Urology

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URINARY TRACT INFECTION (UTI)

Definitions

- Sterile pyuria: Presence of white cells in the urine in the setting of a negative culture (≥ 3 WBC hpf or positive leukocyte esterase on dipstick)
- Asymptomatic bacteriuria: Urine culture with significant bacterial colony count in an asymptomatic patient
- Uncomplicated UTI: Positive urine culture in a symptomatic patient (frequency, urgency, new urinary incontinence)
- Complicated UTI: Urine culture with significant bacterial colony count and associated urologic abnormalities (hydroureter, hydronephrosis, and vesicoureteral reflux)
- Pyelonephritis: Positive urine culture plus fever

Background

- Most UTIs are bacterial infections of the mucosal surface of the urinary tract
- The infection may occur anywhere from the urethra to the renal parenchyma
- A temperature greater than 38 ° C may help to differentiate acute pyelonephritis from lower tract UTI
- The most common organism causing UTI in children is *Escherichia coli*
- Other bacterial pathogens include *Pseudomonas aeruginosa* (non enteric Gram negative), *Enterococcus faecalis*, *Klebsiella pneumoniae*, and group B *Streptococcus* (predominantly in neonates)
- Most UTIs in sexually active females are caused by *E. coli* or *Staphylococcus saprophyticus*
- Diagnosis of UTI depends on obtaining accurate urine culture findings (Table 25.1)
- No laboratory tests can reliably distinguish cystitis from pyelonephritis

Risk factors

- Constipation is a high-risk factor for recurrent UTI
- Uncircumcised male infants

Table 25.1 General criteria to diagnose a urinary tract infection

Method of urine collection	Interpretation
Bag collection	Not recommended. However, if done, and urine analysis is suggestive of an infection, a catheterized or suprapubic aspiration must be completed. If culture is sent, there is high false-positive rate
Urethral catheterization	Pyuria on urine analysis *and* > 50,000 colony forming units/ml of a uropathogen on culture
Midstream urine analysis	
Suprapubic aspiration	

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- Dysfunctional elimination syndrome (bowel bladder dysfunction, including urinary holding behaviors)
- Indwelling or intermittent catheterization
- Anatomical abnormalities, including vesicoureteral reflux and bladder outlet obstruction

Clinical presentation (by age group)

- Presence of fever and urine infection is highly suggestive of pyelonephritis
- **Newborn (birth–1 month)**
  - Fever
    - May be the only presenting symptom without a clear source of infection
    - Temperature elevations greater than 38.0 °C are indicative of upper UTI
- **1 month–24 months**
  - Fever, hypothermia, vomiting, difficulty feeding, cloudy or malodorous urine, frequency, irritability, hematuria, or failure to thrive
- **Preschool (2–6 years)**
  - Abdominal pain, suprapubic pain, costovertebral angle pain, dysuria, urgency, or incontinence (day- or nighttime) in a previously toilet-trained child
  - Pyelonephritis in young children is more likely to manifest as vague abdominal discomfort rather than as the classic flank pain and tenderness observed in adults

Imaging

- Ultrasonography
  - Renal ultrasonography is the safest and fastest method for detecting congenital renal and urinary tract anomalies such as hydronephrosis
- Cystography
  - Fluoroscopic voiding cystourethrography is the gold standard for diagnosing vesicoureteral reflux
  - Other methods include radionuclide cystogram and contrast-enhanced ultrasound
- Renal scan
  - Dimercaptosuccinic acid (DMSA) scintigraphy currently is the accepted gold standard for diagnosing acute pyelonephritis and renal scarring
  - For the purpose of diagnosing renal scarring, DMSA scintigraphy should be performed 3 months after acute infection to allow resolution of acute reversible lesions

Acute management (review American Academy of Pediatrics [AAP] guidelines)

- Uncomplicated UTI: Trimethoprim-sulfamethoxazole (TMP-SMX) twice a day or appropriate culture-specific antibiotics for 3–7 days
- Acute pyelonephritis: 7–10-day oral regimen if > 3 months and if able to maintain hydration as an outpatient. Recommend urology referral

Management of recurrent UTI

- Referral to urology for further workup for anatomical abnormalities and discussion of prophylaxis antibiotics. Prophylaxis antibiotics are not always indicated. While prophylaxis antibiotics may decrease UTIs, there is increased risk of bacterial resistance in those on prophylaxis antibiotics. There are no studies that demonstrate its efficacy in reducing renal scarring
- Common prophylaxis regimens
  - TMP-SMX: 2 mg/kg as a single daily dose or 5 mg/kg twice a week
  - Nitrofurantoin: 1–2 mg/kg as a single daily dose

Vesicoureteral Reflux (VUR)

Background

- VUR or the retrograde flow of urine from the bladder into the ureter
- Anatomic and functional disorder that can result in substantial morbidity, both from acute infection and from the sequelae of reflux nephropathy

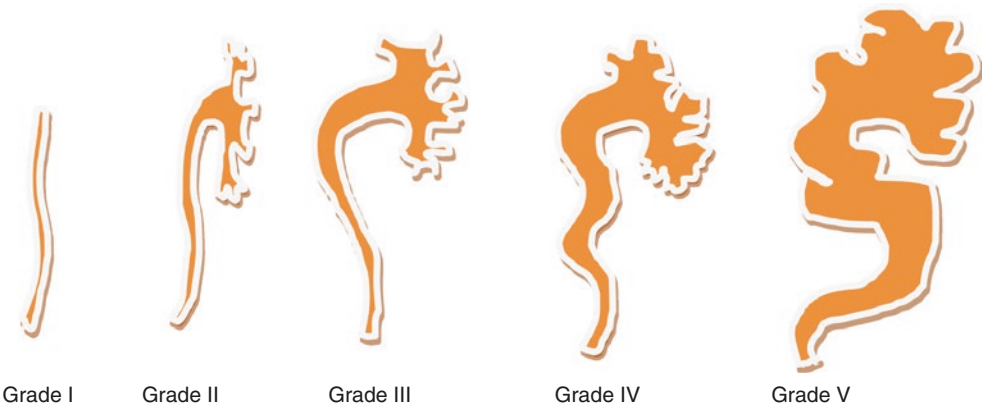

Fig. 25.1 Grades of vesicoureteral reflux (VUR)

International Classification System for VUR (Fig. 25.1)

- Grade I—Reflux into non-dilated ureter
- Grade II—Reflux into renal pelvis and calyces without dilation
- Grade III—Reflux into renal pelvis and calyces with dilation
- Grade IV—Reflux with moderate ureteral tortuosity and dilation of pelvis and calyces
- Grade V—Reflux with gross dilation and tortuosity of ureter, pelvis, and calyces and loss of papillary impressions

Clinical presentation

- Children with VUR may present with hydronephrosis and/or pyelonephritis (febrile UTI)
- Hydronephrosis is often prenatally identified using ultrasonography
- Infants can manifest as failure to thrive with or without fever; other features include vomiting, anorexia, and lethargy
- Older children may report voiding symptoms or abdominal pain

Diagnosis

- Diagnosis is based on imaging studies
- Imaging with ultrasound after the first UTI is indicated in children of any age with febrile UTI
- Children with prenatally identified hydronephrosis (> 7 mm anteroposterior diameter of the renal pelvis) should be evaluated postnatally, with an ultrasound after 48 h of life
- **Voiding cystourethrography (VCUG)**
  - VCUG is the gold standard in the diagnosis of VUR, providing precise anatomic detail and allows grading of the reflux
- **Radionuclide cystography**
  - Lower radiation doses than with VCUG
  - This study provides less anatomical definition but has higher sensitivity in detecting reflux compared to VCUG

Management

- General principles of management in children with known VUR
  - Spontaneous resolution of VUR is common in young children with low-grade reflux
  - Severe reflux is unlikely to resolve spontaneously
  - Sterile reflux, in general, does not result in reflux nephropathy
  - Long-term antibiotic prophylaxis in children has been associated with increased antibiotic resistance
  - Surgery to correct VUR is highly successful
- Constipation is extremely common and may be a much more important etiologic factor than the reflux itself
  - Constipation is a higher risk factor for infection than reflux; it is extremely important that the constipation is addressed

- Time voiding and double voiding may improve symptoms of dysfunctional voiding and reduce the risk of infection in select patients
- Serum chemistries are used to assess for baseline renal function
- A complete blood count (CBC) report can assist in tracking the response to treatment
- Urinalysis helps to determine the presence of proteinuria, which indicates possible renal impairment

Antibiotic prophylaxis

- If used, it is started once a child has completed treatment of the initial UTI
- There are conflicting studies regarding the utility and efficacy of antibiotics in reflux. If used, the duration is based on shared decision-making between the parents and physician
- Discontinue if no VUR is seen on imaging studies
- Antibiotics are usually administered as suspensions once daily, typically in the evening to maximize overnight drug levels in the bladder
- In infants younger than 3 months, the agent of choice is amoxicillin
- For older children, the most common antibiotics used are TMP-SMX and nitrofurantoin

Accepted indications for surgical treatment

- Breakthrough febrile UTIs despite adequate antibiotic prophylaxis
- Severe reflux (grade V or bilateral grade IV) that is unlikely to spontaneously resolve
- Renal scarring on DMSA scan
- Parental choice
- Poor renal growth or function or appearance of new scars

Ureteropelvic Junction Obstruction

Definition

- Ureteropelvic junction (UPJ) obstruction is defined as an obstruction of the flow of urine from the renal pelvis to the proximal ureter
- UPJ obstruction is the most common obstructive lesion

Society of Fetal Ultrasound (SFU) grading of hydronephrosis

- Grade 1: Normal parenchyma with slight splitting of the renal pelvis
- Grade 2: Normal parenchyma with full renal pelvis and dilation of the major calyces
- Grade 3: Normal parenchyma dilation of the minor calyces
- Grade 4: Loss of normal parenchyma

Clinical presentation

- Maternal ultrasound may reveal fetal hydronephrosis
- Palpable renal mass in newborn infants
- Abdominal flank pain
- Febrile UTI
- Hematuria after minimal trauma
- More common on the left side

Diagnosis

- Renal ultrasound
- A VCUG is not always necessary in isolated UPJ obstruction but, to rule out urethral obstruction, should be considered in boys with bilateral hydronephrosis
- A ^{99m}Tc-mercaptoacetyltriglycine (MAG3) renal scan can be used once diagnosis is made to determine renal function and drainage

Management

- Ultrasound 48 h after birth
- Urology referral
- Low-grade hydronephrosis may resolve, but referral is appropriate
- If hydronephrosis is high grade (SFU grade 3 or 4), spontaneous resolution is less likely
- Surgical intervention and timing of intervention for an obstructed UPJ are dependent on imaging findings, history of UTIs, and shared decision-making between the family and physician

Ureterocele

Background

- Ureterocele is a cyst outpouching of the distal ureter into the urinary bladder, typically diag-

nosed after prenatal imaging demonstrating hydronephrosis
- Ureteroceles may be asymptomatic and present with a wide range of clinical signs and symptoms, from recurrent cystitis to bladder outlet obstruction or renal failure

Clinical presentation
- Prenatal imaging
- UTI
- Urosepsis
- Obstructive voiding symptoms
- Urinary retention
- Failure to thrive
- Hematuria
- Cyclic abdominal pain
- Ureteral calculus

Diagnosis
- The first-line imaging study for evaluating the upper and lower urinary tract in children is renal and bladder ultrasonography
- VCUG is essential to evaluate the lower urinary tract for a ureterocele, posterior urethral valve (PUV), ectopic ureter, and vesicoureteral reflux

Management
- Observation alone is rarely a good option in symptomatic ureteroceles
- Antibiotic prophylaxis starts in newborns with prenatal diagnosis of ureterocele
- Indication for surgery depends on the site of the ureterocele, the clinical situation, associated renal anomalies, and the size of the ureterocele

Posterior Urethral Valves (PUV)

Background
- The most common cause of severe obstructive uropathy in male infants
- Posterior urethral dilation, bladder muscle hypertrophy, hydronephrosis, renal dysplasia, and renal failure will depend on the severity of obstruction

Clinical presentation
- PUV should be considered if there is inability to empty bladder or weak urine stream
- If unrecognized during the neonatal period, may present later with failure to thrive, uremia, sepsis, and renal failure
- If less severe, may present with UTI or urinary incontinence at later age

Diagnosis
- Established with VCUG

Treatment
- Transurethral ablation of the valve leaflets by endoscopy

Female Urethral Prolapse

Background
- Urethral prolapse is a circular protrusion of the distal urethra through the external meatus. It is a rarely diagnosed condition that occurs most commonly in prepubertal black females and postmenopausal white women
- Risk factors for urethral prolapse in children include increased intra-abdominal pressure as a result of chronic coughing or constipation

Clinical presentation
- Vaginal bleeding associated with urethral mass is the most common presentation

Management
- Treatment of urethral prolapse ranges from applications of estrogen creams to sitz baths
- Surgery may be indicated in severe, persistent, or symptomatic cases

Prune-Belly Syndrome (Eagle-Barrett Syndrome)

- Deficient abdominal muscles
- Undescended testes
- Urinary tract abnormalities
- Massive dilation of ureters and upper tracts

- Very large bladder oligohydramnios and pulmonary hypoplasia
- Various degrees of renal dysplasia

Urinary Incontinence

Background

- Most children will have control of micturition by age 4–5 years

Causes

- UTI
- Constipation
- Child abuse
- Psychosocial stressor
- Back or sacral anomalies and underlying spinal cord malformation
- Labial adhesions resulting in incontinence from vaginal voiding
- Female epispadias
- Ectopic ureter
- Bladder outlet obstruction

Clinical presentation

- Ectopic ureter: Continuous urinary leakage
- Detrusor instability: Signs of urinary urgency, such as bouncing up and down
- Stress incontinence: Occurs with Valsalva, coughing, or sneezing

Diagnosis

- Depends on history and physical examination
- Urinalysis and urine culture
- Renal ultrasound
- Magnetic resonance imaging (MRI) on the back if spinal cord or vertebral malformation is suspected
- Assessment of constipation

Treatment

- Depends on the etiology of incontinence
  - Ectopic ureter: Surgical
  - Detrusor instability
    - Behavior modification (i.e., timed voiding, address constipation)
    - Medication (i.e., anticholinergics such as oxybutynin, mirabegron)
    - Surgical (Botox injection)
  - Stress incontinence. This is more commonly seen in the adult patient; however, it may be seen in very athletic children (especially girls)
    - Behavior modification (i.e., timed voiding)
    - Pelvic floor strengthening exercises (Kegel exercises)
    - Surgical intervention (i.e., injection of bulking agents, placement of artificial sphincters or slings). Treatment is tailored to each patient and clinical situation

Bladder Exstrophy

- Bladder exstrophy is the externalization of the bladder plate on the anterior abdominal wall
- Bladder should be covered with plastic wrap to keep bladder mucosa moist
- Application of gauze or petroleum gauze should be avoided because significant inflammation will result
- Consult pediatric urologist

Hypospadias

Background

- The most common congenital anomaly of the penis
- The meatus can be in a ventral position from the distal penis to the perineum
- Some mild forms may not need surgical correction
- Associated with chordee, which is more severe in proximal hypospadias cases

Management

- If there is a complete foreskin, circumcision can be performed
- Consult a urologist for surgical decision-making and counseling

Phimosis

Background

- Phimosis occurs when foreskin cannot be retracted
- Most boys will be able to retract their foreskins by age 5 years old; however, some may not be able to until their teen years [1]
- Physiologic phimosis: Seen in all newborn males in normal development of congenital adhesions between the foreskin and glans
- Pathologic phimosis: Nonretractile foreskin secondary to scarring of the prepuce

Treatment

- In causes of pathologic phimosis, corticosteroid cream to foreskin may be tried prior to surgery
- Indications for circumcision include UTI and known anatomical abnormalities such as reflux, balanitis obliterans xerotica (BXO), and balanoposthitis

Paraphimosis

Description

- Paraphimosis is the inability to place the retracted foreskin to its anatomical position
- Foreskin retracted past the coronal sulcus may become edematous, making the replacement of the foreskin over the glans more difficult

Treatment

- Reduction is emergent and may require sedation and anesthesia
- Reduction can be done by compressing the penis to decrease edema, application of sugar or D50 on the edematous foreskin, and pinpricks to the foreskin to allow egress of the edematous fluid. The use of a penile block may be helpful

Balanoposthitis

Definition

- Inflammation and cellulitis of prepuce and/or glans penis

Treatment

- Topical steroids and topical or oral antibiotics
- Eventual circumcision may be indicated, especially if recurrent

Circumcision

AAP Circumcision Policy Statement [2].

- "Existing scientific evidence demonstrates potential medical benefits of newborn male circumcision; however, these data are not sufficient to recommend routine neonatal circumcision."
- "In circumstances in which there are potential benefits and risks, yet the procedure is not essential to the child's current well-being, parents should determine what is in the best interest of the child."
- "To make an informed choice, parents of all male infants should be given accurate and unbiased information and be provided the opportunity to discuss this decision."
- "If a decision for circumcision is made, procedural analgesia should be provided."

Indication of circumcision

- Many families choose to have their male infants circumcised for cultural, religious, or hygienic reasons. Only a few accepted medical indications are recognized: pathologic phimosis, history of paraphimosis, or balanoposthitis

Anatomic contraindication

- Hypospadias with incomplete foreskin
- Epispadias
- Ambiguous genitalia (including bilateral cryptorchidism or micropenis)
- In more severe cases of the following, circumcision may be left to the discretion of the urologist: chordee, penile torsion, penile webbing, and buried penis

Medical contraindications to neonatal circumcision

- Any current illness or medical condition that requires monitoring

- Age less than 12–24 h
- Known bleeding diathesis (e.g., hemophilia or thrombocytopenia)
- Disorders of the skin or connective tissue that would impair normal healing

Instruments usually used for circumcision

- Gomco clamp
- Plastibell device
- Mogen clamp

Complications

- Bleeding
- Infection
- Meatal stenosis
- Penile skin bridges

Education of the parents

- Instruct parents concerning the occurrence of physiologic childhood phimosis, which can last into the school-age years
- Stress the danger of forcibly retracting the foreskin for hygienic purposes
- The adhesions found between the inner prepuce and the glans naturally lyse
- The AAP does not recommend routine neonatal circumcision; however, if circumcision is performed, the AAP recommends the use of procedural analgesia [2]

Micropenis

Definition

- Stretched penile length from pubis to the tip of the penis < 2.5 cm

Causes

- Deficiency of gonadotropin secretion during the last two trimesters
- Testosterone insensitivity
- Kallmann syndrome
- Prader-Willi syndrome
- Panhypopituitarism

Treatment

- Testosterone may be beneficial in selected cases

Testicular Torsion

Background

- Testicular or spermatic cord torsion is an emergency
- It occurs in one in 4000 males < 25 years old
- Most commonly in boys age 12–18
- Most occurs in tunica vaginalis

Clinical presentation (Table 25.2)

- Acute onset of pain
- Nausea and vomiting
- Scrotal edema and redness
- Loss of cremasteric reflex
- High-lying horizontal testis

Diagnosis

- Color-flow Doppler ultrasound; decreased blood flow on the affected side

Management

- Rapid consultation by the urologist in suspected cases

Table 25.2 Differentiation between acute epididymitis and testicular torsion

Testicular torsion	Epididymitis
Inadequate fixation of testis within the scrotum	*E. coli* in young children, gonococcus, or *Chlamydia* after puberty is the most common cause
Sudden onset (hours)	Gradual onset (days)
Usually nausea and vomiting	Usually no nausea and vomiting
No dysuria, no frequency, no fever	May have fever, dysuria, frequency, and urethral discharge
No pyuria	Urinalysis usually reveals pyuria
Absent cremasteric reflex	Normal cremasteric reflex
Scrotum is swollen and testis is exquisitely tender and often difficult to examine	Tenderness and induration occurring first in the epididymal tail and then spreading
High-lying horizontal testis	Normal position testis
Absent or decreased blood flow in the affected testicle on US	Increased blood flow occurs with epididymitis on US
Immediate surgical exploration	Antibiotics, NSAIDS, scrotal support/elevation

- Obtain immediate scrotal ultrasound through the emergency department or urgent care. Do not delay imaging
- Immediate exploration, detorsion, and contralateral testicular fixation are required
- Manual detorsion may be attempted after obtaining a testicular ultrasound
- In the majority of cases, torted testis rotates inward (e.g., the left testis is rotated clockwise)

Prognosis
- Testes can be lost if the surgery was delayed as little as 4 h, and by 24 h, infarction is almost universal

Neonatal Testicular Torsion

Background
- Majority of the case is extravaginal torsion, which is the torsion of entire spermatic cord and testis
- This can be a prenatal event (occurs in utero) or a postnatal event (within the first 30 days of life)

Clinical presentation
- If the torsion occurred as a prenatal event, the testicle is likely nontender; however, it can be tender, depending on proximity of the event to delivery. Scrotum can be discolored
- If the torsion occurred as a postnatal event, there is usually acute tenderness, swelling, and overlying scrotal skin changes compared to previously known normal scrotal physical exam

Management
- Testicular salvage is rarely successful
- Contralateral testis should be fixed as precautionary measure

Testicular Appendage Torsion

Background
- Torsion of testicular appendix, which is a remnant of mesonephric tubule
- Often masquerades as testicular torsion or epididymitis

Clinical presentation
- Acute scrotal pain
- Pain can be mild to severe
- Often there is a palpable tender nodule at the superior or inferior pole of the testicle with blue discoloration (blue dot sign)
- Vertical orientation of the testes is preserved
- The cremasteric reflex is usually intact
- There is normal blood flow to the testicle
- A reactive hydrocele may be seen

Diagnosis
- Doppler ultrasound can differentiate between torsion of appendix and testis
- Testicular appendage torsion appears as a lesion of low echogenicity with a central hypoechogenic area

Treatment
- Usually resolves spontaneously
- NSAIDs

Cryptorchidism

Background
- Most common genital problem of newborn males
- Occurs in one-third of premature boys and in 3–4% of newborn males

Clinical presentation
- Diagnosis is made by physical exam
- Imaging is not indicated and should not be performed before evaluation by a pediatric urologist
- Undescended testis can be intra-abdominal, in the inguinal canal, ectopic in the perineum, or in the upper scrotum
- If the testis was down at birth, the diagnosis is more likely retractile testis
- Retractile testis can be pulled down to the bottom of the scrotum
- Most retractile testes eventually will end up in the scrotum

Treatment

- If the testicle has not descended by 6 months of age, refer to a urologist for evaluation
- The ideal timing for surgical intervention is between 6 and 18 months of age

Prognosis

- Undescended testes have increased risk of cancer even after surgical correction
- Subfertility: Bilateral undescended testes have been associated with infertility in about half of cases

Testicular Cancer

Background

- Accounts for approximately 1–2% of all pediatric solid tumors
  - Typically occurs between ages 2 and 4 and then at puberty
- Compared to postpubertal testicular tumors, prepubertal testicular tumors are more commonly benign and, if malignant, then to have better prognosis
  - Teratoma is the most common benign testicular tumor in prepubertal boy
- Germ cell tumors are the most common pediatric testicular tumor
  - Yolk sac tumor is the most common testicular tumor in prepubertal boys

Clinical presentation

- Painless testicular mass (most common presentation). Occasionally detected in the setting of some other scrotal pathology such as hydrocele, epididymitis, and testicular torsion

Diagnosis

- Testicular ultrasound
- Tumor markers (AFP, LDH, β-HCG)
- Staging imaging: CT abdomen/pelvis
- Pubertal patients should be encouraged to perform regular self-exam

Management

- Urgent same-day referral to a pediatric urologist or to the emergency department. Once the diagnosis of a testicular tumor is made, surgical management should not be delayed
- Surgical: Radical orchiectomy

Varicoceles

Definition

- Abnormal dilation and tortuosity of the testicular vein and pampiniform plexus of spermatic cord
- Occurs most often on the left side. If present on the right, consider obtaining an abdominal ultrasound to evaluate for any renal or retroperitoneal masses

Clinical presentation

- Most patients are asymptomatic
- Larger varicocele may feel and appear like a bag of worms
- Testicular size must be checked for any asymmetry
- Can contribute to infertility in some cases
- Can cause scrotal pain

Management

- Obtain renal ultrasound
- Surgery may be indicated if there is reduced testicular growth, infertility, or pain

Hydroceles

Background

- Hydrocele is due to failure of fusion and obliteration of the processus vaginalis
- Noncommunicating hydroceles usually resolve by 1 year of age

Management

- Observation

- The following factors indicate hydrocele repair: Failure to resolve by age 2 years, continued discomfort, parental preference

Inguinal Hernia

Background
- Develop in 1–5% of children
- 5 to 10 × more common in boys and is more common in premature infants

Presentation
- Painless mass in the groin, which can contain abdominal contents that may wax and wane in size
  - This bulge may be present only in situations of increased abdominal pressure, such as in Valsalva maneuvers, crying, or straining

Management
- Inguinal hernias do not spontaneously heal and must be surgically repaired
- All pediatric inguinal hernias require operative treatment to prevent the development of complications such as inguinal hernia incarceration or strangulation
- Generally, a surgical consultation should be made at the time of diagnosis and repair

Kidney Stones

Background
- Urolithiasis is an uncommon disease in children, but recent studies have demonstrated an increasing incidence in the pediatric population
- Types of kidney stones
  - Calcium oxalate 40–65%
  - Calcium phosphate 14–30%
  - Struvite 10–20%
  - Cystine 5–10%
  - Uric acid 1–4%

Causes
- The most frequently reported abnormalities in children are hypercalciuria and hypocitraturia
- Struvite stones
  - Can grow quickly and form a large staghorn calculus with the bacteria becoming trapped in the stone
  - Proteus is the most common urease-forming bacterial species
  - Recurrent UTIs are the greatest risk for developing struvite stones

Clinical presentation
- Pain, usually colicky
- Dysuria and frequency
- Passage of blood, stones, or gravel
- Look for signs of renal or other metabolic diseases such as renal tubular acidosis, Dent disease, or Lesch-Nyhan syndrome
- Family history
- Dietary history

Diagnosis
- Urinalysis and urine culture
- Urine pH (< 6 for uric acid stones)
- Complete metabolic panel
- Uric acid
- Urine calcium (Ca) and creatinine
- 24-hour metabolic urine evaluation

Imaging
- Renal ultrasonography
- CT scan without contrast. Consider low-dose CT scan

Management
- The greatest risk factors for calcium kidney stone formation are low fluid and high sodium intake
- Decrease the risk of Ca oxalate by limiting intake to a modest amount of high-oxalate foods such as nuts and chocolates
- Recommended dietary allowance (RDA) should be encouraged

- No added salt diet
- Moderate amount of animal protein consumption
- Avoidance of excess vitamin C
- Thiazide diuretic if hypercalciuria and does not respond to a restricted sodium diet
- Antibiotic for infection-related (struvite)
- Flomax (medical expulsive therapy) to help with stone passage

Surgical treatment

- Most stones smaller than 5 mm pass spontaneously in children and do not require surgical intervention
- Stones that are larger than 5 mm may require nephrolithotomy or lithotripsy or endoscopies

Urethral Injuries

Background

- Trauma to the male urethra must be efficiently diagnosed and effectively treated to prevent serious long-term sequelae
- The etiology of a urethral injury can be classified as blunt or penetrating
- Iatrogenic injuries to the urethra occur when difficult urethral catheterization leads to mucosal injury with subsequent scarring and stricture formation
- Diagnosis of urethral injuries requires a reasonably high index of suspicion

Clinical presentation

- Hematuria or inability to void
- Decreased stream
- Blood at the meatus may be seen

Diagnosis

- The diagnosis of urethral trauma is made by retrograde urethrography

Management

- Consult pediatric urologist
- Bladder drainage must be established. Depending on the injury, the urologist may place a catheter or consider draining the bladder with a suprapubic catheter followed by delayed evaluation and reconstruction
- Surgical repair depends on the severity of injuries

PEARLS AND PITFALLS

- Refer children with recurrent febrile UTIs to a pediatric urologist for further anatomical workup and management. The decision regarding prophylactic antibiotics and their management is complex and should be shared by family and physician.
- The diagnosis of a UTI is based on a child having both symptoms and a positive urine culture.
- Refer children to a urologist if a testicle has not descended by 6 months of age.
- Testicular torsion accounts for 20–30% of acute scrotum cases and is a surgical emergency. All families with boys should be counseled and educated about testicular torsion, as it is common for boys to delay notifying an adult of symptoms due to embarrassment.
- Pubertal patients should be encouraged to perform regular self-exam.

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