Topics for Today

1. Urinary Tract Infections/Vesicoureteral Reflux
2. Interstitial Cystitis/Bladder Pain Syndrome
3. Introital Pathology/Masses
Urinary Tract Infections (UTI) and Vesicoureteral Reflux (VUR)
Case 1 – Recurrent UTIs

• 7 yo F with recurrent UTIs
• First UTI at age 5
• Total of 3 febrile infections
• Otherwise healthy

Other Important Patient History Components?
Case 1 – Recurrent UTIs

- **Presenting symptoms**
  - Dysuria, accidents
  - Progress quickly to fevers, flank pain
- **Voiding habits**
  - Holding
  - Significant constipation
- **Prenatal/early childhood history**
  - Normal prenatal ultrasounds
  - No unexplained fevers

- **Family history**
  - No UTIs
- **Social history**
  - Embarrassment, teasing in school
  - Does not want to use school bathroom
- **Development/Coordination**
  - Normal
Case 1 – Recurrent UTIs

Important Physical Exam Features?

- **Patient Exam:**
  - **General:** NAD, well-developed 7 yo F, normal vitals
  - **Abdomen:** S, NT, ND, No CVAT
  - **GU:** Tanner 1, mild-moderate labial erythema, no urine on underwear, no labial adhesions
  - **Back:** no sacral dimple
  - **Neuro:** no focal deficits
Case 1 - Renal US

Normal bladder and kidneys
Case 1 – Voiding Cystourethrogram (VCUG)

Minimal Stool Burden

Left Grade 1 VUR
Pediatric UTI

- Second most common bacterial infection in children\(^1\)

- 5% of girls will develop a UTI by age 6\(^2\)

- **Common organisms:** E. coli, Klebsiella, Proteus, Pseudomonas, Enterococcus*

- **Risk factors:**
  - Young age
  - Female gender
  - White race
  - Being uncircumcised (boys)
  - Anatomic abnormality
  - Neurogenic bladder
  - Immunosuppression
  - Bowel and bladder dysfunction!

\*Suspect if patient not responding to gram negative coverage!

Afebrile vs. Febrile UTI

**Cystitis: Afebrile UTI**

**Symptoms:**
Frequency, urgency, dysuria, hematuria, accidents

**Evaluation:**
Anatomic work-up in select cases (e.g. recurrent, unusual organisms)

**Pyelonephritis: Febrile UTI**

**Symptoms:**
Fever, flank pain, lethargy, chills, vomiting +/- cystitis symptoms

**Evaluation:**
Anatomic work-up always indicated – minimum = renal and bladder ultrasound
Pediatric UTI: Key Points in Evaluation

- **History**: presenting symptoms, number/type of previous infections, bowel/bladder habits, development/coordination, prenatal/medical history, family history
- **Physical Exam**: general, abdominal, GU, presence of urine/stool on underwear, neuro exam (including spine)
- **Laboratory Testing**:
  - UTI diagnosis requires UA with pyuria AND + urine culture of >50K CFU/ml of 1 uropathogen
  - Specimen collection – clean catch or catheterized
  - Screen for renal dysfunction: renal function panel, proteinuria
- **Imaging**:
  - Renal and bladder ultrasound
  - Abdominal plain film
  - VCUG (voiding cystourethrogram)
  - DMSA (dimercaptosuccinic acid) renal scan

3. 2011 AAP UTI Guidelines
Pediatric UTI: Treatment

• Generally outpatient management
• Use local antibiograms to guide initial treatment choice
• Duration: 7-14 days
• Indications for inpatient admission:
  – Vital sign instability
  – Very young age (<2 months)
  – Immunocompromised state
  – Inability to tolerate oral fluids/medications
  – Failure of outpatient therapy

• Considerations after acute treatment: bowel/bladder management, antibiotic prophylaxis, surgical management of anatomic abnormalities
Pediatric UTI: Prophylaxis

• **Indications for prophylaxis:**
  - VUR + UTIs
  - Short-term for recurrent UTIs refractory to bowel/bladder management

• **Common prophylactic agents:** Trimethoprim/Sulfamethoxazole, nitrofurantoin, amoxicillin

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<tr>
<th>Agent</th>
<th>Contraindications</th>
<th>Prophylactic Dose</th>
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| Trimethoprim/Sulfamethoxazole | • Age <2 months  
                              | • G6PD deficiency  
                              | • Severe renal or hepatic disease  
                              | • Porphyria  
                              | 2 mg/kg po daily (dose based on Trimethoprim component) |
| Amoxicillin                | • No absolute, except for previous severe hypersensitivity reaction           | 10-15 mg/kg po daily                                      |
| Nitrofurantoin             | • Age <2 months  
                              | • G6PD deficiency  
                              | • Severe renal disease                                      | 1-2 mg/kg po daily                                  |
Case 1 – Plan/Follow-up

- Placed on nitrofurantoin prophylaxis
- Bowel management with polyethylene glycol (Miralax), fiber
  - Need to tailor to bowel symptoms, stool burden
- Aquaphor for vaginal irritation
- Biofeedback
- Work with school to facilitate water intake, timed voiding, stooling at school
- Surgical treatment for Grade 1 VUR rarely indicated!
- Has been UTI free for 6 months
- Once bowel/bladder management optimized, will discontinue nitrofurantoin
Case 2 – UTI with VUR

- 5 yo F with 6 febrile UTIs
- On antibiotic prophylaxis
- Also has bowel/bladder dysfunction

- Working on bowel/bladder habits, but also with concerning imaging findings...
VCUG: Bilateral Grade 3 VUR
DMSA Renal Scan: Bilateral Upper Pole Scarring
Case 2 – UTI with VUR and Renal Scarring

- Continue antibiotic prophylaxis and bowel/bladder management
- Also discussed surgical options
  - Ureteral reimplantation (open vs. minimally invasive)
  - Subureteric injection of dextranomer/hyaluronic acid (Deflux)
- Family elected for open reimplant
- Patient underwent bilateral intravesical cross-trigonal ureteral reimplant several months ago
  - No postop UTI or complications
  - Awaiting postop VCUG
VUR

- Retrograde flow of the urine from bladder into kidneys
- ~30% prevalence in children with UTI
- Dangerous when combined with UTI
- Often resolves spontaneously
- Possible sequelae:
  - Renal scarring
  - Chronic kidney disease
  - Hypertension
VUR Grading System

- Graded I-V (mild-severe)

VUR – Treatment Options

• **Antibiotic prophylaxis:**
  – All children with VUR grade III or greater
  – All infants with VUR and history of UTI
  – All children >1 year with VUR and bowel/bladder dysfunction, or renal scarring
  – Consider for children >1 year with VUR and history of UTIs

• **Indications for surgery:** breakthrough UTIs, renal scarring, parental preference
Case 3 – Another VUR Case

- 8 yo F with 5 febrile, 6 afebrile UTIs, starting at age 5
  - Includes several hospitalizations
- Reported history of L Gr 2, R Gr 3 VUR on VCUG 2 years ago
- Daytime and nighttime accidents
- Constipation

- Initial plan:
  - Bowel clean-out and bowel regimen
  - Continue antibiotic prophylaxis
  - Repeat imaging
VCUG

Significant Stool Burden

Right Gr 2, L Gr 1 VUR
DMSA: Possible small defect in right upper pole
Case 3 – Recurrent UTIs with Low Grade VUR

• Optimized lower urinary tract management and discontinued antibiotic prophylaxis
  – Patient developed recurrent UTIs
• Reinitiated antibiotics, and discussed surgical options for treatment of VUR
• Family elected for subureteric Deflux injection
  – Low grade VUR
  – Deflux alone may reduce risk of UTI5 - ? Immunologic effect
• Initially did well, but developed recurrent UTI in setting of holding behaviours
• Continuing to work on bowel/bladder habits
• Recommend yearly renal US indefinitely due to risk of late, silent obstruction6

Summary – UTIs and VUR

• 5% of girls will develop a UTI by age 6
• History and physical examination key
• Anatomic abnormalities should be evaluated and managed in conjunction with bowel and bladder dysfunction
• **Individualized treatment plans:**
  – Bowel/bladder management
  – Antibiotic prophylaxis
  – Surgical interventions
Interstitial Cystitis/Bladder Pain Syndrome (IC/BPS)
Case 4 – Longstanding Lower Urinary Tract Symptoms (LUTS)

- 13 yo F with long history of “urethral and bladder pain”
- Started in 2nd grade, but increased intensity over last year
- Describes urethral, bladder and lower back pain, only relieved by voiding
- No gross hematuria, but has had microhematuria multiple times
- No formal gynecologic eval, but no previous tenderness on external GU exams

- PMH: IBS with constipation, chronic abdominal pain
- FH: mother with chronic hematuria as a child

- Imaging: normal CT, normal renal and bladder US

- Previous evaluation by pediatric and adult urologists, told she has interstitial cystitis (next proposed step was cysto/hydrodistension)
Case 4 – Possible Interstitial Cystitis/Bladder Pain Syndrome (IC/BPS)

- Education
- Voiding diary
- Constipation management
- Uroflow/post void residual assessment to evaluate for pelvic floor overactivity
IC/BPS

- **Definition:** unpleasant sensation (pain, pressure, discomfort) perceived to be related to the bladder
  - Associated with lower urinary tract symptoms for >6 weeks
  - No UTI or other identifiable causes

- **Etiologic theories:**
  - Defective urothelial integrity and function
  - Mast cell activation
  - Infectious/inflammatory events
  - Aberration of autonomic nervous system, and central sensitization of pain

- **Common Comorbidities:**
  - Irritable bowel syndrome
  - Fibromyalgia
  - Chronic fatigue
  - Depression
Hunner’s Ulcer: 5-10% of patients with IC/BPS

IC/PBS: AUA Assessment and Treatment Algorithm

**IC/BPS**

An unpleasant sensation (pain, pressure, discomfort) perceived to be related to the urinary bladder, associated with lower urinary tract symptoms of more than six weeks duration, in the absence of infection or other identifiable causes.

**BASIC ASSESSMENT**
- History
- Frequency/Voluntary Chart
- Medication review
- Physical examination

**Symptoms of Complicated IC/BPS**
- Incision/recurrence
- GI symptoms
- Neurologic symptoms
- Genitourinary symptoms

**CONFIRMED OR UNCOMPROMISED IC/BPS**

**TREAT & REASSESS**

**CLINICAL MANAGEMENT PRINCIPLES**
- Treatments are ordered from least to most conservative. Surgical treatment is appropriate only after other treatment options have been found to be ineffective (except for treatment of Hunner’s lesions if indicated).
- Initial treatment level depends on symptom severity, clinician judgment, and patient preferences.
- Multiple simultaneous treatments may be considered if less intense of patient.
- Treatative treatments should be stopped.
- Pain management should be considered throughout course of therapy. Emphasis should be on maximizing function and minimizing pain and side effects. Diagnosis should be reconsidered if no improvement within clinically meaningful timeframe.

**RESERCH TRAILS**
- Patient enrollment as appropriate at any point in treatment process.

**FIRST-LINE TREATMENTS**
- General Relaxation/Stress Management
- Pain Management
- Patient Education
- Self-help/Behavioral Modification

**SECOND-LINE TREATMENTS**
- Anti-epileptic, cimetidine, hydroxyzine, PPS
- Intravesical: BCG, Heel, Lidocaine
- Pain Management

**THIRD-LINE TREATMENTS**
- Cystectomy under anesthesia w/ hydrodistention
- Pain Management
- Excision of Hunner’s lesions if found

**FOURTH-LINE TREATMENTS**
- Intravesical instillation drugs A
- Neuroablative
- Pain Management

**FIFTH-LINE TREATMENTS**
- Cystectomy A
- Pain Management

**SIXTH-LINE TREATMENTS**
- Diversion or ileal conduit cystectomy
- Pain Management
- Substitution cystectomy

*Note: For patients with postoperative small bladders, diversion is indicated at any time desired and patient believes appropriate.*

American Urological Association (AUA) IC/BPS Guidelines
IC/BPS: Clinical Management Principles

• Treatments from most to least conservative
  – Surgical treatment last line (except for treatment of Hunner’s ulcers)
• Initial treatment level based on symptom severity, clinician judgement and patient preference
• OK to consider multiple, simultaneous treatments
• Stop ineffective treatments
• Pain management throughout course of therapy
  – Goal – maximize function, minimize side effects
• Reconsider diagnosis if no improvement within clinically-meaningful time frame
IC/PBS: Assessment and Treatment Algorithm

The evidence supporting the use of Reconstructive, Cystoscopy A, and RTX for IC/PBS is limited by many factors including study quality, small sample sizes, and lack of durable follow-up. None of these therapies have been approved by the U.S. Food and Drug Administration for this indication. The panel believes that none of these interventions can be recommended for general use for this disorder, but rather should be limited to practitioners with experience managing this syndrome and willingness to provide long-term care of these patients post intervention.

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American Urological Association IC/BPS Guidelines
IC/BPS: Initial Assessment

**BASIC ASSESSMENT**
- History
- Frequency/Volume Chart
- Post-void residual
- Physical examination
- Urinalysis, culture
- Cytology if smoking hx
- Symptom questionnaire
- Pain evaluation
IC/PBS: Assessment and Treatment Algorithm
IC/BPS: Concern for Complicated Disease

- Incontinence/OAB
- GI signs/symptoms
  Microscopic/gross hematuria/sterile pyuria
  - Gynecologic signs/symptoms

CONSIDER:
- Urine cytology
- Imaging
- Cystoscopy
- Urodynamics
- Laparoscopy
- Specialist referral (urologic or non-urologic as appropriate)
IC/PBS: Assessment and Treatment Algorithm

American Urological Association IC/BPS Guidelines
IC/PBS: Treatment Algorithm

- General Relaxation/Stress Management
- Pain Management
- Patient Education
- Self-care/Behavioral Modification

SECOND-LINE TREATMENTS
- Appropriate manual physical therapy
- Oral: amitriptyline, cimetidine, hydromorphone, clonidine
- Intravesical: DMSO, Heparin, Lidocaine
- Pain Management

THIRD-LINE TREATMENTS
- Cystoscopy under anesthesia w/ hydrodistention
- Pain Management
- Tx of Hunner’s lesions if found

FOURTH-LINE TREATMENTS
- Intradetrusor botulinum toxin A
- Neuromodulation
- Pain Management

SIXTH-LINE TREATMENTS
- Diversion w/ or w/out cystectomy
- Pain Management
- Substitution cystoplasty

*Note: For patients with end-stage structurally small bladders, diversion is indicated at any time clinician and patient believe appropriate.*

Appropriate to enroll in research trials at any time
IC/BPS: Challenges in Pediatrics

• Overlap with “pediatric” bowel/bladder dysfunction
  – Likely represents a spectrum

• Pediatric urology clinics not well equipped to adhere to recommended evaluation/treatment algorithm
  – Partnership with adult urology practice key
Summary – IC/BPS

• =Unpleasant sensation perceived to be related to the bladder, no other identifiable cause, >6 weeks duration

• May represent a spectrum with the bowel/bladder dysfunction more commonly seen in pediatric urology

• AUA recommended evaluation/treatment algorithm
  – Difficult to operationalize in pediatric setting
  – Partnership with adult urologist key
Introital Pathology/Masses
Case 5 – Introital Mass in a Newborn

• Newborn baby girl referred for introital mass
• No apparent tenderness, bleeding or drainage
• Normal prenatal ultrasounds
• Renal/bladder US: normal
• Presumed Dx: Skene’s gland cyst
  – Recommend observation, procedural drainage rarely indicated
Pediatric Introital Masses: Differential Diagnosis

- Skene’s Gland (Paraurethral) Cyst
- Urethral prolapse
- Ureterocele
- Rhabdomyosarcoma
- Imperforate Hymen
- Hymenal Skin Tag
- (Labial Adhesions)
- Obstructed hemivagina
- Rare: urethral polyp, Gartner’s duct cysts (Wolffian remnant)

Campbell-Walsh Urology, 11th Ed, Ch 149
Skene’s Gland (Paraurethral) Cyst

- Dilation of paraurethral glans, located just inside urethral meatus
- Skene’s Gland = homologue of male prostate
- Can respond to maternal estrogen and secrete mucus
- Symptoms: deflected urinary stream
- Often spontaneously rupture
- If treatment required → needle decompression at bedside
Hymenal Skin Tag

• A nearly normal finding, rarely symptomatic
• Treatment: excision, but only if symptomatic

Campbell-Walsh Urology, 11th Ed, Ch 149
Ureterocele

- Cystic dilation of distal ureter
- Often associated with upper pole of duplex collecting system
- If ectopic, can prolapse through urethra
- Can lead to urinary retention, requiring urgent intervention
Urethral Prolapse

- Circumferential eversion of urethral mucosa at level of meatus
- Most common in African-American girls
- Symptoms: bleeding, spotting
- Treatment options: observation, stiz baths, topical steroids, topical estrogen, surgical excision

Image courtesy of E. Yerkes, MD; do not reproduce without permission
Rhabdomyosarcoma

• Best prognosis of any GU site for female
• Mean age <2 years
• Evaluation: tissue diagnosis with biopsy, then staging with CT abdomen/pelvis, chest xray, bone marrow biopsy
• Often attempt organ-sparing therapy – chemo/XRT with surgery only for salvage

Image courtesy of E. Yerkes, MD; do not reproduce without permission
Imperforate Hymen

- Bulge along posterior introitus from retained fluid
- Secretions in response to maternal estrogen
- Delayed presentation in adolescence: cyclic abdominal pain and amenorrhea
- Treatment: transverse incision in infants, tissue excision often necessary in adolescents

Campbell-Walsh Urology, 11th Ed, Ch 149
Labial Adhesions

- Fusion of labia minora
- Very common – up to 2% of girls
- Originates posteriorly
- Many resolve spontaneously
- Treatment only necessary if symptomatic
- Treatment options: topical estrogen, topical steroids, surgical incision
Summary – Introital Pathology/Masses

• Large differential diagnosis
• Most are benign
• Can be associated with upper urinary tract abnormalities (e.g., ureterocele, Gartner’s duct cyst, vaginal obstruction → hydronephrosis)
• Location and appearance on physical exam key to diagnosis
Questions and Discussion
References


Additional Reading


