Common Pediatric Urologic Problems in Female Children

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Learning Objectives

1. Understand the etiology of common presentations of urinary problems in female children

2. Understand how to diagnose common presentations of urinary problems in female children

3. Understand the modes of treatment of common presentations of urinary problems in female children

Normal Voiding

Infant voiding: spinal cord reflex, decreased volitional cortical control

Normal voiding:
• Progressive maturation from involuntary incontinence (not aware of bladder filling) to daytime continence by age 4 (able to suppress detrusor contractions & finally coordinate sphincter and detrusor function) to day & night continence by age 5-7
• Approx. 20% of 4-6 year olds have daytime accidents with a decrease to 4% for 12 year olds

Normal Voiding

Filling phase: activation sympathetic Alpha & Beta receptors with bladder neck contraction & detrusor relaxation respectively, and pudendal motor neurons stimulated contracting external sphincter. Storage is low pressure, usually <30cm H₂O. High pressures > 40 cm H₂O increase risk for kidney injury

Voiding phase: Pontine micturition center via spinal cord inhibits pudendal motor neurons, external sphincter relaxes, and stimulated parasympathetic splanchnic nerves cause detrusor contraction, also sympathetic hypogastric nerve inhibition relaxes bladder neck
Case Scenario
A 6 year old female is brought by her mother, her main complaint being having to rush to the toilet feeling she can’t hold her urine. This has been progressively worsening.
What questions need to be asked:
How often does she void?
Is there any nocturnal enuresis?
How often does she have bowel movements?
Does she have any urinary or fecal incontinence?
Has she had any UTI’s?
Does this happen at home and at school?
Does mother notice any posturing? Holding behaviors?

Case Scenario
A 9 year old female is brought by her parents, she has had several UTI’s over the years. They seem to be increasing in frequency. Her mother mentions that her daughter since starting school has resisted going to the toilet till she absolutely has to, often crossing her legs and pushing on her lower abdomen.
What questions need to be asked or information needed:
How many UTI’s over the last year? Febrile UTI’s?
Any documentation of positive urine cultures?
How often does she void?
How much does she void?
When did she start holding maneuver’s?
Does she strain or Valsalva void?
What is her post void residual?
Are toilet facilities an issue at school? Dirty? Perception of being unsafe? No privacy?
Voiding Dysfunction

- Abnormalities in either the filling and/or emptying of the bladder
  - Non-neurologic (40% of office visits):
    - Daytime incontinence—
      - Overactive bladder
      - Voiding postponement
    - Dysfunctional voiding (detrusor contractions during voiding against a closed external urethral sphincter; high voiding pressures predispose to infections, reflux and renal damage)
    - Nighttime incontinence or enuresis
  - Neurological (detrusor dyssynergy): congenital myelomeningocele, spinal cord trauma
  - Anatomy: ectopic ureter, ureterocele, posterior urethral valves (males only)
  - Associated dysfunction elimination (bowel bladder dysfunction): abnormalities in bowel and bladder emptying, especially in non-neurogenic patients

Ectopic ureter

Neurogenic bladder with severe high grade reflux
Neurogenic bladder with detrusor overactivity

Voiding Dysfunction

- Daytime frequency - voiding >8 times during waking hours, decreased daytime frequency is defined as <3 voids
- Incontinence - uncontrolled leakage of urine, continuous or intermittent
- Urgency - sudden, unexpected, immediate need to void
- Overactive bladder - abnormal detrusor contractions during filling, decreases with age from 7(20%) to 18(5%) years, association with nocturnal enuresis, constipation, fecal incontinence, history of urinary tract infections, delayed bladder control, and poor toilet facilities
- Nocturia - awakening to void at night

International Children's Continence Society (ICCS) Guidelines for children > 5 years old

- Hesitancy - difficulty in the initiation of voiding or waiting a considerable amount of time before voiding starts
- Straining - application of abdominal pressure (Valsalva maneuver) by the child to initiate and maintain voiding
- Weak stream - observed ejection of urine with a weak force
- Primary bladder neck dysfunction - delayed or incomplete opening of the bladder neck
- Intermittent stream - voiding stream of urine that occurs in several discrete bursts rather than the normal continuous stream. Normal physiologic pattern in children <3 years old
- Dysuria - burning or discomfort during voiding
**Voiding Dysfunction**

- Voiding postponement - habitually postpone micturition, develop an underactive bladder with weak detrusor contraction, large post void residuals, increased UTI’s, overflow incontinence; associated with behavior, female: male ratio of 5:1
- Holding maneuvers - observed behavior used to postpone voiding or suppress urgency, e.g. standing on tiptoe, forcefully crossing the legs, or squatting with a hand or heel pressed into the perineum
- Post micturition dribbling - involuntary urine leakage immediately after completion of voiding in children who have achieved bladder control regardless of age
- Giggle incontinence - leakage only with laughter, mainly in girls
- Vaginal Voiding - leakage after standing, if legs pressed together during voiding, urine temporarily trapped in the vagina

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**“Vincent’s curtsy”**

- Urinary withholding maneuver
- Appears to be doing a curtsy
- Occurs during strong bladder contraction
- Moving the child from this position produces gross urinary incontinence

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**“Vincent’s curtsy”**

- Heel is lodged against the perineum to enhance external urethral sphincteric activity
Case Scenario

A 10 year old female is being seen for a routine visit. Her mother mentions that she still has accidents at night. Her daughter is very embarrassed and admits that this is really upsetting her.

What questions need to be asked or information needed:

- Does she have diabetes, thyroid or renal disease?
- Any history of seizures?
- What is her normal bowel movement frequency? Any constipation?
- Is she obese? Does she snore? Can sleep apnea be a factor?
- Any rectal itching? Pinworms?
- Does she have any daytime bladder symptoms? Any urgency?
- Does she have to strain in the daytime?
- Does she have dribbling after urination?
- Any history of UTIs?
- Does the child drink before bedtime? Drinking pattern?

Voiding Dysfunction

Enuresis (intermittent nocturnal incontinence): discrete episodes of urinary incontinence during sleep in children ≥5 years of age

- Monosymptomatic: no symptoms or bladder dysfunction; decreases from 15% age 5 to 1% by age 15; ratio female to male 1:2; Causes are:
  - Delayed maturation gross motor
  - Smaller bladder capacity
  - Genetic predisposition
  - Nocturnal polyuria - decreased ADH, blunted response to ADH, inc fluids
  - Detrusor overactivity rarely
  - Deep or disturbed sleep
- Non-mono symmetric: with symptoms or bladder dysfunction
- Primary: children who have never achieved a satisfactory period of nighttime dryness (80%) vs secondary: enuresis after a dry period of ≥6 months, ascribed to an unusually stressful event. Stool retention and suboptimal daytime voiding habits also may play a role
- Need to exclude: diabetes, thyroid dysfunction, seizures, constipation, UTI, chronic renal disease, spinal dysraphism, sleep apnea, pinworms
- Treatment: reassurance & reward, change timing of fluid intake, enuresis alarms, desmopressin or tricyclic antidepressant(imipramine)
Case Scenario

A 7 year old is brought by her mother for urinary symptoms that include urgency and straining while voiding. She complains of lower abdominal pain frequently. Her mother states that she pushes hard when she urinates. She is a picky eater and does not like vegetables. She has an upcoming appointment with a pediatric GI specialist as she has trouble with bowel movements.

What questions need to be asked or information needed:

- Has she had any UTIs?
- How often does she void?
- What is the volume voided?
- Does she avoid the bathroom?
- What is the frequency of bowel movements?
- Does she have any urinary or fecal incontinence?
- Does this happen at home and at school?
- When does she have pain? Any relationship with micturition or bowel movements?

Voiding Dysfunction

Associated comorbidities:

- UTI: predisposition to recurrent UTI's, possible renal damage
- Vesicoureteral reflux: seen in overactive bladder, higher filling pressures (40cm H2O) with increased risk renal damage
- Constipation: in 30-90% of patients; rectal distension with direct mass effect, urethral & anal sphincter affected similarly with prolonged contraction, large volume urine & stool with dyssynergy pelvic floor, increased parasympathetics with colon distension
- Behavioral/psychiatric issues:
  - prolongation of infantile bladder behavior
  - abnormal acquired toilet training habits
  - learned process
  - voiding postponement from limited access to bathrooms, privacy and cleanliness issues, or active discouragement of voiding
  - an association with ADHD

Bowel bladder dysfunction (Dysfunctional elimination syndrome)

Includes bladder overactivity (urge), increased or decreased voiding frequency, and bladder underactivity. Associated with vesicoureteral reflux

Can be constipation but also encopresis

Functional constipation (Rome III criteria): 2 symptoms over 2 months

- At least one episode of fecal incontinence per week
- History of retentive posturing or excessive volitional stool retention (stool withholding)
- History of painful or hard bowel movements
- Presence of a large fecal mass in the rectum
- History of large-diameter stools that may obstruct the toilet

Factors affecting bowel habits:

- History of painful evacuation
- Difficulties with toilet training
- Stool withholding
- Introduction of cow’s milk
- Diet: low fiber content (few fruits or vegetables) and low fluid intake
Voiding Dysfunction

Evaluation:
- Hx:
  - Perinatal hx: neonatal injury, infection and Hx of - any delay in development
  - Family hx: urologic disorders
  - Bladder symptoms: urgency, bedwetting, posturing
  - Prior UTI's
  - Diet - fluid intake, foods consumed
  - Toilet training - details, any conflicts
  - Bowel habits - frequency, size, consistency, caliber, associated pain, incontinence, postponement
  - Social hx / Family conflicts / stressors
- ROS:
  - Nausea, weight loss, fatigue, excessive thirst, polyuria, abdominal pain
  - Neck - adenotonsillar hypertrophy
  - Abdomen - distension
  - Lower back - presacral dimple, hair patch, lipoma, or asymmetric gluteal cleft
  - Neuro:
    - LE strength, fine motor, perineal sensation, anocutaneous reflex, rectal tone
    - Pelvis / rectal:
      - Inspection of external genitalia and anus, adhesions, skin excoriation, dermatitis, pinworms, fecal contamination, fissures, hemorrhoids, signs of abuse
    - Observed voiding:
      - for hesitancy, dribbling, pain, intermittent or weak stream, deviation, valsalva or straining

Voiding & stool diary: 3 days; fluid intake, frequency voids / stool / incontinence, volume of voids
- UA, UCC
- Intake diary: in refractory cases, noting caffeine & soda, also volume & timing
- Uroflowmetry - shape of flow, voided volume, flow time, max flow rate, average flow rate (normal > 15cc/sec); expected bladder capacity (age plus 2 x 30) can be compared with volume voided plus PVR

Urodynamic imaging as needed:
- Ultrasound:
  - Renal & bladder: duplicated system, abnormal anatomy, hydronephrosis, PVR > 20cc, bladder wall thickening > 3.5 mm, bladder displaced upwards, rectal diameter measurement
- Voiding cystourethrogram - any vesicoureteral reflux or “spinning top urethra”, constipation on scout film
- MRI - LS spine

Urodynamic testing - rarely required, most cases of bladder dysfunction are due to functional causes in which behavioral therapy is successful in bladder function retraining and improvement of symptoms
Uroflowmetry

Staccato voiding pattern  Valsalva voiding

Bowel bladder dysfunction - displaced bladder, stool in rectum

Bowel bladder dysfunction - thickened bladder wall

Bowel bladder dysfunction - displaced bladder, stool in rectum
Bowel bladder dysfunction - displaced bladder, stool in rectum

Constipation

‘Spinning top’ urethra with reflux
Voiding Dysfunction

Treatment:
- Voiding behavior modification including timed voiding regimen q 2-3 hrs, modified volume intake; keep a diary
- Proper posture when voiding, no Valsalva or strain
- Diet change - caffeine, carbonated beverages, chocolate, citrus decreased; increase fiber
- Treat constipation - polyethylene glycol(osmotic laxative) over a prolonged period, mineral oil, milk of magnesia; senna & bisacodyl 2nd line
- Pelvic floor muscle exercises - relaxation, biofeedback
- Avoid risk factors for vulvovaginitis - bubble baths
- Reward for success in keeping with timed regimen
- Intermittent catheterization - in under active bladder patients with large PVR

Voiding Dysfunction-Medications

Treatment with medications - used 1-2 months post conservative management & behavior modification failure
- For detrusor overactivity-anticholinergic blocking muscarinic 3 receptor; main s.e, are constipation(20%), dry mouth & flushing(15%)
  - Oxybutynin(Ditropan XL): under 5 years old 0.2mg/kg po bid-qid, max 15mg/day & over 5 years old 2.5-15mg q day
  - Hyoscyamine (Levans): 0.0625-0.125mg PO/SL q 4hrs prn, max 0.75mg/day
- For urinary retention & neurogenic bladder:
  - Dosesin(Cardura):alpha 1 adrenergic receptor antagonist with bladder neck smooth muscle relaxation; limited data, may be beneficial in non-neurogenic dysfunctional voiding and primary bladder neck dysfunction.
  - Bethanechol(choline):stimulates cholinergic receptor. 0.6mg/kg/day tid dosing
- For enuresis:
  - DDAVP(Desmopressin): 0.0-0.4mcg po qhs
  - Imipramine(Tofranil): 10-75mg po qhs, inhibits norepinephrine & serotonin reuptake, for nocturnal enuresis
- No pediatric indication yet— anticholinergics--tolteridine, darifenacin, solifenacin, trospium

Case Scenario

A 16 year old patient comes in complaining of stress incontinence, in her history you discover she is a serious athlete in track and cross country.

What questions need to be asked or information needed:
What is the fluid intake?
When do they feel wet? Only with bladder feeling full?
Any leaking with laughter or coughing?
Any constipation?
Any nocturia?
Do you know where the bathrooms are? In school? At the mall?
Do you leak when you giggle?
Case Scenario

A 15 year old female comes in and states she has lifelong incontinence and a history of UTI’s. She had prior evaluation at age 5, diagnosed with dysfunctional voiding pattern, no follow up since. She complains of urine rushing out, no awareness, but has improved continence with use of atampon. US/VCUG/MRI/Cystoscopy all negative.

What questions need to be asked or information needed:

What is her pattern for bowel movements?
Does she have urgency?
Does she posture and hold urine?
How does she know she has UTI’s? Any febrile episodes?
Does she use the school bathroom?
How often does she void?
Is there any nocturnal enuresis?
Does she have any urinary or fecal incontinence?

Case Scenario

A 4 year old is brought in by her mother with complaints of recurrent external rashes in the perineal area, pain with urination and some discharge seen in the underwear. She loves playing in the bath with bath oils and soaps. She has taken empiric antibiotics for presumed UTI twice. The last 2 vux are negative and contaminated respectively. On examination, the labia majora are slightly erythematous, there is suprapubic excoriation and the child admits to scratching and rubbing. The introitus has an exam with Vulva some grey-white discharge, no foreign body.

What is the diagnosis?

Vulvovaginitis and lichen chronic simplex

What is the treatment?

Stop baths with added oils/soaps, use Mycolog 2 externally, treat the bacterial vaginosis and possible yeast with metronidazole and diflucan

Additional questions: Ask about wetting symptoms and posturing.

Vesicoureteral reflex (VUR)

VUR: retrograde passage urine to upper tracts, predisposes to pyelonephritis and renal parenchyma loss with scarring, most common urologic anomaly; associated with wetting problems

Goal: identify & prevent recurrent UTI’s & renal damage as increasing severity of VUR is associated with increased risk of febrile urinary tract infection (UTI) recurrence and renal scarring, and a decreased likelihood of spontaneous resolution

Treatment:

• Antibiotic prophylaxis qhs (trimethoprim, sulf, nitrofurantoin) especially in bowel-bladder dysfunction group reduced symptomatic UTI’s but did not reduce renal scarring and increased the risk for resistant bacteria
• Surgical correction - reimplantation, success > 95%, subureteric transurethral injection of dextranomer/hyaluronic acid (DEFUX), success > 60-90%, delayed failure rate 5-25%
• Long-term renal outcome (recurrent UTI and scarring) is comparable in patients treated with either prophylactic antibiotics or surgical correction
International classification of vesicoureteral reflux (VUR)

Vesicoureteral reflux, grade 3-4

Urinary Tract Infections

Etiology:
• Anatomic:
  • Neurogenic bladder
  • Posterior urethral valves
  • Duplicated system
  • Urethral stenosis (defected urinary stream)- needs meatotomy
  • Bladder dysfunction
    • Bowel/bladder dysfunction - abnormal elimination pattern, bladder or bowel incontinence, withholding/postponement behavior; very common, often overlooked
• Dysfunctional voiding pattern with urinary retention
• Poor hygiene: associated vulvovaginitis
• Medical conditions: diabetes (20 fold increased risk), rare malignancy
• Post sexual activity
• Pathogeneic colonization periurethra with uropathogenic bacteria
Urinary Tract Infections

Presentation:
- Prevalence 7-8% in febrile children
- Race: white 2-4 fold higher prevalence vs black
- Females 2-4 fold higher vs circumcised boys
- Prevalence 15% in white girls with temp >39°C
- Fever/Chills:
  - under age 2, a temp > 39°C may be the only symptom
  - suprapubic tenderness and prior hx UTI’s sometimes may be useful as discriminators
- Urinary symptoms: dysuria, frequency, incontinence, hematuria
- Flank, abdominal or back pain
- Constipation or vesicoureteral reflux history
- Older children with renal damage from unrecognized UTI’s present with short stature, poor weight gain, even hypertension

Diagnosis:
- Catherization strongly recommended unless the child cannot urinate for a clean catch
- Sterile bag collection may be inadequate
- Pyuria is common in true UTI’s
- Uropathogen >50,000 CFU/ml on catheterization requires treatment
- Concomitant vulvovaginitis may present with urinary symptoms, 8 fold higher risk for positive UTI
- Greater than 50% of UTI patients have concurrent vulvovaginitis, usually E. Coli or enterococcus in preadolescent girls
- Group A streptococcus may present as a UTI
- E. Coli in 80% of UTI’s, also other gram negatives -- Klebsiella, Proteus, Enterobacter, Citrobacter, gram positives -- Enterococcus & Staph
- Recurrent UTI’s - in 6 months 3 febrile UTI’s

Treatment:
- Antibiotics, fluids, pyridium

Left kidney diminished function
Right kidney upper pole scarring

LT. POSTERIOR RT.
3 HOURS POST INJECTION

DMSA renal scan in patient with recurrent pyelonephritis
Urethral Prolapse Vs Caruncle

Urethral prolapse: circumferentially everted mucosa at meatus, edematous, nontender, doughnut shaped, often presents as bleeding

Urethral caruncle: eversion posterior edge distal urethra; hyperplastic urothelial & squamous epithelium; chronic irritation with inflammation, presents as pain with urination

Treatment: estrogen 1-2 times a day for 2-3 months; success > 75%; if unsuccessful, then excision
Ureterocele

Ureterocele:
- Terminal ureter cystic dilation, a “diverticulum” due to a stenotic ureteral orifice
- Intravesical in bladder or
- Ectopic in urethra
- Female to male ratio is 4-6:1
- Association with the upper pole of a duplex collecting system in 80% of patients with 60% of these being ectopic
- Intravesical ureteroceles are more common in single systems
- Diagnosis: ultrasound, voiding cystourethrogram (VCUG), renal scan to assess relative function

Left ureterocele within bladder