

cartilage in this septum. The greater part of the body is concealed under the anterior commissure of the labia, its swelling outline forming the *torus clitoridis*.

The glans, which terminates the organ, is a small, rounded, conoid tubercle. It is independent of the corpora cavernosa, capping over their fusiform ends as in the penis. It has a small prepuce derived from the nymphae, and a preputial sac in which small collections of smegma may accumulate. To its under surface is attached the frenulum.

The following measurements of the clitoris are given by Krause:

	When relaxed.	When erect.
Length of body	18 mm.	29 mm.
Thickness of body	5 mm.	9 mm.
Length of crura	40 mm.	45 mm.
Thickness of crura	5 mm.	8 mm.
Diameter of glans	4-7 mm.	6-9 mm.
Total volume	2 c.c.	6 c.c.

Considerable individual variations are found. The organ may be of such size as to be mistaken for a small hypospadiate penis, and thus lead to mistake in determining the sex of a child.

The structure of the clitoris repeats, on a diminutive scale, that of the penis. Each corpus cavernosum is surrounded by a firm, elastic, fibrous envelope, the *tunica albuginea*, from whose deep surface are given off numerous bands or trabeculae, along which run smooth, muscular fibres. These trabeculae divide the substance of the organ into numerous small spaces, termed areolae, which are really venous sinuses, as they are lined with endothelium and communicate widely with the veins. Into these areolae empty arterioles (helicine arteries). Erection occurs from the rapid filling of the areolae by the expansion of the arterial orifices through the action of vaso-dilator nerves, and the impeding of the venous discharge by the ischio-cavernosus muscle and the elastic envelope. This apparatus is by no means as well developed as in the corresponding organ of the male, consequently erection is less complete.

The glans has no albuginea, but under its epithelium is a considerable fibro-elastic network which performs a similar function. Areolae occur and the vascular supply is similar to that of the corpora cavernosa. Its cutaneous investment is supplied with special nerve endings, which give it remarkable and special sensibility. According to Dogiel there are intra-epithelial plexuses with filaments ending in flattened platelets, tactile corpuscles within the papillae, corpuscles of Pacini and the end bulbs of Krause in the subcutaneous tissue, while at the base of the papillae are the special endings which Krause believes to be related to the peculiar sensibility of the organ and has named corpuscles of sexual pleasure (Wollustkörperchen). They are usually called genital corpuscles.

The Bulbs of the Vestibule.—The corpus spongiosum urethrae of the male, including the bulb of the urethra, is represented in the female by two oval masses of erectile tissue that lie beneath the nymphae on either side of the vestibule and in front of the triangular ligament (Figs. 4245, 4246). Their lower ends are free, but they are united above over the lower end of the urethra, thus simulating the form of a horseshoe set astride of the vaginal opening. They were called by De Graaf *corpora retiformia*, by Taylor *semibulbi corporis spongiosi*, but, since the time of Kobelt (1844), are generally known as the *bulbs of the vestibule* (*bulbi vestibuli*). They should be considered as the male organ separated into two portions by the intrusion of the vaginal opening in the median line.

Enlarged and rounded at their lower extremities, they are bulb-like in form. Their shape has also been compared to that of an almond, a fig, or, still more aptly, to that of an engorged leech, which they closely resemble because of their long, tapering, upper extremities which unite with each other and with the clitoris. Their

dimensions vary in different individuals. Usually reaching as far back as the navicular fossa, they may not extend beyond the middle of the vaginal opening, or, on the other hand, they may be continued behind on to the perineum. When not turgid, each bulb is, in ordinary cases, about 30-40 mm. long, 10-15 mm. broad, and 5-10 mm. thick.

The bulbs are only about 8-10 mm. from the pubic arch, but are so situated with regard to the vaginal opening that they are pushed forward and away from the bones as the fetal head descends. Rupture of one of them may, however, occur during labor, especially if instruments are used. This occasions a large hæmatoma in the corresponding labium, or, if the rupture extends through the entire integument, a serious hemorrhage.

The upper or deeper surface of the organ is applied to the ischio-vulvar or outer sheet of the triangular ligament, to which it is attached by some lax, areolar tissue. Its inferior or superficial surface is covered by the basis of the nymphae. Like the bulb of the urethra in the male, it is invested externally by a sphincter muscle, the bulbo-cavernosus, which, by the separation of the two bulbs, becomes applied to the outer surface only, forming a constrictor of the vagina. Its internal surface embraces the vestibule, skirting the orifice of the urethra, the vagina, and the vestibular glands. Its anterior extremity, pointed and drawn out, communicates above the opening of the urethra with the plexus of the clitoris and with the opposite bulb. The plexus thus formed was called by Kobelt the *pars intermedia*. It lies immediately under the habenule urethrales, and with them constitutes a vestige of the corpus cavernosum urethrae of the male.

In structure the bulbs resemble the corresponding organ of the male. They are invested by a thin tunica albuginea, within which is a plexus of large veins surrounded by muscular fibres sparsely distributed. The organ has the general structure of erectile tissue, but is much less perfect in that function than the clitoris, and very far below the male penis. When engorged with blood it assumes a swollen, doughy consistence rather than a complete rigidity. It is supplied by the artery of the bulb from the internal pudic. The blood, after leaving the plexus of veins found in the organ, passes into the pudic, perineal, and clitoridian veins.

Arteries.—The arterial supply of the vulva is shown in the following scheme:

Arteries.	Distribution.
<i>From the common femoral artery</i> —	
Superior external pudic...	Small branches to the mons pubis and anterior commissure of the labia.
Inferior external pudic...	Anterior labial branches to anterior half of labia, some of which reach the nymphae.
<i>From the internal pudic artery</i> —	
Dorsal artery of the clitoris.	Glans clitoridis and anterior part of nymphae, a few twigs extending upward to the mons pubis.
Artery of the corpus cavernosum.	Crura and body of clitoris, small branch to bulbs of the vestibule.
Artery of the bulb.....	Bulbs of the vestibule, meatus urinarius (urethral artery), vestibular glands.
Superficial perineal.....	Posterior labial branches to posterior half of labia and nymphae, bulbs of the vestibule, vestibular glands.
Transverse perineal.....	Posterior end of labia, navicular fossa.
<i>From the obturator artery</i>	
Internal terminal branch.	External labial, to outer surface of labia.

Veins.—With one exception these have the same general arrangement as the arteries, discharging into the internal saphenous, the internal pudic, and the obturator trunks (Fig. 4245). The dorsal vein of the clitoris discharges into the vesical plexus (plexus of Santorini), whose efferent vessels terminate in the internal iliac vein. Numerous venous plexuses occur in the different organs. Thus the areolae of the clitoris themselves constitute a plexus, the veins of the bulbs of the vestibule are arranged in a superficial large-meshed plexus and a deep, fine-meshed one, and a plexus also exists within the nymphae.

These communicate freely with each other and with the vesical and vaginal plexuses.

Lymphatics.—The lymphatic vessels of the external genitals are very numerous, especially upon the nymphae and the inner surface of the labia. They discharge, for the most part, into the superior internal or pubic group of superficial inguinal glands. This group lies internal to the saphenous opening and near the spine of the pubis. It includes two to four glands. Some vessels may discharge into the inferior internal group of superficial glands, or even, though rarely, reach some of the external group. In injecting the lymphatics on one side of the vulva, it is often found that the injection reaches the opposite side.

Cunéo and Marcille have recently shown that the lymphatics of the glans of the clitoris ascend by way of the mons pubis to the inguinal canal, through which they pass, to terminate in glands situated along the iliac vessels.

Nerves.—The nervous supply of the vulva is derived both from the cerebro-spinal and from the sympathetic systems. The cerebro-spinal nerves come from both the lumbar and the sacral plexuses, the sympathetic from extensions of the hypogastric plexus known as the cavernous and the utero-vaginal plexuses. From the first are given off two nerves, the greater cavernous nerves, and a number of small nerves, the lesser cavernous nerves that supply the crura, body, and glans of the clitoris. The nervous supply of the organ is far greater, in proportion to its size, than that of the penis. With the cavernous plexus are distributed the branches from the third and fourth sacral nerves that effect erection, the *nervi erigentes* of Eckhard. Other nerves from the cavernous plexus combine with the cerebro-spinal nerves, whose distribution is given in the following scheme:

Nerves.	Distribution.
<i>From the lumbar plexus.</i>	
Ilio-hypogastric—	
Hypogastric branch....	Integument upon upper part of mons pubis.
Ilio-inguinal—	
Inguinal branch.....	Integument upon lower part of mons pubis and upper part of labium.
Genito-crural—	
Genital branch.....	To labia (anterior labial nerves).
<i>From the sacral plexus.</i>	
Internal pudic—	
Perineal branch.....	To labia (posterior labial nerves), nymphae, prepuce and glans of clitoris, vestibule and meatus urinarius (nerve of vestibule), bulb of the vestibule.
Dorsal nerve of clitoris.	Glans, prepuce, body and crura of clitoris.
Small sciatic—	
Inferior pudendal branch.	To labia (posterior labial nerves).

The following have been freely used in the preparation of this article. In Waldeyer, Rieffel, and Nagel excellent bibliographies will be found.

Rieffel, H.: *Appareil genital de la femme*. In vol. v. of Poirier's *Traité d'anatomie humaine*, Paris, 1901.
Waldeyer, W.: *Das Buecken*, Berlin, 1890.
Testut, L.: *Traité d'anatomie humaine*, vol. iii., Paris, 1894.
Nagel, W.: *Die weiblichen Geschlechtsorgane*. In *Bardleben's Handbuch der Anatomie des Menschen*, Bd. 7, 2te Teil, 1te Abtheilung, Jena, 1896.

Frank Baker.

SEXUAL ORGANS, MALE. See *Genital Organs, Male*.

SEXUAL ORGANS, MALE, INJURIES AND DEFECTS OF.—I. CONGENITAL DEFECTS OF THE PENIS.—**Abnormalities in Shape and Size of the Penis.**—Abnormalities in the size of the penis are of relatively frequent occurrence, although they do not naturally come under the surgeon's observation. No two penes are alike in size, and the general rule that the length of the penis varies inversely to the girth of its possessor is commonly accepted. It is alleged that rudimentary development of the penis is often associated with intellectual deficiency. It is also alleged that men of great intelligence have undersized genitals. Cryptorchids and sufferers from epispadias and hypospadias habitually have small penes. That sexual exercise has any influence upon the

size of the penis is not proven. The so-called penis congestor is a mere gauge of gullibility.

Absence of the Penis.—When the penis is so small as to be apparently or actually absent the testicles are usually retained in the groin or in the abdomen, and the scrotum is split. As a result the genital organs resemble those of the female, and the condition is that of complete male pseudohermaphroditism.

Apparent Absence of the Penis.—The penis may be congenitally adherent to the scrotum; very rarely it is concealed beneath the skin of the abdomen or of the scrotum. Thus Bouteiller reported a case in which the penis appeared to be absent, but could be felt beneath the skin of the scrotum, whence it was liberated by a T-shaped incision. Usually, however, the penis is curved and only partially adherent. Such a condition is commonly accompanied by hypospadias.

Double Penis.—Double penis is extremely rare. A number of cases have been recorded in which the penile abnormality was associated with other evidences of fetal inclusion. Exceptionally, the reduplication of the genital organ is the only abnormality. How frequent such a condition is it is impossible to estimate, since patients so afflicted not only fail to apply for relief, but sedulously shun observation. Four cases have been recorded.*

Torsion of the Penis.—This is an unusual feature of hypospadias and epispadias (*q. v.*). Caddy † has reported a case of torsion unaccompanied by any other defect.

II. PHIMOSIS.—Phimosis is an abnormal tightness of the prepuce. There are two kinds of phimosis: the one consists in an adhesion of the prepuce to the glans penis, and this is a normal condition in every male child at birth. The relief of such a phimosis is accomplished by forcibly stripping back the foreskin until the glans is entirely uncovered, recurrence of the adhesions thus torn being prevented by the application of dusting powders and by repeated retraction of the skin. This minor operation is noteworthy chiefly because its omission is the commonest cause of permanent cicatricial phimosis.

The second variety of phimosis is an undue tightness of the prepuce caused by a chronic thickening at the preputial orifice, and resulting in an inability to retract the prepuce. Such phimosis is commonly spoken of as being either congenital or acquired; but, strictly speaking, it is probably always acquired, since the thickening at the preputial orifice which prevents retraction seems, in the cases called congenital, to be occasioned by the adhesive phimosis noticed above, and by the balanoposthitis to which it gives rise; acquired phimosis is caused by any inflammation of the prepuce, notably by chancroids occurring at the preputial orifice. During the course of any of these inflammations a temporary phimosis, known as inflammatory phimosis, may be caused by inflammatory oedema.

Results of Phimosis.—If the prepuce be unduly tight, or merely unduly long, it may cause two different sets of conditions, the one irritative, the other obstructive. Thus in infancy it encourages balanoposthitis, adhesions, premature sexual excitement, and masturbation; while, from retention, it may cause incontinence of urine, frequent and painful micturition so painful as to lead to the suspicion of stone; while the straining to overcome the obstacle may result in hernia and rectal prolapse. In later life the obstruction may give rise to hypertrophy of the bladder and dilatation of the ureters and kidneys; while chronic retention may result in the form of preputial calculi, in intensified venereal troubles, especially gonorrhoea and chancroid (*q. v.*), and epithelioma of the penis (*q. v.*). Finally, phimosis interferes with coitus, and violent retraction of the tight prepuce may result in paraphimosis.

Treatment.—The treatment of phimosis is circumcision. The operation of dilating the prepuce is not worthy of consideration (*cf. Circumcision*).

*Keyes: "Diseases of the Genito-Urinary Organs," third edition, 1905.
† *Lancet*, 1894, ii., 634.

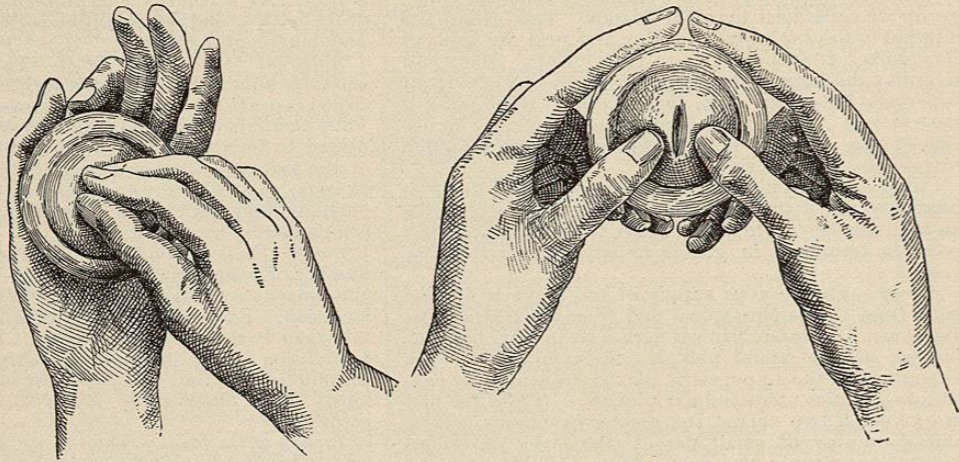
III. PARAPHIMOSIS.—Paraphimosis is that condition in which the phimotic prepuce, having been forcibly retracted behind the corona glandis, cannot be replaced. The immediate result of such retraction is an acute œdema of the prepuce and the glans penis, which œdema persists and tends to grow larger and more leathery, and thus to form the chief obstruction to the surgeon's efforts at retraction. When the patient is seen the glans penis is greatly swollen and congested, while behind it rises a tense, shining œdematous collar of mucous membrane, behind which again lies a deep sulcus, most marked on the dorsum of the penis. This sulcus is the site of constriction; it is often ulcerated. Behind it usually arises a second collar. If the circulation is completely obstructed, spots of gangrene will be found upon the glans and the prepuce.

Treatment.—The treatment of paraphimosis depends upon the severity of the local reaction. If the obstruction is slight and there seems to be no danger of gangrene, palliative and mechanical treatment may be employed, in the hope of reducing the œdema sufficiently to permit reposition of the prepuce; but if gangrene threatens, the paraphimosis must be relieved at once lest the patient lose a portion of his penis.

Mechanical Treatment.—The first aim of the surgeon must be to reduce the œdema as far as possible. This may be done by encircling the glans penis with tape or cotton string (Fig. 4247), or by applying over the whole penis a compressing wet dressing of boric-acid solution. Such a dressing should be applied as tightly as possible, and should be left in place not longer than an hour or two, after which reduction should be attempted. In reducing a paraphimosis the physician's efforts should be directed to slipping the constricting band over the glans penis, rather than to forcing the glans through the constriction. This may be accomplished in several ways, the simplest of which are shown in Figs. 4248 and 4249.

Surgical Treatment.—But mechanical treatment may fail, or the presence or imminence of gangrene may call for immediate relief, or the surgeon may very wisely con-

clude that his patient requires relief, not only from his present difficulty but also from the danger of its recurrence, a relief which can be obtained only by some sort of operation. The sole requirement is to relieve the penis



FIGS. 4248 AND 4249.—Simple Methods of Reducing Paraphimosis.

from its constriction, and this is best accomplished as follows: The skin behind the constriction is rendered surgically clean, and a small area on the dorsum of the penis near its root is infiltrated with cocaine. In this area a longitudinal incision is carried through the skin to one side of the dorsal vein and just long enough to admit a small, blunt-pointed straight bistoury or tenotomy knife. This is burrowed forward through the loose, subcutaneous connective tissue until it arrives on the dorsum at the constricting band. Here some care is required to insert the knife blade beneath the constriction without puncturing it. When this is done the knife blade is turned outward and the constriction thoroughly divided, the knife immediately withdrawn, and the first incision protected with a collodion dressing. The prepuce may then be replaced, unless excessive œdema renders this impossible, and the penis is held erect and covered with a mild antiseptic wet dressing. The after-treatment requires no special comment, though circumcision may subsequently be necessary in order to obtain an æsthetic result.

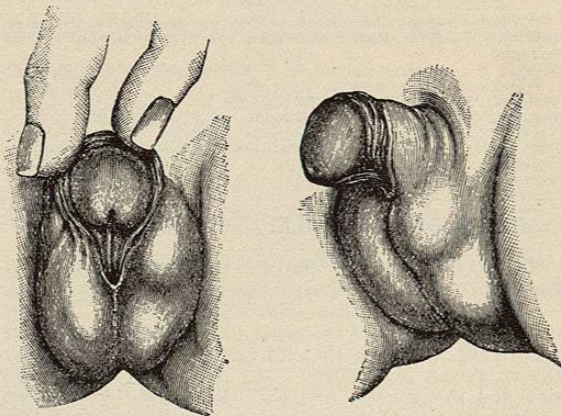


FIG. 4250.—Penoscrotal Hypospadias. Front and side views.

IV. HYOSPADIAS AND EPISPADIAS.—Hypospadias is a lack of union of the urethra upon its floor, while epispadias is a similar lack of union upon its roof. The canal may thus terminate at any point between the bladder

and the normal meatus. Hence in hypospadias the canal may terminate (1) at the base of the glans (balanitic hypospadias), or (2) in the penile urethra (penile or penoscrotal hypospadias) (Fig. 4250), or (3) in the perineum (perineal hypospadias). Similarly epispadias may be balanitic or penile. The urethra may continue forward in front of the hypospadiac or epispadiac opening, or this remaining portion of the canal may exist only as a shallow gutter.

With urethral deformities of the graver sorts are often associated such deformities of the penis as incurvation, torsion, and scrotal adhesion; while with perineal hypospadias the scrotum is often split, and there may be other features of pseudohermaphroditism. Of these various deformities, balanitic hypospadias is by far the most common, while penile hypospadias stands next in order of frequency. Epispadias and perineal hypospadias are extremely rare.

Fig. 4251.—Rochet's Modified Nové-Josserand Operation for Hypospadias. The flaps are cut, the catheter is introduced, and the scrotal flap sutured around it.

There seems to be a hereditary tendency to the occurrence of these urethral defects.

Symptoms.—The symptoms of hypospadias and epispadias are sexual and urinary. The sexual symptoms are incomplete erection and imperfect emission due to the urethral and penile defect, and varying in severity with the gravity of this defect. Though it is alleged that balanitic hypospadias may cause relative sterility by producing insufficient ejaculation, this theory is by no means proven; while the many known cases in which hypospadiac individuals have had numerous children are at variance with the theory. The urinary symptoms of hypospadias consist in a deflection and a dribbling of the stream in all but the perineal cases; in these the patient cannot safely urinate excepting in a squatting posture. Yet the urethra always terminates in front of the triangular ligament, and, therefore, there is never incontinence of urine in hypospadias. In epispadias, however, the urethral orifice may be large and situated practically in the anterior wall of the bladder, there being little or no vesical sphincter. A patient suffering from this malformation has incontinence of urine, and is in almost as sorry a plight as he who suffers from exstrophy of the bladder. (*Cf. Bladder of the Male—Malformations.*)

Treatment.—The multiplicity of operations that have been suggested for the cure of hypospadias and epispadias attests the inefficiency of all of them. Time and

again new procedures are advocated and new statistics compiled to prove the efficiency of one or the other operation. Yet it remains true to-day that no operation is ideal, that no operation can absolutely promise success, and that no operation should be attempted without the understanding that the best results can be obtained only by a succession of steps, the completion of which will certainly require several months, perhaps several years.

In general, the operation may be divided into two parts: (1) the relief of associated penile deformities, and (2) the relief of the urethral deformity.

Relief of Penile Deformities.—If there is incurvation of the penis or penoscrotal adhesion, this requires relief before the urethra is attacked. Adhesion is relieved by dividing the adhering skin transversely and suturing it longitudinally. Incurvation of the penis is relieved by carrying this transverse incision through the sheath of the corpora cavernosa and, if necessary, deeply into the intercavernous septum, and bandaging the organ in an overextended position until complete healing occurs. The urethral defect may now be attacked, the mode of attack depending upon the nature of this defect.

Relief of Balanitic Hypospadias.—While balanitic hypospadias cannot be said to demand relief, the patient may prefer that an attempt should be made to place his urethral orifice in the normal position at the end of the gland. This may best be done by Beck's operation, which is performed as follows: The prepuce is separated from the glans penis by a transverse incision running from side to side across the venter of the organ and skirting the orifice of the hypospadiac urethra. The proximal flap of prepuce is then freely dissected up, exposing an inch or more of the urethra. This terminal part of the urethra is then dissected free from the surrounding tissues and carried forward until the meatus can be sutured in its proper position at the head of the glans penis, the glans having been prepared to receive the urethra by a simple incision or by puncture. The meatus is sutured in place, the preputial skin is brought forward over the urethra, and the suture and the wounds are sealed as far as possible with collodion.

Fig. 4252.—Rochet's Modified Nové-Josserand Operation for Hypospadias. The final sutures.

Relief of Penile and Perineal Hypospadias.—Of the operations employed for the relief of penile and perineal hypospadias Duplay's is the most favored by text-books. This operation is performed as follows: A soft-rubber catheter is inserted through the urethra

into the bladder and is carried forward along the groove on the under surface of the penis until it finally issues through a hole punched in the imperforate glans.

By means of a longitudinal incision, one-third of an inch from the median line on each side, flaps are raised to surround this catheter, their epithelial surface inward. These are sutured with catgut, and the exposed raw surface is covered by flaps raised and carried inward from the sides of the penis.

Such operations as Duplay's have not been very successful, because the flaps do not unite well and the fistula left between the old hypospadiac urethra and the new artificial one is very hard to close, both on account of the smallness of the parts—since these operations are habitually performed on children—and the befoulment by urine.

An operation which promises to avoid this difficulty is the Rochet-Nové-Josserand procedure. This is performed as follows: The hypospadiac meatus having been incised in order that there may remain no stricture at this point, a transverse skin incision 2 cm. long is made just in front of it. Through this incision a stout probe is introduced and passed forward in the subcutaneous cellular tissue of the venter of the penis, thus burrowing a channel, the anterior orifice of which is formed by a slit or a puncture in the glans penis. A long rectangular flap is then cut from the perineum, its base surrounding the hypospadiac orifice. It should be a little over 2 cm. wide and one-third as long as the new urethra is expected to be.

A small soft-rubber catheter is then introduced into the bladder, the flap is sutured around this with the finest catgut (Fig. 4251), and the distal end of catheter and graft is pushed through the subcutaneous canal and out at its anterior orifice, where the flap is sutured (Fig. 4252). A few skin sutures taken transversely close the perineal wound, and the child is then immobilized in a plaster-of-Paris dressing and put to bed with the penis in an erect position and the catheter leading into a urinal. This catheter should be left in place five or six days, after which spontaneous urination may be permitted.

The after-treatment consists in the passage of bougies every week or so in order to insure the patency of the canal. This operation reduces to a minimum the probability of fistula, and has been followed by admirable results.

Relief of Epispadias.—Epispadias is so rare that the surgery of this condition has not yet been satisfactorily developed. Duplay's operation may be applied to the epispadiac urethra, while it is probable that Rochet's operation could be modified to give as good results here as in hypospadias.

The favorite operation of the text-books is Thiersch's, in which the penile canal is formed by an inverted flap from one side of the penis covered by a longer direct flap carried across from the opposite, the inverted flap forming the roof of the urethra, the direct flap forming the skin covering. The fistula at the base of the penis is covered in by triangular flaps, one turned inside out and the other simply brought down and covering the raw surface, while the fistula at the base of the glans is covered by transferring the loose preputial skin from below the glans. Thiersch's original case was cured by this method after eighteen months. When epispadias is complicated by loss of the vesical sphincter, it may be regarded as a mild case of vesical exstrophy and should be treated accordingly.

It may be observed that none of these operations pretends to replace the corpus spongiosum, and the new urethra, bereft of its physiological coverings, may not be expected to perform its urinary and sexual functions in a perfect manner.

V. INJURIES OF THE PENIS.—*Contusion and Fracture.*—The flaccid penis may be expected to escape the buffets of adversity more readily than any other part of the body; injuries inflicted upon the erect penis are habitually in some manner sexual. Thus contusion may result from misguided efforts in coitus; strangulation is occa-

sionally caused by encircling the penis with a metallic ring; and the so-called fracture, which is actually a rupture of the erectile bodies, is only a more severe injury due to like causes. Even though the contusion be but slight, hemorrhage into the loose subcutaneous tissue of the penis is likely to be free; while fracture of the erectile bodies is immediately followed by alarming subcutaneous hemorrhage, which may swell the organ to an incredible size.

The two therapeutic indications are control of hemorrhage and prevention of retention. The former is accomplished by the application of cold and pressure, or, if these fail, by incision; while the latter may require a retained catheter. In mild cases surrounding the penis with ice for a few hours is all that is required. But if the erectile bodies are fractured, it is wiser to incise immediately over the seat of the injury and to suture the torn fibrous sheath.

Open Wounds.—Open wounds require similar treatment, control of hemorrhage, and suture of the sheaths of the erectile bodies. If the injury to the erectile bodies has been severe the resultant scar may permanently impair erection.

Dislocation.—A few cases have been reported in which violent traction upon the skin of the flaccid penis has resulted in tearing this free at the balanopreputial junction and permitting the penis to slip under the integument of the thigh, the abdomen, or the scrotum. The immediate oedematous reaction conceals the absence of the penis from its cutaneous envelope, and it is not until catheterization is attempted or urination occurs that the abnormal position of the penis is discovered.

Nélaton was able in one case to replace the penis by means of an aneurism needle; but if this could not be done, it would always be possible to reach it by an incision. And in this connection it must be remembered that, even though the patient has urinated beneath his skin, unless the urine is infected it may be disregarded and will probably be absorbed.

SKIN DISEASES. See *Skin Diseases of the Scrotum*, below.

BALANOPSTHITIS. See *Balanitis*.

VENEREAL ULCERATION. See *Chancroid*, *Syphilis*.

HERPES PROGENITALIS. See *Herpes*.

LYMPHANGITIS AND CELLULITIS. See *Chancroid*, *Gonorrhoea*.

VI. INFLAMMATION OF THE ERECTILE BODIES.—This condition, known variously as penitis or cavernitis, is extremely rare. Spontaneous inflammation is said to occur during acute exanthemata. The inflammation which occurs as a result of injury must be combated by the usual local antiseptics and drainage and irrigation, while the inflammation of the corpus spongiosum complicating gonorrhoea and stricture is a condition which meets consideration in the articles upon those subjects.

VII. GANGRENE OF THE PENIS.—The blood supply of the penis is so generous that gangrene of this organ is most exceptional. Yet it may occur from three causes: (1) strangulation, (2) virulent infection, (3) debility.

Strangulation is the commonest cause of penile gangrene. It occurs mechanically, as when the penis is encircled by a ring, or by a paraphimotic prepuce, and from inflammation, if the inflammatory reaction is severe enough to obstruct the lymph spaces. Virulent infection, a less frequent cause, is well exemplified by phagedena (see *Chancroid*), and by infiltration of urine (see *Urethra*, etc.). Debility, whether senile or diabetic, exceptionally causes gangrene, as do also thrombosis and embolism.

Treatment.—The treatment of these various forms of gangrene consists primarily in the removal of their cause. Thus a paraphimosis causing gangrene requires immediate reduction or incision. A ring around the penis must be cut away, or, if it be gold, amalgamated by the application of metallic mercury. Infiltration of urine calls for prompt incision and drainage (see *Urethra*, etc.). Severe cellulitis requires liberating incisions and wet dressings, while phagedena demands prompt and energetic antiseptics (see *Chancroid*). Senile and diabetic

gangrene present here as elsewhere a most gloomy prognosis; yet much may be done by stimulating and dieting the patient and by cleansing and keeping clean the dead tissue.

A discussion of this part of the treatment will be found in the article on *Gangrene*.

VIII. TUBERCULOSIS.—Tuberculous ulceration of the glans and prepuce is very rare. It may be confounded with carcinoma or with venereal ulceration. The tuberculous ulcer is "shallow, rarely attaining a great size, with characteristic edge, is made up of a succession of small, jagged indentations, caused by the degeneration of miliary tubercles, so that the lesion has an appearance as if gnawed out. The floor of the ulcer is not, as a rule, crusted, but covered with a seropurulent fluid, and occasionally yellowish elevations, representing miliary nodules, may be seen scattered over its surface. At the periphery also these miliary nodules may sometimes be seen, and their presence is of course pathognomonic, although frequently they are absent" (Bowen).

A number of cases of tuberculous infection of the prepuce following ritual circumcision have been reported. This infection is attributed to inoculation from tubercle bacilli in the mouth of the rabbi who sucks the wound. Thus Lehmann found ten children infected by one man; three of them died marasmic.

IX. CIRCUMSCRIBED FIBROSIS OF THE ERECTILE BODIES.—Circumscribed fibrosis of the erectile bodies, otherwise known as chronic inflammation or induration of the corpora cavernosa, consists of a hard fibrous deposit in the sheath and the adjoining portions of the erectile tissue of one of the erectile bodies of the penis. This fibrous mass feels like a flat plate set in but not projecting from the surface of the erectile body. It is fairly common in the corpora cavernosa, of which it may affect one or both, but is very rare in the corpus spongiosum. The nature of this growth is disputed. The few specimens that have been examined have proven to be fibromata or enchondromata. Sometimes a single specimen is fibrous in one part, cartilaginous in another, and bony in another. Such a tumor has been excised by Dr. Chetwood.

Circumscribed fibrosis habitually appears upon one or other of the corpora cavernosa of a man between thirty-five and fifty-five years of age. The patient first notices that his penis when erect deviates toward the side affected. Less often the first symptom is a slight uneasiness in the region of the growth. But the patient does not habitually recognize the presence of any abnormal tissue before he presents himself for examination. This reveals a hard, flattened mass with sharply defined margins occupying the substance of one or both corpora cavernosa near the surface, and feeling like cartilage. The edges of the mass may be slightly elevated and slightly tender. The mass is usually irregularly oval in shape. The tendency of this growth is to change. It grows either larger or smaller and either toward or away from the root of the penis, involving new portions of the corpora cavernosa as it recedes in other directions.

Thus the prognosis of the condition is most uncertain. It is impossible to say where it will next shift to, and whether it will grow larger or smaller.

The two symptoms of the disease are the very slight pain and the bending on erection, the latter being often so great as to prevent intromission. As Verneuil first observed, this condition is apparently analogous to Dupuytren's contraction of the palmar and plantar fascia, and is habitually associated with gout. It has been suggested that diabetes plays some etiological rôle, but further experience has disproven this.

I know no treatment that can be depended upon to remove this growth satisfactorily. The application of ointments, of iodine, of electrolysis, and of blisters has uniformly failed. Alkaline and anti-gouty remedies seem to do some good in such cases. Cures have been reported after excision, but, inasmuch as this only replaces the new growth with scar tissue, it is not justifiable to promise a cure by the knife; although operation may be under-

taken if the patient is willing to recognize that it is not a certain cure.

X. CALCIFICATION AND OSSIFICATION OF THE PENIS.—Calcification of portions of the corpora cavernosa is very rare and ossification is most unusual; only five cases of the latter condition have been reported. Apparently the cartilaginous or bony tumor develops secondarily in an area of fibrosis. The only treatment is excision.

XI. HORNS.—Soft warts of the glans or prepuce may become cornified and grow as horns. These horns seem peculiarly liable to epitheliomatous degeneration.

XII. MALIGNANT NEOPLASMS.—The primary neoplasms of the penis are epithelioma and sarcoma; secondary neoplasms are extremely rare.

Primary sarcoma begins in the cavernous tissue of one of the erectile bodies; it usually appears in early manhood and develops with characteristic rapidity, promptly involving the inguinal glands. As the tumor grows it causes priapism by closing the cavernous spaces, and may also obstruct the urethra, causing retention of urine. Early amputation is the only treatment (see below).

Primary epithelioma occurs exceptionally in the urethra and fairly frequently in the prepuce and the glans (Fig. 4253). A few cases of epithelioma have been observed in early life, as, for instance, one of Freyer's at the age of seventeen. The growth may develop from scar tissue, as from urethral fistula or from the scars of injuries or of venereal sores; but the commonest sources of epithelioma are soft warts and chronic balanitis. Twenty-nine of the thirty-seven cases collected by Kaufmann began as apparently benign warts. Tight phimosis, by retaining the smegma and encouraging balanitis, seems to have a marked predisposing tendency. Thus Demarquay noted phimosis in forty-two out of fifty-nine cases, and it is claimed that the circumcised Jew does not suffer from this disease. There is no evidence that the penis may be inoculated from the carcinomatous cervix uteri.

Jacobson recognized four ways in which penile epithelioma may first show itself: 1. It usually begins as a wart, its malignancy being first recognized by the indurated and ulcerated base and the exuberant growth. 2. The first evidence may be a subepithelial lump or induration without warty excrescence or ulceration; this little, apparently innocent nodule is distinctly malignant. 3. A superficial excoriation may persist after a balanitis, comparable to the condition in the tongue when a leucoplakia becomes raw, and is the first evidence of malignant disease. 4. Very rarely the new growth begins as an ulcer, either proceeding from a venereal ulcer, arising from the scar of such an ulcer, or coming on after some injury.

Whatever be the origin of the tumor, it soon becomes frankly malignant, its base is indurated, elevated, and ulcerated; the discharge is thin, sanious, and foul, while there may or may not be exuberant warty overgrowth. The inguinal glands suffer a pyogenic as well as a cancerous infection, enlarge, become matted together, suppurate and ulcerate. The ulcers thus formed become new centres of epitheliomatous invasion. The primary disease spreads superficially, sparing the corpora cavernosa and the corpus spongiosum, although widely involving the skin and destroying the glans. If the urethra

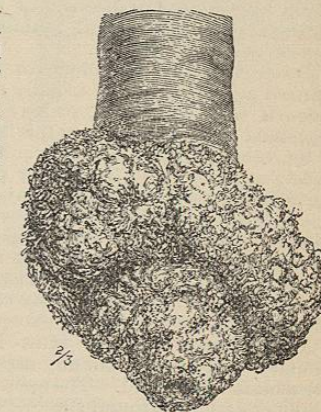


FIG. 4253.—Epithelioma of Penis.