. Balloon dilation of stricture
- B. repeat primary repair of ureter
- C. Nephrectomy
- D. Boari flap ureteral reimplantation
**Preferred Treatment**

- A. Nephrectomy
- B. Repeat Balloon dilation of ureter
- C. Boari flap ureteral reimplant
- D. Ileal ureter
Repair Intra-operative Cystotomy

Paul Pettit MD

AAGL
November 5, 2012

At the conclusion of this activity, participants will be better able to:
Identify areas where critical information is lacking and specify needs for future studies

Bladder Injury During Gynecologic Procedures

• Most commonly injured urinary organ: 0-2.9%
• Overall incidence: 2.8%
  Review of 91,682 GYN procedures
  Gilmore et al OBGYN 94(5), 1999
• Laparoscopic incidence: 1%
  Review of 5,571 procedures
  Francis et al CME J GYNOG 7:85, 2002

Principles to Prevent Injury
• Adequate exposure
• Identification of bladder and ureter
• Exposure and dissection of all contiguous structures
• Need more than visualization
• Loss of ability to palpate with laparoscopy and robotics

Steps To Prevent Injury-Bladder
• Sharply dissect the bladder off the cervix and vagina
• Expose at least 2 cm below site of transection of vagina
• Traction and counter tractions
• Indwelling catheter during operation-decompress and to demonstrate bladder
• Avoid excess cautery to back of bladder

Disclosure
• I have no financial relationships to disclose.
Repair Of Cystotomy
- Open, vaginal or laparoscopic/robotic
- Mark the injury with suture
- Repair at end of operation
- Close the defect with a two layers of 3-0 synthetic absorbable suture (continuous)
- Flap of peritoneum; labial fat pad
- Drain with catheter for at least 7 days (six weeks if radiation)
- Cystogram?

Exception
- Sling trocar to dome of bladder

Delayed Recognition or Bladder Injury
- Trocar/needle injury
  - Foreign body/stone
  - Sx: UTI, hematuria
  - Tx: Endoscopic removal
- Vesicotomy
  - Vesicovaginal fistula or vesicocutaneous fistula
Vesicovaginal Fistula

- Most common cause
- Benign hysterectomy
- Symptoms
  - Vaginal fluid drainage after Foley removal
- Diagnosis
  - Tampon test – intravesicle indigo ± oral Pyridium
  - Cystoscopy, vaginoscopy ± retrogrades
  - Fluid creatinine analysis
  - Cystogram/IVP

Vesicovaginal Fistula Conservative Treatment

- Catheter drainage + antibiotics (closure in 10-20%)
- Depithelialize small fistula (screw, cautery, AgNO₃) ± fibrin glue
- If no closure @ 3 weeks, definitive repair likely
- Indication: Small fistula, no radiation therapy, no malignancy

Vesicovaginal Fistula Surgical Repair

- Timing
  - Early (3 weeks)
  - Delayed (3-6 mo)
- Method
  - Transabdominal vs transvaginal
- Barrier enteroposition
  - Omentum
  - Labial fat
  - Gracilis
  - Fibrin

Major Issues
Vesicovaginal Fistula

>90%

Surgery benign conditions (70% TAH)

Lee et al Obstet Gyn 72:313, 1988
Conclusion

• Regardless of experience injury to the urinary tract will occur
• All contiguous structures at risk to injury must be exposed - helps avoid injury and recognize injuries
• Cystoscopy does not replace technique
• One must respond - nothing magical happens on the way to recovery (Shull)
CULTURAL AND LINGUISTIC COMPETENCY

Governor Arnold Schwarzenegger signed into law AB 1195 (eff. 7/1/06) requiring local CME providers, such as the AAGL, to assist in enhancing the cultural and linguistic competency of California’s physicians (researchers and doctors without patient contact are exempt). This mandate follows the federal Civil Rights Act of 1964, Executive Order 13166 (2000) and the Dymally-Alatorre Bilingual Services Act (1973), all of which recognize, as confirmed by the US Census Bureau, that substantial numbers of patients possess limited English proficiency (LEP).

California Business & Professions Code §2190.1(c)(3) requires a review and explanation of the laws identified above so as to fulfill AAGL’s obligations pursuant to California law. Additional guidance is provided by the Institute for Medical Quality at http://www.imq.org.

Title VI of the Civil Rights Act of 1964 prohibits recipients of federal financial assistance from discriminating against or otherwise excluding individuals on the basis of race, color, or national origin in any of their activities. In 1974, the US Supreme Court recognized LEP individuals as potential victims of national origin discrimination. In all situations, federal agencies are required to assess the number or proportion of LEP individuals in the eligible service population, the frequency with which they come into contact with the program, the importance of the services, and the resources available to the recipient, including the mix of oral and written language services. Additional details may be found in the Department of Justice Policy Guidance Document: Enforcement of Title VI of the Civil Rights Act of 1964 http://www.usdoj.gov/crt/cor/pubs.htm.

Executive Order 13166, "Improving Access to Services for Persons with Limited English Proficiency", signed by the President on August 11, 2000 http://www.usdoj.gov/crt/cor/13166.htm was the genesis of the Guidance Document mentioned above. The Executive Order requires all federal agencies, including those which provide federal financial assistance, to examine the services they provide, identify any need for services to LEP individuals, and develop and implement a system to provide those services so LEP persons can have meaningful access.

Dymally-Alatorre Bilingual Services Act (California Government Code §7290 et seq.) requires every California state agency which either provides information to, or has contact with, the public to provide bilingual interpreters as well as translated materials explaining those services whenever the local agency serves LEP members of a group whose numbers exceed 5% of the general population.

If you add staff to assist with LEP patients, confirm their translation skills, not just their language skills. A 2007 Northern California study from Sutter Health confirmed that being bilingual does not guarantee competence as a medical interpreter. http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2078538.