The Male Genital System

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Education Gaps

Clinicians should be able to recognize common disorders of the male external genitalia, differentiate urgent from more benign conditions, perform initial diagnostic studies when indicated, treat appropriately, and refer to a specialist when necessary.

Objectives

After completing this article, readers should be able to:

1. Understand basic embryologic events in development of the male external genitalia.
2. Diagnose hypospadias and recognize associated disorders.
3. Differentiate micropenis, buried penis, and webbed penis.
4. Differentiate physiologic phimosis from pathologic phimosis and treat accordingly.
5. Recognize penile trauma.
6. Identify and manage cryptorchidism.
7. Establish a differential diagnosis of acute scrotal pain and treat accordingly.

EMBRYOLOGY

Male genital differentiation begins with the Y chromosome. During normal development, the sex-determining region Y chromosome (SRY gene) codes the bipotent gonad to undergo a male phenotype. (1) The origins of the testis can be traced back to the 5th week of gestation with formation of the gonadal ridge, an area where primordial germ cells migrate before differentiating. (1) The testicle is composed of both Leydig and Sertoli cells. The SRY gene helps drive differentiation of Sertoli cells that produce Mullerian inhibiting substance, also known as anti-Mullerian hormone, which prevents female pattern development. The Leydig cells, when stimulated by placental gonadotropin, also known as human chorionic gonadotropin, will produce testosterone. Primordial germ cells destined to become male gametes remain quiescent until puberty, when seminiferous tubules mature. (2) Movement of the testis in the retroperitoneum is regulated by insulinlike hormone and androgens during the transabdominal migration.
phase, occurring at 10 to 15 weeks, and during the transinguinal phases of descent, occurring at 25 to 35 weeks. (3) During this process, a sliver of peritoneum enters the scrotum, forming the tunica vaginalis that lines the anterior surface of the testis. (4) Because the testis begins development in the retroperitoneum, the blood supply originates from the abdominal aorta near the renal vessels.

The genital tubercle is the undifferentiated phallus that becomes the clitoris in females and the penis in males. After the 8th week of gestation, high levels of testosterone, owing to male differentiation, stimulate the genital tubercle to form the penis. (5) The urethral groove appears in the ventrum and is flanked laterally by the urethral folds. (6) The penile urethra forms with medial folding of the urethral folds from proximal to distal, creating a urethral seam eventually fusing in the midline. (5)(6) When this process is disrupted, hypospadias will occur. The urethral seam is secondarily canalized, forming the penile urethra. As the phallus elongates, ectoderm forms the penile skin, and mesoderm gives rise to the corpora cavernosa and subcutaneous tissue located dorsal to the urethra. (1) The most distal aspect of the penis is the glans penis, which is typically obscured by the prepuce in newborns (Fig 1).

**PENIS**

**Hypospadias**

Hypospadias describes an abnormally proximal position of the urethral meatus. The condition is usually associated with ventral curvature of the penis, known as chordee, and abnormal foreskin, typically seen as an absence of ventral foreskin and excess dorsal foreskin, creating a “hood” (Fig 2). (7) Patients are typically asymptomatic, and the finding occurs during routine neonatal evaluation and examination of the penis. Of note, the presence of congenital chordee and “hooded” foreskin may be present with a normally placed meatus, which sometimes prompts the inaccurate diagnosis of hypospadias. (7)(8) The exact cause of hypospadias is unclear, but the disorder may be understood as incomplete or arrested development of the penile urethra. This is a very common condition with an estimated mean prevalence of 34.2 per 10,000 births according to a recent literature review. (9) Most cases are idiopathic and isolated, but the astute clinician should be wary of associated disorders such as Mowat-Wilson syndrome. (10)(11) The combination of hypospadias and cryptorchidism should alert the clinician that a disorder of sexual development may be present. (12) Performing a karyotype to confirm male genotype is prudent. Treatment of hypospadias is surgical. Because corrective surgery may be complex and require local tissue transfer, attempts should be made to avoid circumcision at birth. Surgical repair is usually performed at approximately 6 months of age.

**Micropenis**

A penis that appears smaller than “normal” may raise concern for micropenis; however, other conditions must be considered as well. Two diagnoses that may be mistaken for micropenis include buried penis and penoscrotal webbing. Congenital buried penis refers to a developmentally normal penis that is obscured below the preputial skin. (13) The acquired state is typically due to penile adhesions or a large suprapubic fat pad. (14) A loss of the ventral penoscrotal angle, or even penoscrotal fusion, leads to a webbed penis. (14) Circumcision should be deferred in the neonatal period when a webbed penis, buried penis, or micropenis is diagnosed. These conditions do not typically exhibit any genitourinary symptoms but are discovered on physical examination. When examining patients to differentiate the aforementioned entities, the penis must be properly measured by assessing the stretched penile length. This is performed by holding the tip of the penis between the thumb and forefinger and stretching it. The
distance from the pubic symphysis to the tip of the stretched penis will determine the penile length. True micropenis is 2.5 SD or more below the mean stretched length for a patient's age (Table 1). (15) Micropenis may be related to defects in hormone production (hypothalamus or testis) or in the penis (lack of end-organ response). Additional diagnostic studies include karyotype analysis and measurement of luteinizing hormone, follicle-stimulating hormone, testosterone, and Mullerian inhibiting substance levels. Pelvic sonography assesses the presence of Mullerian-derived organs. In general, medical therapy with testosterone replacement should be considered with the goal of obtaining an adequate penile length for normal sexual function, upright voiding, and acceptable self-image. (16) Intramuscular testosterone preparations as well as topical therapy have been described with efficacious results. (17)(18)(19) Lastly, consultation with an endocrinologist is obtained because these patients may need hormonal replacement for other deficiencies affecting the adenohypophysis.

Phimosis

The prepuce is redundant skin that covers the penile glans. Phimosis, which refers to the inability to retract the foreskin, is present at birth and resolves in most patients by 4 years of age but may persist until puberty (Fig 3). In the author's experience, this process may begin as late as 5 years of age, and should not prompt any concern in absence of pain or difficulty voiding. (20) This "physiologic" phimosis resolves over time with accumulation of smegma, which is white- or yellow-colored epithelial debris that helps to separate the foreskin from the glans penis. (21) This is not purulent discharge. Forceful retraction should never be attempted. No special care is needed for the uncircumcised male beyond routine hygiene. The clinician must distinguish physiologic from pathologic phimosis, which refers to the presence of a firm, hard, white ring of the distal foreskin that prevents retraction (Fig 4). Indications for treatment of the foreskin include recurrent balanitis (inflammation of the glans), balanoposthitis (inflammation of the foreskin and the glans), balanitis xerotica obliterans (lichen sclerosis), and severe scarring of the foreskin. Topical corticosteroid cream, typically betamethasone 0.5% or triamcinolone 0.1%, is highly effective for phimosis, with a recent Cochrane review reporting a greater than 2-fold chance of partial or complete resolution over placebo. (22) Circumcision may be

Figure 2. Features of hypospadias: abnormal prepuce creating a dorsal hood (top left), abnormal curvature (top right), and proximally located urethral meatus, in this case the meatus is located at the glans corona (bottom).
performed in refractory cases or based on parental preference. Phimosis should be distinguished from paraphimosis, a condition in which the prepuce is retracted and becomes trapped proximal to the coronal sulcus of the glans penis. Patients may present with significant penile pain or swelling of the distal penis as it becomes strangulated by the prepuce. Urgent treatment is needed because progressive edema of the prepuce leads to ischemia and necrosis of the glans. Reducing a paraphimosis is accomplished by compressing the prepuce to reduce edema, manually or with a gauze wrap, followed by exerting digital pressure on the glans penis while simultaneously pulling the foreskin over the coronal sulcus. Sedation or a penile block is often needed. Should manual reduction fail, a dorsal slit, that is, incising the prepuce, is performed to relieve the constriction. Active treatment may be sought after paraphimosis to prevent recurrence, although this view is not universally held. (21)

### TABLE 1. Penile Stretched Length in Healthy Males

<table>
<thead>
<tr>
<th>AGE</th>
<th>MEAN ± SD, CM</th>
<th>MEAN ± 2.5 SD, CM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neonate 30 wk of gestation</td>
<td>2.5 ± 0.4</td>
<td>1.5</td>
</tr>
<tr>
<td>Neonate 34 wk of gestation</td>
<td>3.0 ± 0.4</td>
<td>2.0</td>
</tr>
<tr>
<td>0–5 mo</td>
<td>3.9 ± 0.8</td>
<td>1.9</td>
</tr>
<tr>
<td>6–12 mo</td>
<td>4.3 ± 0.8</td>
<td>2.3</td>
</tr>
<tr>
<td>1–2 y</td>
<td>4.7 ± 0.8</td>
<td>2.6</td>
</tr>
<tr>
<td>2–3 y</td>
<td>5.1 ± 0.9</td>
<td>2.9</td>
</tr>
<tr>
<td>3–4 y</td>
<td>5.5 ± 0.9</td>
<td>3.3</td>
</tr>
<tr>
<td>4–5 y</td>
<td>5.7 ± 0.9</td>
<td>3.5</td>
</tr>
<tr>
<td>5–6 y</td>
<td>6.0 ± 0.9</td>
<td>3.8</td>
</tr>
<tr>
<td>6–7 y</td>
<td>6.1 ± 0.9</td>
<td>3.9</td>
</tr>
<tr>
<td>7–8 y</td>
<td>6.2 ± 1.0</td>
<td>3.7</td>
</tr>
<tr>
<td>8–9 y</td>
<td>6.3 ± 1.0</td>
<td>3.8</td>
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<tr>
<td>9–10 y</td>
<td>6.3 ± 1.0</td>
<td>3.8</td>
</tr>
<tr>
<td>10–11 y</td>
<td>6.4 ± 1.1</td>
<td>3.7</td>
</tr>
<tr>
<td>Adult</td>
<td>13.3 ± 1.6</td>
<td>9.3</td>
</tr>
</tbody>
</table>


![Figure 3. Physiologic phimosis. Note that the prepuce obscures the glans penis and the foreskin cannot be retracted.](http://pedsinreview.aappublications.org/Downloaded from http://pedsinreview.aappublications.org/)
Penile Trauma

Genital trauma in the pediatric population is infrequent, with a recent epidemiologic study finding genital trauma to represent 0.6% of all pediatric injuries. (27) Toilet seat-related accidents, which involve accidental falls onto the rim of the commode during voiding or the penis becoming entrapped between a toilet seat and commode, represent the most common forms of penile injury according to a study of nonsexual penile trauma. (28) The most common finding is glans ecchymosis, which responds to topical ointment therapy such as bacitracin or a combination ointment of neomycin, polymyxin B, and bacitracin. More severe injuries in the form of lacerations are repaired surgically. A high degree of suspicion should always be maintained for the possibility of sexual abuse. Clinical history that is incompatible or incongruent with physical examination should alert one to begin the process of involving child protective services.

TESTIS

Cryptorchidism

Cryptorchidism is a common condition, with a prevalence of 2.1% to 9%. (29)(30)(31)(32) This condition is readily identified during examination of the scrotum. In the event of an empty hemiscrotum, the groin should be palpated for a semisoft ovoid structure. Certain maneuvers may be used should the testis not be palpable. Gentle pressure may be applied over the groin while moving one’s hand toward the external inguinal ring. Using the other hand, the testis may be palpated in the upper scrotum as the testis is being “pushed” toward the scrotum. Another useful technique is applying soap to the examiner’s hands and slowly applying pressure over the groin while moving from the anterior superior iliac spine to the pubic tubercle. A testis in the groin will be palpated as it “pops” away as the examiner’s hand passes over. A large retrospective cohort study examining the fate of patients with congenital cryptorchidism found that full-term patients had the same rate of cryptorchidism at 6 and 12 months, suggesting that spontaneous descent is unlikely to occur after 6 months. (33) This is in concordance with American Urologic Association guidelines on cryptorchidism, which recommend that such patients be referred for surgical correction. Two consequences of cryptorchidism are of concern: infertility and malignancy. Lee et al (34) showed that paternity in control men was 93.2% and paternity in men who had a unilateral orchiopexy was 89.7%, and men who had a bilateral orchiopexy had a paternity rate of 65.3%. Also, there seems to be a correlation between early correction with
improved total testicular volume and sperm concentration. Regarding malignancy, a literature review concluded that 1) the overall relative risk of cancer is 2.7 to 8 compared with noncryptorchid patients, 2) surgical correction by age 10 to 12 years lowers the relative risk of developing malignancy to 2 to 3, and 3) there is no risk of the contralateral testis developing cancer. (35) Although orchiopexy does not seem to completely eliminate the risk of malignancy, surveillance of the formerly cryptorchid testis is simplified. If malignancies develop, they are usually seminoma in cryptorchid (inguinal or abdominal) testicles and nonseminomatous tumors in descended (formerly cryptorchid) testicles. Congenital cryptorchidism should be distinguished from a retractile testis, defined as “a gonad that can be brought down into the scrotum without tension despite a history of being above the scrotum most of the time,” before referring to a surgical specialist. (36) To distinguish this entity from congenital cryptorchidism, the testis is palpated in the upper scrotum or near the external ring and brought into the scrotum and held there. This allows the cremaster muscle, which is thought to be hyperactive in the retractile testis, to fatigue and relax. If the testis is retractile, it should remain in the scrotal position temporarily. (37) Surveillance is advised in these cases because there are reported rates as high as 32% of acquired cryptorchidism, which refers to the testis ascending after initially being in the scrotum. (38)(39) Surgical management of cryptorchidism is very successful, with a recent large retrospective study showing a 10% failure rate at 1 year and a 0.5% perioperative complication rate. (29) Referral should be made to those surgeons most experienced in managing cryptorchid testis for optimal outcomes.

Testicular Torsion

Acute-onset scrotal pain should prompt one to consider testicular torsion. The exact etiology of nontraumatic testicular torsion is unclear, but classically the “bell-clapper” deformity results in an abnormal superior and inferior fixation of the testis in the tunica vaginalis. (40) This allows axial rotation of the spermatic cord. Scrotal pain may be accompanied by scrotal swelling, nausea, vomiting, and lower abdominal pain. (41) Examination may demonstrate an edematous, exquisitely tender hemiscrotum with an absent cremasteric reflex. A national database suggested that the yearly incidence of testicular torsion is 3.8 per 100,000, with an orchietomy rate of 42%. (42) Prompt diagnosis is essential because testicular viability decreases with prolonged ischemia time. (43) Testicular torsion is a clinical diagnosis, and surgical management should not be delayed in favor of obtaining a diagnostic test. (14) The ubiquity of ultrasonography in tertiary care facilities, and even in outpatient offices, allows for rapid assessment of testicular blood flow, thus differentiating torsion from epididymo-orchitis and torsion of the appendix epididymis or testis. Duplex ultrasonography is a very accurate test, with sensitivity as high as 91% and specificity of 87%. (44) Emergency consultation with a urologist is absolutely required if there is high suspicion of torsion or the diagnosis is confirmed. Time is of the essence because the salvage rate is highest when detorsion is performed within 6 hours. (45)(46) Manual detorsion, accomplished by rotating the testicle from a medial to lateral direction, akin to opening a book, of the testis may be attempted to salvage the testis before operative intervention. (47)(48) Even with successful detorsion, surgical exploration is still needed because the affected testis may be only partially detorsed, and the risk of repeated torsion remains. In the operating room, the affected testis is either excised or fixed to the dartos fascia depending on the testis’ viability, and the unaffected testis is also fixed with suture (orchiopexy) to prevent contralateral torsion (Fig 5).

Varicocele

Varicoceles, an abnormal dilation of the pampiniform plexus in the spermatic cord, is a common finding present in approximately 15% of men and adolescents. (49)(50) Patients are typically asymptomatic; however, some patients may present with scrotal pain. (51) The condition almost always presents on the left side because of higher pressure in the ipsilateral spermatic vein from orthogonal insertion of the spermatic vein into the left renal vein. (52) The diagnosis is made by examining the patient while standing and asking him to perform a Valsalva maneuver. Large, dilated spermatic veins will be visualized and palpated with this maneuver, and these veins should decompress when the patient lies supine. The presence of an isolated right-sided varicocele or left-sided varicocele that does not improve with recumbence should have one consider abdominal imaging to rule out an abdominal mass causing venous obstruction. The clinical concern about varicoceles is related to future fertility because in the adult population varicoceles are seen more commonly in men with male factor infertility, up to 41% of men with primary infertility in fact. (52)(53) Indications for treatment of the adolescent varicocele include a smaller ipsilateral testicle (>20% smaller than the contralateral) or an abnormal semen analysis. At the time of publication of this manuscript, use of volume differential has been disputed and is controversial. Most boys do not undergo semen
analysis, thus spermatic function is typically inferred from testicular volume. Studies presently are conflicted as to whether those with initially diminished testicular volume of an affected testis relatively will have “catch up” growth when observed as they progress through puberty. Patients with palpable varicoceles, not subclinical varicoceles (seen only on ultrasonography), should be referred to a urologist because these patients should be followed to determine whether there is a need for operative management. Several techniques are available, including microsurgical, laparoscopic, and embolization, each with varying rates of success and complications.

Orchitis and Epididymitis
Inflammation of the testis and epididymis is called orchitis and epididymitis, respectively. The diagnosis of epididymo-orchitis is made because significant inflammation obscures which organ was affected first. The incidence of epididymo-orchitis varies heavily from 4% to 71% in children with acute scrotal pain in different series. The most common cause is inflammation induced from a torsed appendix epididymis or appendix testis in prepubertal boys. Those afflicted typically present with acute-onset scrotal pain with or without associated swelling of the affected hemiscrotum. The main condition that must be excluded is testicular torsion because both clinical history and examination findings are very similar. Timely use of Doppler ultrasonography is key. Because this condition is rarely infectious, conservative therapy is called for with scrotal support, ice packs, and nonsteroidal anti-inflammatory drugs. Patients with a torsion of an appendix testis or epididymis will usually have complete relief within 5 to 7 days of diagnosis.

For patients who are sexually active, there should be a high index of suspicion for sexually transmitted infections. Chlamydia trachomatis and Neisseria gonorrhoea remain the most common causative agents. Both should be tested for using nucleic acid amplification tests in a urine specimen. A single dose of intramuscular ceftriaxone with a 10-day course of doxycycline is recommended for empirical treatment based on current Centers for Disease Control and Prevention guidelines.

Testicular Mass
Overall, testicular cancer in the pediatric population is rare, accounting for approximately 1% of solid pediatric tumors. As discussed previously herein, a history of cryptorchidism increases the risk of testicular cancer. Patients who are born with a disorder of sexual differentiation are also at higher risk for malignancy should a gonad contain Y chromosome material. The chief complaint of a nontender, slow-growing, testicular mass
is very concerning for malignancy. Approximately 15% of testicular masses will present with a hydrocele; thus, ultrasonography is warranted. (63) The presence of a heterogeneous lesion in the testicle is highly suggestive of cancer. (64) Benign conditions that should be recognized on sonography include intratesticular cysts, which have a smooth, round wall with an anechoic center and enhanced through transmission (increased echoes); epidermoid cysts, which may appear as alternating hyper-echoic and hypoechoic concentric circles; and adrenal rest tumors, which are typically bilateral and associated with congenital adrenal hyperplasia. (64) After a presumptive diagnosis of neoplasm, obtaining alpha-fetoprotein and human chorionic gonadotropin levels can aid in the diagnosis if these levels are elevated in patients beyond 6 months of age. (61) Both these tumor markers may be present in yolk sac tumors, which is 1 of the most common malignant prepubertal testicular malignancies, but are not present in teratomas. Prompt surgical resection is indicated, and consultation with oncology may be needed to decide on adjuvant therapy depending on pathology and metastatic evaluations. Most prepubertal testis tumors are teratomas, and these can generally be removed with a partial orchiectomy. For all patients with nonteratomas, including adolescent patients with mixed teratoma and nonteratoma, radical, not partial, orchiectomy is indicated.

**Testicular Trauma**

Testicular trauma is largely divided into blunt or penetrating when considering management options. Blunt testicular trauma may cause testicular rupture, which is a break in the tunica albuginea with extrusion of seminiferous tubules. Examination of the testicle itself is often difficult because of edema and tenderness, thus immediate ultrasonography is an invaluable study. Several features on ultrasonography suggest evidence of testicular rupture, including hematocoele (which refers to blood collecting in the tunica vaginalis), hypoechoic and heterogeneous testicular parenchyma, abnormal contour of the testis, and disrupted tunica albuginea. (65) If there is evidence of blood outside of the tunica vaginalis, then a scrotal hematoma is more likely. Scrotal hematomas are typically observed for resolution, with delayed evacuation should the hematoma persist or expand. (66) Classically, early surgical exploration was indicated for patients who are diagnosed as having testicular rupture because the salvage rate is up to 90% when performed within 72 hours. (67) More recently, a conservative approach was described in a select population of patients who experienced testicular rupture. (68) Cubillos et al (68) reported a series of 7 patients treated successfully with expectant management. On follow-up, 5 of the 7 patients had no evidence of testicular atrophy; 2 of the 7 did not follow up in person, but phone interviews confirmed that the patients demonstrated no negative sequelae. Only 1 patient required operative intervention for a large symptomatic hydrocele. Although these results are promising and help prevent iatrogenic orchiectomy during exploration, presently this approach is not validated with larger, prospective series. Emergency consultation with a urologist should be arranged to help manage testicular rupture or any type of penetrating scrotal trauma.

**CONCLUSION**

Conditions affecting the male genitalia are commonplace in pediatric practice. Table 2 includes a brief summary of genitourinary complaints and associated diagnoses. A basic understanding of these disorders is important for the care of male children seen by pediatricians in the ambulatory setting.

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**TABLE 2. Commonly Encountered Urologic Complaints in Males**

<table>
<thead>
<tr>
<th>COMPLAINT</th>
<th>DIFFERENTIAL DIAGNOSIS</th>
<th>EVALUATION</th>
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<tbody>
<tr>
<td>Scrotal pain</td>
<td>Testicular torsion</td>
<td>Urinalysis</td>
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<tr>
<td></td>
<td>Torsion of appendix testis</td>
<td>Urine culture</td>
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<td></td>
<td>Torsion of appendix epididymis</td>
<td>Scrotal duplex ultrasonography</td>
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<td></td>
<td>Epididymo-orchitis</td>
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<td></td>
<td>Trauma</td>
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<td>Hydrocele</td>
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<td>Inguianal hernia</td>
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<tr>
<td></td>
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<td></td>
<td>Varicocele</td>
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<tr>
<td></td>
<td>Testicular cancer</td>
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<tr>
<td>Penile pain</td>
<td>Balanitis/ balanoposthitis</td>
<td>Physical examination</td>
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<td></td>
<td>Cellulitis</td>
<td>Penile ultrasonography</td>
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<tr>
<td></td>
<td>Trauma</td>
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<td>Priapism</td>
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<td>Hypercalciuria</td>
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<td>Distal ureterolithias</td>
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<td>Altered urinary stream</td>
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<td>Physical examination</td>
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<td></td>
<td>Pathologic phimosis</td>
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Summary

- Male differentiation relies on the presence of the Y chromosome and the action of testosterone on bipotent genital structures.
- Hypospadias is a commonly encountered disorder of the penis. Further evaluation is prudent in cases associated with undescended testis based on an observational study. (12)
- By consensus, micropenis is defined as 2.5 SD or more below the mean stretched length for a patient’s age. Endocrinologic evaluation should be instituted once this diagnosis is made. More benign entities, including webbed penis and buried penis, should be ruled out by proper measurement of the penis. Treatment with testosterone supplementation is effective based on observational studies. (17)(18)(19)
- Physiologic phimosis resolves over time, with the prepuce becoming retractile in most patients by 4 years of age. Paraphimosis is an emergency condition that requires immediate medical attention. Complications from the prepuce may be treated medically or surgically.
- Male circumcision has medical benefits, such as decreased risk of urinary tract infection, penile cancer, and contracting human immunodeficiency virus based on strong data from meta-analysis of the present literature. (24)
- Penile trauma is an uncommon clinical entity. A thorough history should be obtained to ensure that the mechanism of injury is consistent with the physical injury.
- Cryptorchidism is a common condition that requires close follow-up. Referral to a surgical specialist is recommended should a testis fail to descend by 6 months of age. There is strong evidence based on a literature review that surgical correction helps lower the risk of testicular malignancy in cryptorchid testes. (35)
- By consensus, testicular torsion is an emergency condition that requires rapid diagnosis and management. This condition should be considered in all patients with acute scrotal pain.
- Varicoceles are of clinical concern because of possible future infertility. Its management in the adolescent population is still a subject of great debate.
- Epididymo-orchitis may mimic testicular torsion because patients present with similar symptoms of acute scrotal pain and swelling. Duplex ultrasonography is helpful in making the proper diagnosis.
- Based on clinical studies, cancer of the testis is uncommon in the pediatric population. A slow-growing, nontender mass should raise concern for an intrascrotal malignancy. Referral to a urologist is indicated for surgical resection once the diagnosis is made.
- Trauma to the testis may lead to testicular rupture. Early surgery is indicated to prevent testicular atrophy when rupture is suspected or when there is penetrating trauma. Conservative management is acceptable in select populations based on an observational study. (68)

References for this article are at http://pedsinreview.aappublications.org/content/41/3/101.
1. In normal development after the 8th week of gestation, and under the influence of testosterone, the penile urethra forms with the medial folding of the urethral folds from proximal to distal, creating a urethral seam that eventually fuses in the midline. Which of the following is likely to occur if this process is disrupted?
   A. Cryptorchidism.
   B. Hypospadias.
   C. Phimosis.
   D. Testicular malignancy.
   E. Webbed penis.

2. A 2-month-old boy is brought to the clinic by his mother for his health supervision visit. The baby is uncircumcised. The mother, who is a first-time mom, commented that she is unable to retract the foreskin to clean, and she wonders if the foreskin is tight. The baby otherwise seems to have a strong urine stream. Examination of the genitalia shows uncircumcised normal male genitalia with normal position of the urethra and mild physiologic phimosis preventing full retraction of the foreskin. The testes are descended bilaterally. Which of the following is the most appropriate next step in the management of this patient?
   A. Advise the mother to forcefully retract the patient’s foreskin with every bath.
   B. Circumcision before 6 months of age.
   C. Circumcision if the foreskin is not retractable by 2 years of age.
   D. Reassurance because phimosis will resolve in most patients by 4 years of age.
   E. Topical corticosteroid cream if phimosis is not resolved by puberty.

3. The parents of a newborn baby boy ask for guidance in deciding whether to circumcise their child. Which of the following is the statement that is most consistent with the current position of the American Academy of Pediatrics regarding circumcision?
   A. Circumcision should be delayed until at least 6 months of age.
   B. Complications are frequent and should be understood before proceeding.
   C. Nonpharmacologic interventions such as oral sucrose should be used for anesthesia rather than local injection or topical anesthetics.
   D. The preventive health benefits of elective circumcision outweigh the risks of the procedure.
   E. Third-party payment for circumcision is not warranted because this is a purely elective procedure.

4. The parents of a 3-month-old boy are concerned that they cannot find the testicles in the child’s scrotum. After thorough examination, both testes are located high in the inguinal canal just outside the inguinal ring. The examiner brings the testicles down into the scrotum and holds them there for a short time. On releasing the testicles, they stay in the scrotum for the next several minutes. Which of the following is the best advice for these parents?
   A. No further surveillance is required because this is a normal examination.
   B. Surgical correction decreases the risk of infertility in the future.
   C. Surgical correction decreases the risk of testicular malignancy in the future.
   D. Surgical correction is not required for this condition.
   E. The infant’s testes are at increased risk of torsion.
5. A 10-year-old boy experienced an acute onset of right-sided scrotal pain starting 2 hours earlier. Examination shows an absent cremasteric reflex and an edematous, exquisitely tender hemiscrotum on the right. Emergency ultrasonography shows absence of blood flow to the right testicle. Which of the following is the next best step in the management of this patient?

A. Analgesics, ice, and scrotal elevation for the next 3 days.
B. Five-day course of antibiotics active against *Escherichia coli*.
C. Immediate manual detorsion, and follow-up in 48 hours for recheck.
D. Immediate surgical correction of the right side with orchiopexy of the left side.
E. Surgical correction of the right side only if no spontaneous resolution in 48 hours.
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