Chapter 41. Disorders of the Penis & Male Urethra

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Congenital Anomalies of the Penis

Apenia

Congenital absence of the penis (apenia) is extremely rare. In this condition, the urethra generally opens on the perineum or inside the rectum.

Patients with apenia should be considered for assignment to the female gender. Castration and vaginoplasty should be considered in combination with estrogen treatment as the child develops.

Megalopenis

The penis enlarges rapidly in childhood (megalopenis) in boys with abnormalities that increases the production of testosterone, for example, interstitial cell tumors of the testicle, hyperplasia, or tumors of the adrenal cortex. Management is by correction of the underlying endocrine problem.

Micropenis

Micropenis is a more common anomaly and has been attributed to a testosterone deficiency that results in poor growth of organs that are targets of this hormone. A penis smaller than 2 standard deviations from the norm is considered a micropenis (see Table 41–1). The testicles are small and frequently undescended. Other organs, including the scrotum, may be involved. Early evidence suggests that the ability of the hypothalamus to secrete luteinizing hormone-releasing hormone (LHRH) is decreased. The pituitary–gonadal axis appears to be intact, since the organs respond to testosterone, although this response may be sluggish at times. Studies have shown that topical application of 5% testosterone cream causes increased penile growth, but its effect is due to absorption of the hormone, which systemically stimulates genital growth. Patients with micropenis must be carefully evaluated for other endocrine and central nervous system anomalies. Retarded bone growth, anosmia, learning disabilities, and deficiencies of adrenocorticotropic hormone and thyrotropin have been associated with micropenis. In addition, the possibility of intersex problems must be carefully investigated before therapy is begun.

Table 41–1. Size of Unstretched Penis and Testis from Infancy to Adulthood.

Age (years)	Length of penis (cm ± SD)	Diameter of testis (cm ± SD)
0.2–2	2.7 ± 0.5	1.4 ± 0.4
2.1–4	3.3 ± 0.4	1.2 ± 0.4
4.1–6	3.9 ± 0.9	1.5 ± 0.6
6.1–8	4.2 ± 0.8	1.8 ± 0.3
8.1–10	4.9 ± 1	2 ± 0.5
10.1–12	5.2 ± 1.3	2.7 ± 0.7
12.1–14	6.2 ± 2	3.4 ± 0.8
14.1–16	8.6 ± 2.4	4.1 ± 1
16.1–18	9.9 ± 1.7	5 ± 0.5
18.1–20	11 ± 1.1	5 ± 0.3
20.1–25	12.4 ± 1.6	5.2 ± 0.6

Source: Reproduced, with permission, from Winter JSD, Faiman C: Pituitary-gonadal relations in male children and adolescents. Pediatr Res 1972;6:126.

The approach to management of micropenis has undergone gradual change in recent years, but androgen replacement is the basic requirement. The objective is to provide sufficient testosterone to stimulate penile growth without altering growth and closure of the epiphyses. A regimen of 25 mg orally every 3 weeks for no more than four doses has been recommended. Penile growth is assessed by measuring the length of the stretched penis (pubis to glans) before and after treatment. Therapy should be started by age 1 year and aimed at maintaining genital growth commensurate with general body growth. Repeat courses of therapy may be required if the size of the penis falls behind as the child grows. For undescended testicles, orchiopexy should be done before the child is 2 years old. In the future, treatment with LHRH may correct micropenis as well as cause descent of the testicles, but at present, LHRH is not approved for such use.

Adult Penile Size

In recent years, penile augmentation and enhancement procedures have been done with increasing frequency, although no validation of success has been documented. Suspensory ligament release with pubic fat pad advancement, fat injections, and dermal fat grafts have been used in attempts to enhance penile size. Many consider that these procedures have not been proved safe or efficacious in normal men. Wessells et al (1996) evaluated penile size in the flaccid and erect state in otherwise normal adult men and found very good correlation between stretched and erect length (R^2= 0.793; Table 41–2). This information can provide a guideline for physicians whose patients are concerned with their penile dimensions.

Table 41–2. Adult Penile Size: Relationships among Flaccid, Stretched, and Erect Measurements.[a]

Penile state	Length (cm)	Circumference (cm)
Flaccid	8.8	9.7
Stretched	12.4	—
Erect	12.9	12.3

[a]Data represent the mean of measurements in 80 men and are drawn from Wessells H, Lue TF, McAninch JW: Penile length in the flaccid and erect states: Guidelines for penile augmentation. J Urol 1996;156:995.

Congenital Anomalies of the Urethra

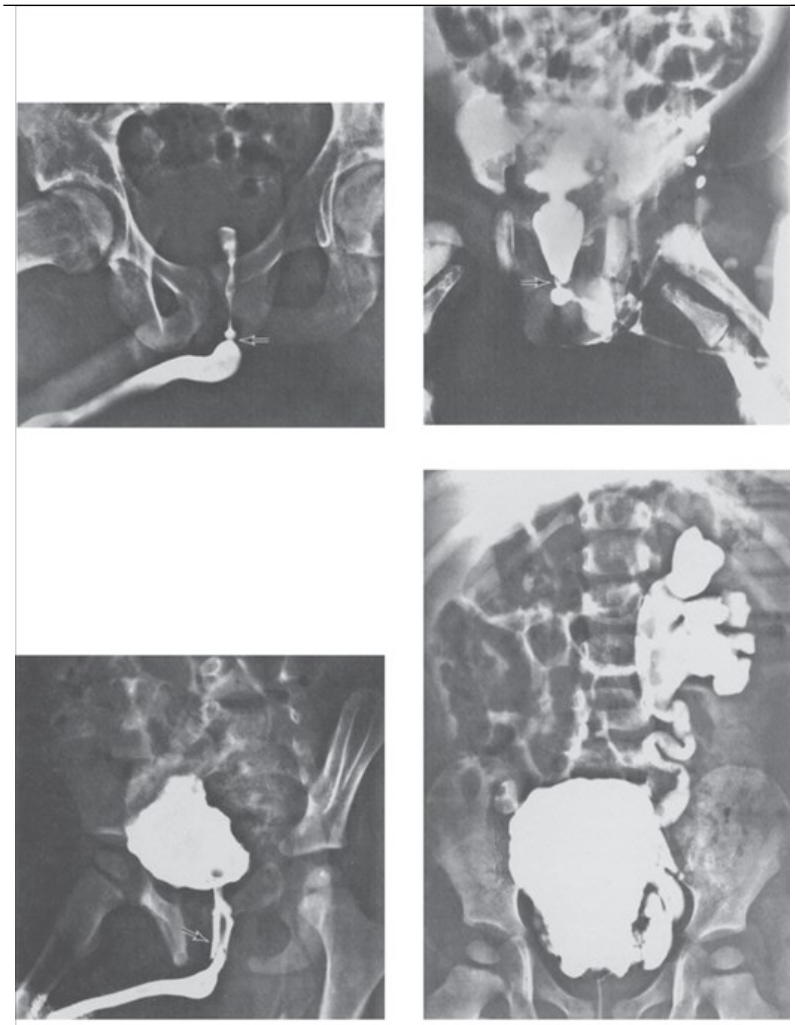
Duplication of the Urethra

Duplication of the urethra is rare. The structures may be complete or incomplete. Resection of all but one complete urethra is recommended.

Urethral Stricture

Congenital urethral stricture is uncommon in infant boys. The fossa navicularis and membranous urethra are the two most common sites. Severe strictures may cause bladder damage and hydronephrosis (see Chapter 11), with symptoms of obstruction (urinary frequency and urgency) or urinary infection. A careful history and physical examination are indicated in patients with these complaints. Excretory urography and excretory voiding urethrography often define the lesion and the extent of obstruction. Retrograde urethrography (Figure 41–1) may also be helpful. Cystoscopy and urethroscopy should be performed in all patients in whom urethral stricture is suspected.

Figure 41–1.



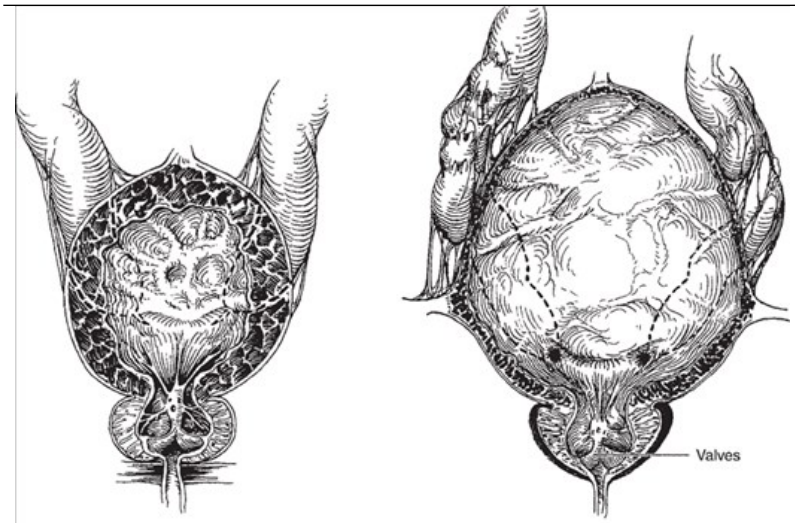
Upper left: Retrograde urethrogram showing congenital diaphragmatic stricture. ***Upper right:*** Posterior urethral valves revealed on voiding cystourethrography. *Arrow* points to area of severe stenosis at distal end of prostatic urethra. ***Lower left:*** Posterior urethral valves. Patient would not void with cystography. Retrograde urethrogram showing valves (*arrow*). ***Lower right:*** Cystogram, same patient. Free vesicoureteral reflux and vesical trabeculation with diverticula.

Strictures can be treated at the time of endoscopy. Diaphragmatic strictures may respond to dilation or visual urethrotomy. Other strictures should be treated under direct vision by internal urethrotomy with the currently available pediatric urethrotome. It may be necessary to repeat these procedures in order to stabilize the stricture. Single-stage open surgical repair by anastomotic urethroplasty, buccal mucosa graft, or penile flap is desirable if the obstruction recurs.

Posterior Urethral Valves

Posterior urethral valves, the most common obstructive urethral lesions in infants and newborns, occur only in males and are found at the distal prostatic urethra. The valves are mucosal folds that look like thin membranes; they may cause varying degrees of obstruction when the child attempts to void (Figure 41–2).

Figure 41–2.



Posterior urethral valves. ***Left:*** Dilatation of the prostatic urethra, hypertrophy of vesical wall and trigone in stage of compensation; bilateral hydroureters secondary to trigonal hypertrophy. ***Right:*** Attenuation of bladder musculature in stage of decompensation; advanced ureteral dilatation and tortuosity, usually secondary to vesicoureteral reflux.

Clinical Findings

Symptoms and Signs

Children with posterior urethral valves may present with mild, moderate, or severe symptoms of obstruction. They often have a poor, intermittent, dribbling urinary stream. Urinary infection and sepsis occur frequently. Severe obstruction may cause hydronephrosis (see Chapter 11), which is apparent as a palpable abdominal mass. A palpable midline mass in the lower abdomen is typical of a distended bladder. Occasionally, palpable flank masses indicate hydronephrotic kidneys. In many patients, failure to thrive may be the only significant symptom, and examination may reveal nothing more than evidence of chronic illness.

Laboratory Findings

Azotemia and poor concentrating ability of the kidney are common findings. The urine is often infected, and anemia may be found if infection is chronic. Serum creatinine and blood urea nitrogen levels and creatinine clearance are the best indicators of the extent of renal failure.

X-Ray Findings

Voiding cystourethrography is the best radiographic study available to establish the diagnosis of posterior urethral valves. The presence of large amounts of residual urine is apparent on initial catheterization done in conjunction with radiographic studies, and an uncontaminated urine specimen should be obtained via the catheter and sent for culture. The cystogram may show vesicoureteral reflux and the severe trabeculations of long-standing obstruction, and the voiding cystourethrogram often demonstrates elongation and dilatation of the posterior urethra, with a prominent bladder neck (Figure 41–1). Excretory urograms may reveal hydroureter and hydronephrosis when obstruction is severe and long standing.

Ultrasonography

Ultrasonography can be used to detect hydronephrosis, hydroureter, and bladder distention in children with severe azotemia. It can also detect fetal hydronephrosis, which is typical of urethral valves, as early as 28 weeks of gestation; when the obstruction is from valves, an enlarged bladder with bilateral hydroureteronephrosis is usually present.

Instrumental Examination

Urethroscopy and cystoscopy, performed with the patient under general anesthesia, show vesical trabeculation and cellules and, occasionally, vesical diverticula. The bladder neck and trigone may be hypertrophied. The diagnosis is confirmed by visual identification of the valves at the distal prostatic urethra. Supravesical compression shows that the valves cause obstruction.

Treatment

Treatment consists of destruction of the valves, but the approach depends on the degree of obstruction and the general health of the child. In children with mild to moderate obstruction and minimal azotemia, transurethral fulguration of the valves is usually successful. Occasionally, catheterization, cystoscopy, or urethral dilation by perineal urethrostomy destroys the valves.

The more severe degrees of obstruction create varying grades of hydronephrosis requiring individualized management. Treatment of children with urosepsis and azotemia associated with hydronephrosis includes use of antibiotics, catheter drainage of the bladder, and correction of the fluid and electrolyte imbalance. Vesicostomy may be of benefit in patients with reflux and renal dysplasia.

In the most severe cases of hydronephrosis, vesicostomy or removal of the valves may not be sufficient, because of ureteral atony, obstruction of the ureterovesical junction from trigonal hypertrophy, or both. In such cases, percutaneous loop ureterostomies may be done to preserve renal function and allow resolution of the hydronephrosis. After renal function is stabilized, valve ablation and reconstruction of the urinary tract can be done.

The period of proximal diversion should be as short as possible, since vesical contracture can be permanent after prolonged supravesical diversion.

It has been noted that approximately 50% of children with urethral valves have vesicoureteral reflux and that the prognosis is worse if the reflux is bilateral. After removal of the obstruction, reflux ceases spontaneously in about one-third of patients. In the remaining two-thirds of patients, the reflux should be corrected surgically.

Long-term use of antimicrobial drugs is often required to prevent recurrent urosepsis and urinary tract infection even though the obstruction has been relieved.

Prognosis

Early detection is the best way to preserve kidney and bladder function. This can be accomplished by ultrasonography in utero, by careful physical examination and observation of voiding in the newborn, and by thorough evaluation of children who have urinary tract infections. Children in whom azotemia and infection persist after relief of obstruction have a poor prognosis.

Anterior Urethral Valves

Signs of anterior urethral valves, a rare congenital anomaly, are urethral dilatation or diverticula proximal to the valve, bladder outlet obstruction, postvoiding incontinence, and infection. Enuresis may be present. Urethroscopy and voiding cystourethrography will demonstrate the lesion, and endoscopic electrofulguration will effectively correct the obstruction.

Urethrorectal and Vesicorectal Fistulas

Urethrorectal and vesicorectal fistulas are rare and are almost always associated with imperforate anus. Failure of the urorectal septum to develop completely and separate the rectum from the urogenital tract permits communication between the two systems (see Chapter 2). The child with such a fistula passes fecal material and gas through the urethra. If the anus has developed normally (ie, if it opens externally), urine may pass through the rectum.

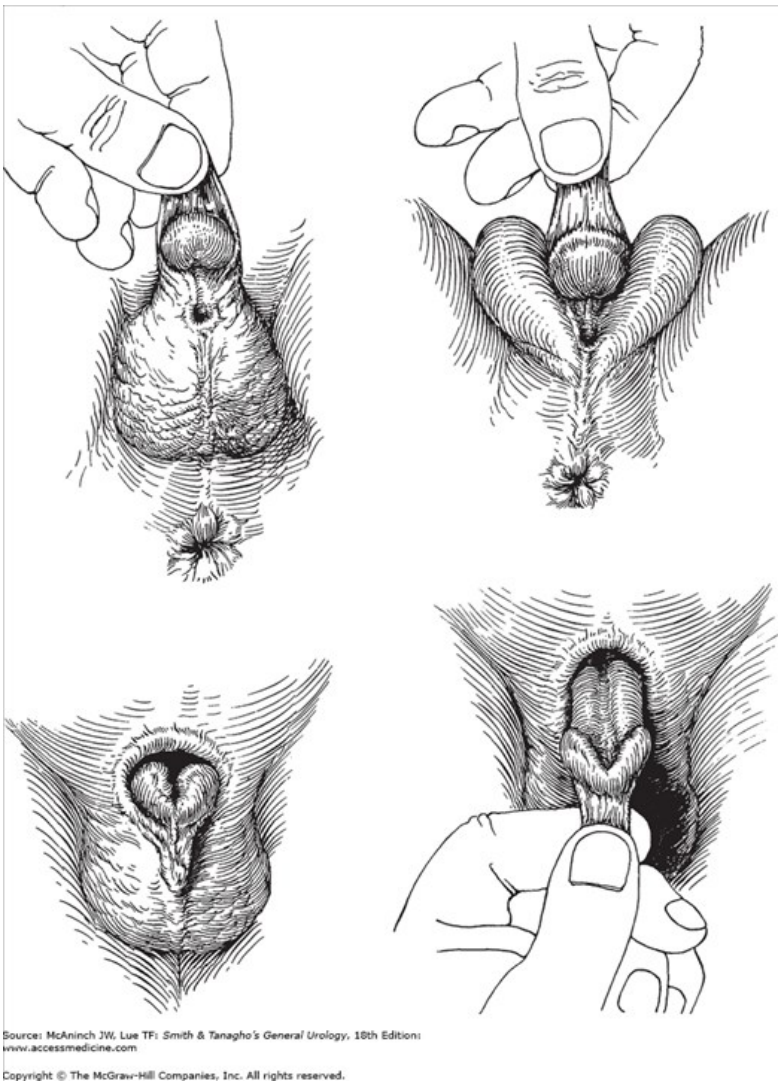
Cystoscopy and panendoscopy usually show the fistulous opening. Radiographic contrast material given by mouth will reach the blind rectal pouch, and the distance between the end of the rectum and the perineum can be seen on appropriate radiograms.

Imperforate anus must be opened immediately and the fistula closed, or if the rectum lies quite high, temporary sigmoid colostomy should be performed. Definitive surgery, with repair of the urethral fistula, can be done later.

Hypospadias

In hypospadias, the urethral meatus opens on the ventral side of the penis proximal to the tip of the glans penis (Figure 41–3).

Figure 41–3.



Hypospadias and epispadias. ***Upper left:*** Hypospadias, penoscrotal type. Redundant dorsal foreskin that is deficient ventrally; ventral chordee. ***Upper right:*** Hypospadias, midscrotal type. Chordee more marked. Penis often small. ***Lower left:*** Epispadias. Redundant ventral foreskin that is absent dorsally; severe dorsal chordee. ***Lower right:*** Traction on foreskin reveals dorsal defect.

Sexual differentiation and urethral development begin in utero at approximately 8 weeks and are complete by 15 weeks. The urethra is formed by the fusion of the urethral folds along the ventral surface of the penis, which extends to the corona on the distal shaft. The glandular urethra is formed by canalization of an ectodermal cord that has grown through the glans to communicate with the fused urethral folds (see Chapter 2). Hypospadias results when fusion of the urethral folds is incomplete.

Hypospadias occurs in 1 in every 300 male children. Estrogens and progestins given during pregnancy are known to increase the incidence. Although a familial pattern of hypospadias has been recognized, no specific genetic traits have been established.

Classification

There are several forms of hypospadias classified according to location: (1) glandular, that is, opening on the proximal glans penis; (2) coronal, that is, opening at the coronal sulcus; (3) penile shaft; (4) penoscrotal; and (5) perineal. About 70% of all cases of hypospadias are distal penile or coronal.

Hypospadias in the male is evidence of feminization. Patients with penoscrotal and perineal openings should be considered to have potential intersex problems requiring appropriate evaluation. Hypospadiac newborns should not be circumcised, because the preputial skin may be useful for future reconstruction.

Clinical Findings

Symptoms and Signs

Although newborns and young children seldom have symptoms related to hypospadias, older children and adults may complain of difficulty directing the urinary stream and stream spraying. Chordee (curvature of the penis) causes ventral bending and bowing of the penile shaft, which can prevent sexual intercourse. Perineal or penoscrotal hypospadias necessitates voiding in the sitting position, and these proximal forms of hypospadias in adults can be the cause of infertility. An additional complaint of almost all patients is the abnormal (hooded) appearance of the penis, caused by deficient or absent ventral foreskin. The hypospadiac meatus may be stenotic and should be carefully examined and calibrated. (A meatotomy should be done when stenosis exists.) There is an increased incidence of undescended testicles in children with hypospadias; scrotal examination is necessary to establish the position of the testicles.

Laboratory, X-Ray, and Endoscopic Findings

Since children with penoscrotal and perineal hypospadias often have a bifid scrotum and ambiguous genitalia, a buccal smear and karyotyping are indicated to help establish the genetic sex. Urethroscopy and cystoscopy are of value to determine whether internal male sexual organs are normally developed. Excretory urography is also indicated in these patients to detect additional congenital anomalies of the kidneys and ureters.

Some authors recommend routine use of excretory urography for all patients with hypospadias; however, this seems to be of little value in the more distal types of the disorder, because there appears to be no increased incidence of upper urinary tract anomalies.

Differential Diagnosis

Any degree of hypospadias is an expression of feminization. Perineal and scrotal urethral openings should be carefully evaluated to ascertain that the patient is not a female with androgenized adrenogenital syndrome. Urethroscopy and cystoscopy will aid in evaluating the development of internal reproductive organs.

Treatment

For psychological reasons, hypospadias should be repaired before the patient reaches school age; in most cases, this can be done before age 2.

More than 150 methods of corrective surgery for hypospadias have been described. Currently, one-stage repairs with foreskin island flaps and incised urethral plate are performed by many urologists. It now appears that buccal mucosa grafts are more advantageous than others and should be considered the primary grafting technique when indicated. Fistulas occur in 15–30% of patients, but the fistula repair is considered a small, second-stage reconstruction.

All types of repair involve straightening the penis by removal of the chordee. The chordee removal can be confirmed by producing an artificial erection in the operating room following urethral reconstruction and advancement. Most successful techniques for repair of hypospadias use local skin and foreskin in developing the neourethra. In recent years, advancement of the urethra to the glans penis has become technically feasible and cosmetically acceptable.

Prognosis

After corrective surgery, most patients are able to void in the standing position as well as to deposit semen into the vagina. The overall cosmetic appearance and the prevention of fistula formation remain the greatest challenges in these repairs.

Chordee Without Hypospadias

Congenital ventral chordee without hypospadias is seen occasionally and is caused by a short urethra, fibrous tissues surrounding the corpus spongiosum, or both. The urethral opening is in the normal position on the glans penis; only with erection does the penis bow, thus preventing satisfactory vaginal penetration. During examination, if the patient cannot achieve an erection naturally, erection can be induced by injecting saline solution into the corpus cavernosum after placing a tourniquet at the base of the penis. This technique should also be used during corrective surgery to be certain that the penis will be straight after the operation.

If the penis is adequate in length, the dorsal surface can be shortened (1) by excising elliptic portions of the tunica albuginea on the dorsum of the penis on either side of the midline or (2) by making transverse cuts in a similar position and then closing them longitudinally, thus shortening the dorsum. Fibrous tissue found in association with the urethra and corpus spongiosum should be totally excised.

Epispadias

The incidence of complete epispadias is approximately 1 in 120,000 males and 1 in 450,000 females. The urethra is displaced dorsally, and classification is based on its position in males. In glandular epispadias, the urethra opens on the dorsal aspect of the glans, which is broad and flattened. In the penile type, the urethral meatus, which is often broad and gaping, is located between the pubic symphysis and the coronal sulcus. A distal groove usually extends from the meatus through the splayed glans. The penopubic type has the urethral opening at the penopubic junction, and the entire penis has a distal dorsal groove extending through the glans.

Patients with glandular epispadias seldom have urinary incontinence. However, with penopubic and penile epispadias, incontinence is present in 95% and 75% of cases, respectively.

Females with epispadias have a bifid clitoris and separation of the labia. Most are incontinent.

Urinary incontinence is a common problem because of maldevelopment of the urinary sphincters. Dorsal curvature of the penis (dorsal chordee) is also present (Figure 41–3). The pubic bones are separated as in exstrophy of the bladder. Epispadias is a mild form of bladder exstrophy, and in severe cases, exstrophy and epispadias coexist.

Surgery is required to correct the incontinence, remove the chordee to straighten the penis, and extend the urethra out onto the glans penis. Repair of the urinary sphincter has not been very successful. Chordee excision and urethroplasty with advancement of the meatus have been successful in achieving acceptable cosmetic and functional results. Bladder augmentation combined with the artificial sphincter may be required in patients in whom incontinence cannot be corrected.

Acquired Diseases and Disorders of the Penis and Male Urethra

Priapism

Priapism is an uncommon condition of prolonged erection. It is usually painful for the patient, and no sexual excitement or desire is present. The disorder is idiopathic in 60% of cases, while the remaining 40% of cases are associated with diseases (eg, leukemia, sickle cell disease, pelvic tumors, pelvic infections), penile trauma, spinal cord trauma, or use of medications (trazodone). Currently, intracavernous injection therapy for impotence may be the most common cause. Although the idiopathic type often is initially associated with prolonged sexual stimulation, cases of priapism due to the other causes are unrelated to psychic sexual excitement.

Priapism may be classified into high- and low-flow types. High-flow priapism (nonischemic) usually occurs secondary to perineal trauma, which injures the central penile arteries and results in loss of penile blood-flow regulation. Aneurysms of one or both central arteries have been observed. Aspiration of penile blood for blood–gas determination demonstrates high oxygen and normal carbon dioxide levels. Arteriography is useful to demonstrate aneurysms that will respond to embolization; erectile function is usually preserved.

The patient with low-flow priapism (ischemic) usually presents with a history of several hours of painful erection. The glans penis and corpus spongiosum are soft and uninvolved in the process. The corpora cavernosa are tense with congested blood and tender to palpation. The current

theories regarding the mechanism of priapism remain in debate, but most authorities believe the major abnormality to be physiologic obstruction of the venous drainage. This obstruction causes buildup of highly viscous, poorly oxygenated blood (low O_2, high CO_2) within the corpora cavernosa. If the process continues for several days, interstitial edema and fibrosis of the corpora cavernosa will develop, causing impotence.

Ischemic priapism must be considered a urologic emergency. Epidural or spinal anesthesia can be used. The sludged blood can then be evacuated from the corpora cavernosa through a large needle placed through the glans. The addition of adrenergic agents administered via intracavernous irrigation has proved helpful. Monitoring intracavernous pressure ensures that recurrence is not imminent. Multiple wedges of tissue can be removed with a biopsy needle to create a shunting fistula between the glans penis and corpora cavernosa. This technique, which has been very successful, provides an internal fistula to keep the corpora cavernosa decompressed. To maintain continuous fistula drainage, pressure should be exerted intermittently (every 15 minutes) on the body of the penis. The patient can do this manually after he has recovered from anesthesia.

If the shunt described fails, another shunting technique may be used by anastomosing the superficial dorsal vein to the corpora cavernosa. Other effective shunting methods are corpora cavernosa to corpus spongiosum shunt by perineal anastomosis; saphenous vein to corpora cavernosa shunt; and pump decompression.

Patients with sickle cell disease have benefited from massive blood transfusions, exchange transfusions, or both. Hyperbaric oxygen also has been suggested for these patients. Patients with leukemia should receive prompt chemotherapy. Appropriate management of any underlying cause should be instituted without delay. Such treatment should not prevent aggressive management of the priapism if the erection persists for several hours.

Impotence is the worst sequel of priapism. It is more common after prolonged priapism (several days). Early recognition (within hours) and prompt treatment of priapism offer the best opportunity to avoid this major problem.

Peyronie's Disease

Peyronie's disease (plastic induration of the penis) was first described in 1742 and is a well-recognized clinical problem affecting middle-aged and older men. Patients present with complaints of painful erection, curvature of the penis, and poor erection distal to the involved area. The penile deformity may be so severe that it prevents satisfactory vaginal penetration. The patient has no pain when the penis is in the nonerect state.

Examination of the penile shaft reveals a palpable dense, fibrous plaque of varying size involving the tunica albuginea. The plaque is usually near the dorsal midline of the shaft. Multiple plaques are sometimes seen. In severe cases, calcification and ossification are noted and confirmed by radiography. Although the cause of Peyronie's disease remains obscure, the dense fibrous plaque is microscopically consistent with findings in severe vasculitis. The condition has been noted in association with Dupuytren's contracture of the tendons of the hand, in which the fibrosis resembles that of Peyronie's disease when examined microscopically.

Spontaneous remission occurs in about 50% of cases. Initially, observation and emotional support are advised. If remission does not occur, *p*-aminobenzoic acid powder or tablets or vitamin E tablets may be tried for several months. However, these medications have limited success. In recent years, a number of operative procedures have been used in refractory cases. Excision of the plaque with replacement with a dermal or vein graft has been successful, as has the use of tunica vaginalis grafts after plaque incision. Other authors have incised the plaque and inserted penile prostheses in the corpora cavernosa. Additional methods include radiation therapy and injection of steroids, dimethyl sulfoxide, or parathyroid hormone into the plaque. The success of such treatments is poorly documented.

Phimosis

Phimosis is a condition in which the contracted foreskin cannot be retracted over the glans. Chronic infection from poor local hygiene is its most common cause. Most cases occur in uncircumcised males, although excessive skin left after circumcision can become stenotic and cause phimosis. Calculi and squamous cell carcinoma may develop under the foreskin. Phimosis can occur at any age. In diabetic older men, chronic balanoposthitis may lead to phimosis and may be the initial presenting complaint. Children younger than 2 years seldom have true phimosis; their relatively narrow preputial opening gradually widens and allows for normal retraction of foreskin over the glans. Circumcision for phimosis should be avoided in children requiring general anesthesia; except in cases with recurrent infections, the procedure should be postponed until the child reaches an age when local anesthesia can be used.

Edema, erythema, and tenderness of the prepuce and the presence of purulent discharge usually cause the patient to seek medical attention. Inability to retract the foreskin is a less common complaint.

The initial infection should be treated with broad-spectrum antimicrobial drugs. The dorsal foreskin can be slit if improved drainage is necessary. Circumcision, if indicated, should be done after the infection is controlled.

Paraphimosis

Paraphimosis is the condition in which the foreskin, once retracted over the glans, cannot be replaced in its normal position. This is due to chronic inflammation under the redundant foreskin, which leads to contracture of the preputial opening (phimosis) and formation of a tight ring of skin when the foreskin is retracted behind the glans. The skin ring causes venous congestion leading to edema and enlargement of the glans, which make the condition worse. As the condition progresses, arterial occlusion and necrosis of the glans may occur.

Paraphimosis usually can be treated by firmly squeezing the glans for 5 minutes to reduce the tissue edema and decrease the size of the glans. The skin can then be drawn forward over the glans. Occasionally, the constricting ring requires incision under local anesthesia. Antibiotics should be administered and circumcision should be done after inflammation has subsided.

Circumcision

Although circumcision is routinely performed in some countries for religious or cultural reasons, it is usually not necessary if adequate penile cleanliness and good hygiene can be maintained. There is a higher incidence of penile carcinoma in uncircumcised males, but chronic infection and poor hygiene are usually underlying factors in such instances. Circumcision is indicated in patients with infection, phimosis, or paraphimosis (see preceding sections).

Urethral Stricture

Acquired urethral stricture is common in men but rare in women. (Congenital urethral stricture is discussed earlier in the chapter.) Most acquired strictures are due to infection or trauma. Although gonococcal urethritis is seldom a cause of stricture today, infection remains a major cause—particularly infection from long-term use of indwelling urethral catheters. Large catheters and instruments are more likely than small ones to cause ischemia and internal trauma. External trauma, for example, pelvic fractures (see Chapter 17), can partially or completely sever the membranous urethra and cause severe and complex strictures. Straddle injuries can produce bulbar strictures.

Urethral strictures are fibrotic narrowings composed of dense collagen and fibroblasts. Fibrosis usually extends into the surrounding corpus spongiosum, causing spongiofibrosis. These narrowings restrict urine flow and cause dilation of the proximal urethra and prostatic ducts. Prostatitis is a common complication of urethral stricture. The bladder muscle may become hypertrophic, and increased residual urine may be noted. Severe, prolonged obstruction can result in decompensation of the ureterovesical junction, reflux, hydronephrosis, and renal failure. Chronic urinary stasis makes infection likely. Urethral fistulas and periurethral abscesses commonly develop in association with chronic, severe strictures.

Clinical Findings

Symptoms and Signs

A decrease in urinary stream is the most common complaint. Spraying or double stream is often noted, as is postvoiding dribbling. Chronic urethral discharge, occasionally a major complaint, is likely to be associated with chronic prostatitis. Acute cystitis or symptoms of infection are seen at times. Acute urinary retention seldom occurs unless infection or prostatic obstruction develops. Urinary frequency and mild dysuria may also be initial complaints.

Induration in the area of the stricture may be palpable. Tender enlarged masses along the urethra usually represent periurethral abscesses. Urethrocutaneous fistulas may be present. The bladder may be palpable if there is chronic retention of urine.

Laboratory Findings

If urethral stricture is suspected, urinary flow rates should be determined. The patient is instructed to accumulate urine until the bladder is full and then begin voiding; a 5-second collection of urine should be obtained during midstream maximal flow and its volume recorded. After the patient repeats this procedure eight to ten times over several days in a relaxed atmosphere, the mean peak flow can be calculated. With strictures creating significant problems, the flow rate will be <10 mL/s (normal 20 mL/s).

Urine culture may be indicated. The midstream specimen is usually bacteria free, with some pyuria (eight to ten white blood cells [leukocytes] per high-power field) in a carefully obtained first aliquot of urine. If the prostate is infected, bacteria will be present in a specimen obtained after prostatic massage. In the presence of cystitis, the urine will be grossly infected.

X-Ray Findings

A urethrogram or voiding cystourethrogram (or both) will demonstrate the location and extent of the stricture. Sonography has also been a useful method of evaluating the urethral stricture. Urethral fistulas and diverticula are sometimes noted. Vesical stones, trabeculations, or diverticula may also be seen.

Instrumental Examination

Urethroscopy allows visualization of the stricture. Small-caliber strictures prevent passage of the instrument through the area. Direct visualization and sonourethrography aid in determining the extent, location, and degree of scarring. Additional areas of scar formation adjacent to the stricture may be detected by urethroscopy.

The stricture can be calibrated by passage of bougies à boule.

Differential Diagnosis

Benign or malignant prostatic obstruction can cause symptoms similar to those of stricture. After prostatic surgery, bladder neck contracture can develop and induce stricture-like symptoms. Rectal examination and panendoscopy adequately define such abnormalities of the prostate. Urethral carcinoma is often associated with stricture; urethroscopy demonstrates a definite irregular lesion, and biopsy establishes the diagnosis of carcinoma.

Complications

Complications include chronic prostatitis, cystitis, chronic urinary infection, diverticula, urethrocutaneous fistulas, periurethral abscesses, and urethral carcinoma. Vesical calculi may develop from chronic urinary stasis and infection.

Treatment

Specific Measures

Dilation

Dilation of urethral strictures is not usually curative, but it fractures the scar tissue of the stricture and temporarily enlarges the lumen. As healing occurs, the scar tissue reforms.

Dilation may initially be required because of severe symptoms of chronic retention of urine. The urethra should be liberally lubricated with a water-soluble medium before instrumentation. A filiform is passed down the urethra and gently manipulated through the narrow area into the bladder. A follower can then be attached (see Chapter 10) and the area gradually dilated (with successively larger sizes) to approximately 22F. A 16F silicone catheter can then be inserted. If difficulty arises in passing the filiform through the stricture, urethroscopy should be used to guide the filiform under direct vision.

An alternative method of urethral dilation employs Van Buren sounds. These instruments are best used by an experienced urologist familiar with the size and extent of the stricture involved. First, a 22F sound should be passed down to the stricture site and gentle pressure applied. If this fails, a 20F sound should be used. Smaller sounds should be used with care, because they can easily perforate the urethral wall and produce false passages. Bleeding and pain are major problems caused by dilation.

Urethrotomy under Endoscopic Direct Vision

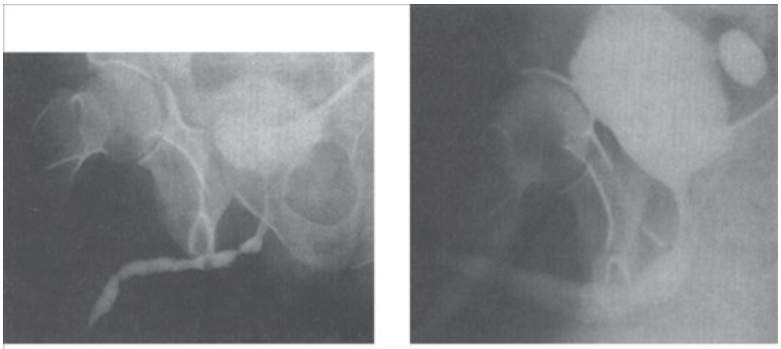
Lysis of urethral strictures can be accomplished using a sharp knife attached to an endoscope. The endoscope provides direct vision of the stricture during cutting. A filiform should be passed through the stricture and used as a guide during lysis. The stricture is usually incised circumferentially with multiple incisions. A 22F instrument should pass with ease. A catheter is left in place for a short time to prevent bleeding and pain. Results of this procedure have been satisfactory in short-term follow-up in 70–80% of patients, but long-term success rates are much lower. The procedure has several advantages: (1) minimal anesthesia is required—in some cases, only topical anesthesia combined with sedation; (2) it is easily repeated if the stricture recurs; and (3) it is very safe, with few complications.

Surgical Reconstruction

If urethrotomy under direct vision fails, open surgical repair should be performed. Short strictures (≤2 cm) of the anterior urethra should be completely excised and primary anastomosis done. If possible, the segment to be excised should extend 1 cm beyond each end of the stricture to allow for removal of any existing spongiofibrosis and improve postoperative healing.

Strictures >2 cm in length can be managed by patch graft urethroplasty. The urethra is incised in the midline for the full length of the stricture plus an additional 0.5 cm proximal and distal to its ends. A full-thickness skin graft is obtained—preferably from the penile skin or buccal mucosa—and all subcutaneous tissues are carefully removed. The graft is then tailored to cover the defect and meticulously sutured into place (Figure 41–4).

Figure 41–4.

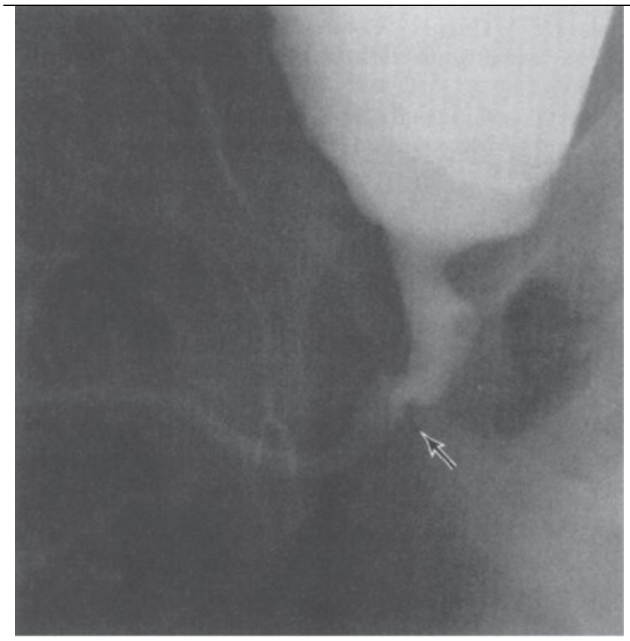


Left: Urethrogram demonstrating multiple anterior urethral strictures. ***Right:*** Voiding cystourethrogram following a patch skin graft of 14 cm in the same patient. There are no residual strictures.

In very long, densely fibrotic strictures, the distal penile fasciocutaneous flap technique has been successful in >80% cases. This single-stage procedure can be combined with buccal mucosa grafting in panurethral strictures. In adults, grafts from buccal mucosa or penile skin should be applied with an onlay technique in the bulbar region of the urethra to maximize graft vascularization from the corpus spongiosum.

Strictures involving the membranous urethra ordinarily result from external trauma (see Chapter 17) and present problems in reconstruction. Most can be corrected by a perineal approach with excision of the urethral rupture defect and direct anastomosis of the bulbar urethra to the prostatic urethra (Figure 41–5). At times, partial pubectomy from the perineal approach can be done to improve urethral approximation without tension on the anastomosis. Rarely, total pubectomy combined with the perineal approach is required to accomplish the direct end-to-end anastomosis.

Figure 41–5.



Voiding urethrogram following repair of traumatic posterior urethral stricture. *Arrow* indicates that area of repair is stricture free.

These single-stage procedures have a high success rate and create a urethra free of hair—a major problem seen with two-stage procedures. Although seldom required, two-stage procedures are important reconstructive techniques to be considered in complex urethral strictures.

Treatment of Complications

Urinary tract infection in patients with strictures requires specific antimicrobial therapy, followed by long-term prophylactic therapy until the stricture has been corrected. Periurethral abscesses require drainage and use of antimicrobial drugs. Urethral fistulas usually require surgical repair.

Prognosis

A stricture should not be considered "cured" until it has been observed for at least 1 year after therapy, since it may recur at any time during that period. Urinary flow rate measurements and urethrograms are helpful to determine the extent of residual obstruction.

Urethral Condylomata Acuminata (Urethral Warts)

Condylomata acuminata are uncommon in the urethra and are almost always preceded by lesions on the skin. They are wart-like papillomas caused by a papilloma virus and are usually transmitted by direct sexual contact but may be transmitted nonsexually.

Patients commonly complain of bloody spotting from the urethra and occasionally have dysuria and urethral discharge. Examination of the urethral meatus often reveals a small, protruding papilloma. If a lesion is not found in this location, the meatus should be separated with the examining fingers so that the distal urethra can be inspected. About 90% of such lesions are situated in the distal urethra. Complete urethroscopy must be done to be certain other lesions do not exist.

Lesions of the meatus can be treated by local excision. A local anesthetic is applied to the area at the base of the lesions, and the pedunculated lesions are sharply incised with small scissors. The area is then fulgurated by electrocautery. Meatotomy may be indicated for excision of lesions in the fossa navicularis and glandular urethra.

Deeper lesions may be fulgurated transurethrally with a resectoscope or Bugby electrode. Recently, lesions have been successfully destroyed using a carbon dioxide or holmium laser. Laser therapy does minimal damage to the urethral mucosa, and stricture formation seems less likely with its use.

Multiple lesions have also been treated with fluorouracil, 5% solution or cream. The drug is instilled in the urethra for 20 minutes twice a week for 5 weeks. Care must be taken to protect the penile skin and scrotum from coming in contact with the medication, since it may produce severe irritation.

Lesions may become infected and ulcerated. This suggests carcinoma, and histopathologic confirmation of the diagnosis should be obtained. Rarely, giant condylomata (Buschke-Löwenstein tumors) involving the glans penis and often the urethra may be seen. Such lesions suggest carcinoma and a biopsy must be done. Surgical excision is the treatment of choice.

To prevent recurrence of condylomata acuminata, the sexual partner must also be examined and treated if necessary.

Stenosis of the Urethral Meatus

Newborns are often suspected of having meatal stenosis of some degree. This condition is thought to be secondary to ammonia dermatitis following circumcision and resulting in prolonged irritative meatitis.

Calibration is important, since the visual appearance of the meatus does not correlate well with its actual size. The urethra should easily accept the tip of an 8F pediatric feeding tube. The significance of metal stenosis is debated, but a meatal caliber <5F in children <10 years of age is an indication for meatotomy.

Penile Phlebothrombosis and Lymphatic Occlusion

Superficial veins and lymphatic vessels of the dorsal penile shaft just proximal to the corona may become irritated and inflamed. A careful history usually indicates that minor trauma to the area (eg, from prolonged sexual intercourse) has occurred. Examination reveals a tender, indurated, cord-like structure on the distal penile shaft. Slight erythema may be present.

For clinical purposes, there is no need to distinguish lymphatic and venous causes, since both penile phlebothrombosis and lymphatic occlusion will resolve spontaneously. The patient must be reassured.

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