

features resembling those of exulcerated herpes in groups. The distinguishing signs of the two will be given in the chapter on chancre.

TREATMENT.—The first indication is to remove any peripheral irritation which may exist. Hence, in cases of a long and tight prepuce circumcision is necessary, and we have often seen a permanent cure from this operation. Even in the absence of a long and tight prepuce, there may be such an abundant irritating secretion in the balano-preputial fold as to require careful attention to cleanliness, and the interposition of lint, either dry, which we prefer, or wet with a mildly astringent wash. When herpes follows sexual intercourse, immediate ablution and immersion of the penis in an astringent liquid will be of service. In all cases of a gouty and rheumatic tendency, and in cases of dyspepsia, appropriate remedies should be used. For the local treatment of the ulcerations we would recommend the interposition of dry lint, or the application of dry calomel, or some other absorbent powder. As washes we sometimes use the following:

R. Argenti Nitrat., gr. v	30
Aquæ, ℥j	30
M.	
R. Zinci Sulphat., gr. vj	36
Spt. Lavandulæ Comp., ℥ss	2
Aquæ, ℥ij	60
M.	
R. Acidi Carbolici, gtt. xx	130
Glycerinæ, ℥ij	12
Aquam ad ℥ij	60
M.	

In cases in which there is much circumferential hyperæmia the ordinary lead-water is very useful. In those instances in which the neuralgic pain persists in spite of the ordinary lotions, the surest mode of giving relief is by immersions of the penis in hot water and by thorough cauterization of the sores either with the fuming nitric acid or by the actual or galvano-cautery. This may be followed by the application of lotion number two, just given, to each ounce of which a drachm of the wine of opium may be added with benefit. When ulceration is persistent, a powder composed of iodoform, one part, and calomel, three parts, will soon induce healing. Again, in other cases, I have found that an ointment composed of iodoform, one part, and vaseline, ten to twenty parts, have induced a cure when other remedies had failed. Iodoform is often very beneficial in allaying the neuralgic pain accompanying herpes progenitalis.

CHAPTER XXIV.

STRICTURE OF THE URETHRA.

HAVING considered the complications of gonorrhœa, it remains to speak of one of the most frequent and important results of the same disease, urethral stricture.

ANATOMICAL CONSIDERATIONS.

An acquaintance with the anatomy of the urethra—including the character of its lining membrane, the fibrous, muscular, elastic, and erectile tissues which surround it, its dimensions and direction—is essential to a proper appreciation of the pathology of stricture and the skilful execution of operative procedures requisite in its treatment.

The male urethra is naturally divided into three portions, viz., the prostatic, membranous, and spongy.

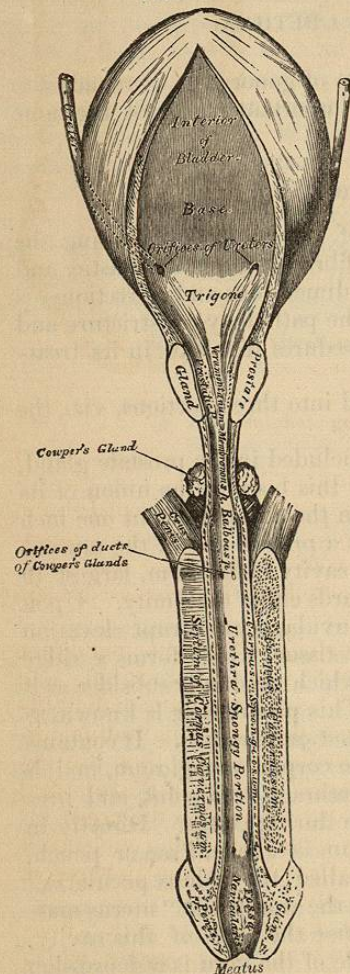
The *prostatic urethra* is the portion included in the prostate gland, and generally, but not always, traverses this body at the union of its middle and upper thirds. Its length in the adult is about one inch and a quarter; its posterior boundary is a prominence of the mucous membrane, called the *uvula vesicæ*; its cavity is fusiform, largest in the centre, and somewhat contracted towards either extremity. Upon its floor, a short distance in front of the uvula, is an abrupt elevation of the mucous membrane and subjacent tissue, which forms a ridge three-fourths of an inch in length, and which gradually subsides as it approaches the membranous urethra. This prominence is known as the *veru montanum*, *crista urethræ*, or *caput gallinaginis*. It contains erectile tissue, connected with that of the corpus spongiosum, and is adapted to assist in the closure of the urethra at this point, and prevent the passage backwards of the semen during coitus. Directly in front of the summit of the *veru montanum* is a small sac or pouch, three or four lines in depth, which is called the “sinus pocularis,” and, also, from its probable homology to the womb, the “uterus masculinus.”¹ The ejaculatory ducts traverse the walls of this cavity, and open upon its margin. On each side of the *veru* is a depression called the “prostatic sinus,” in which are found the orifices of the prostatic ducts, from twenty to thirty in number.

The *membranous urethra* extends from the apex of the prostate to the bulb, and is nearly or wholly included within the two layers of

¹ The most recent philosophical anatomists confirm the homology between the prostatic vesicle and the uterus. For an able résumé of this subject, see Simpson, *Obstetric Memoirs and Contributions*, vol. ii., p. 294. Philadelphia, 1856.

the deep perineal fascia. It is about three-fourths of an inch in length on its upper, but is shorter on its lower surface, owing to the encroachment of the bulb upon the latter. It is narrower than any other part of the urethra, except the meatus, and in consequence of the greater

FIG. 49.



The bladder and urethra laid open. Seen from above. (After Gray.)

development and number of muscular tissues surrounding it, possesses in a higher degree the power of contraction. This characteristic has led some authors to give it the name of the "muscular region" of the urethra.

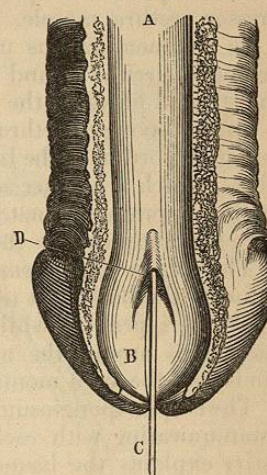
The *spongy urethra*, inclosed in the erectile tissue of the corpus spongiosum, varies in length according to the degree of turgescence of the penis; in a state of relaxation, it usually measures about five inches; during erection it may attain seven or eight. The posterior portion of this region is somewhat dilated, especially on its inferior aspect, and has received the name of "the sinus of the bulb." The term, "bulbous portion," is also applied to the posterior inch of the spongy urethra. The ducts of Cowper's glands open near its centre. Besides being somewhat dilated, the sinus of the bulb is extremely dilatable. This may be shown by two casts of the urethra in fusible metal, the one taken while the canal is simply filled, the other, while it is forcibly distended by the metal. The difference in the size of the part corresponding to the bulb will exhibit the dilatability of which it is susceptible. Anterior to its sinus, the spongy portion maintains a nearly uniform diameter until within about an inch of the meatus, where it again enlarges and forms the "fossa navicularis."

Lastly, the external orifice or "meatus" is a narrow vertical slit, which is generally the most contracted part of the whole canal. In some instances, however, the smallest diameter is found about a quarter of an inch within the meatus, where it can of course be seen.

The mucous membrane lining these various regions is continuous

posteriorly with that of the bladder, and anteriorly with the covering of the glans penis. It is very delicate in its structure, and abundantly supplied with bloodvessels and nerves, which render it highly vascular and sensitive. Numerous glands ("glands of Littre"), racemose in their structure,¹ are found in the spongy and membranous, and mucous follicles in the prostatic region, the secretion from all of which constantly lubricates the passage. Fossæ or lacunæ of the mucous membrane, apparently destitute of glandular structure, are also found upon the upper, and more numerous upon the lower surface of the urethra. They may sometimes be traced for nearly half an inch beneath the lining membrane, and their mouths are commonly directed forwards. One, larger than the rest, and called the "lacuna magna," is situated on the upper aspect of the canal, from half an inch to an inch posterior to the meatus. These lacunæ, especially when dilated by long-continued inflammation, may obstruct the passage of a sound, and lead to the formation of false passages. The urethral mucous membrane is covered with the cylindrical form of epithelium. Except in the prostatic region, this membrane is arranged in longitudinal folds, which are generally in contact and close the canal, the latter appearing on a transverse section of the penis as a mere star or split.

FIG. 50.



Lacuna magna.

According to Mr. Thompson, the rugæ of the mucous membrane "appear to be connected with the existence of numerous long and slender bands of fibrous tissue, which are seen lying immediately beneath the mucous membrane, for the most part in a longitudinal direction. In the bulbous and membranous portions they are extremely delicate, constituting these the weakest parts of the urethral wall, a fact worthy of remembrance in connection with the use of instruments." In the bulbous region the danger of doing violence is increased by the dilatability of the passage, and by the presence of the firm anterior layer of perineal fascia just beyond it.

The dimensions and direction of the urethra, taken as a whole, will be better appreciated, after considering other tissues which surround it.

The urethra is invested by "unstriped, organic or involuntary" muscular fibres, which vary very much in their abundance and their arrangement in different parts of the canal. These fibres in the prostatic urethra are both longitudinal and circular, the latter layer

¹ Kölliker, Manual of Human Histology, published by the Sydenham Soc., vol. ii., p. 236.

being nearly half an inch thick near the neck of the bladder, and gradually diminishing towards the apex of the prostate. It has been called by Henle the *sphincter vesicæ internus*. External to this layer is another, called the *sphincter vesicæ externus*, which is most developed near the apex of the prostate, where it is continuous with the compressor urethræ muscle.

In the membranous urethra is found a layer of unstriated fibres arranged circularly, and this portion of the canal is also invested by the striated fibres of the compressor urethræ muscle.

In the spongy urethra there are no circular fibres except in the posterior portion of the bulb. There are a few unstriated longitudinal fibres, which are either scattered, or which form only a broken layer. It thus appears, on anatomical grounds, that spasmodic stricture cannot exist anteriorly to the deepest portion of the bulb.

The *corpus spongiosum* is dilated at its posterior extremity where it forms the bulb. It terminates anteriorly in an expansion, called the "glans penis;" while a thin layer of erectile tissue is continued backwards around the membranous portion of the urethra and extends into the veru montanum of the prostate.

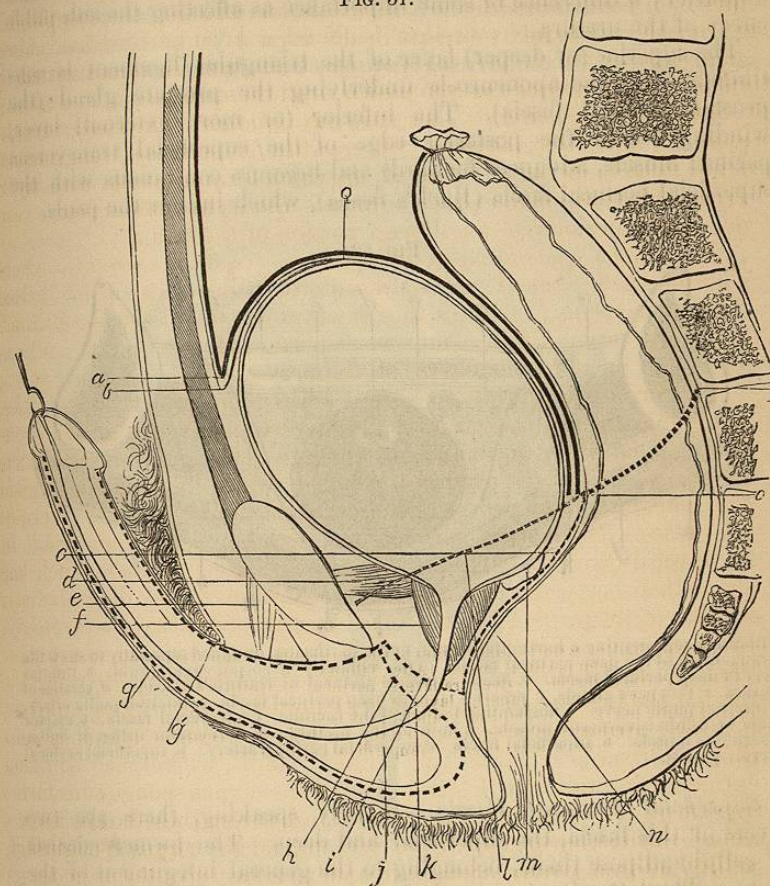
The corpus spongiosum consists of a vast number of venous sinuses, communicating with each other in all directions. Its great vascularity explains the hæmorrhage which is liable to ensue when the spongy portion of the urethra is divided by the knife of the surgeon or accidentally wounded. This occurrence, however, is less likely to take place when an incision is confined to the mesial line and made in an upward direction, since the amount of vascular tissue is much less above than below the urethra. This will be shown by diagrammatic sections of the penis, when we come to speak of internal urethrotomy.

The *corpora cavernosa* are two in number. Arising in front of the tuber ischii, and intimately united to the periosteum covering the rami of the ischium and pubis, the two unite in front of the symphysis, to which they are connected by the suspensory ligament, and are continued forwards as far as the corona glandis, where their common extremity is capped by the expansion of the corpus spongiosum forming the glans. The vascular connection between these bodies is free, though little, if any, exists between them and the corpus spongiosum, which lies in a groove upon their under surface.

Deep Perineal Fascia.—The triangular space, seen in the bony pelvis to intervene between the pubic and ischiatic rami, is occupied by a tense, fibrous septum, constituting one of the chief supports of the pelvic viscera above, and known by the various names of "deep perineal fascia," "triangular ligament of the urethra," "Camper's ligament," "middle perineal fascia," "ano-pubic aponeurosis," etc. This septum is composed of two layers, an inferior and a superior, separated by an interval in which are found the membranous portion of the urethra, which necessarily passes through the deep perineal fascia to arrive at the surface, the compressor urethræ muscle, Cowper's glands and ducts, the arteries of the bulb, and the dorsal vein,

nerve, and artery of the penis. We might familiarly liken this septum to a double window, through which a funnel, representing the urethra, passes; in which case the portion of the funnel contained between the sashes would correspond to the membranous region.

FIG. 51.



Vertical, antero-posterior section in the median line, showing fascia. (After Tillaux.) *a*, anterior, or pubo-vesical cul-de-sac of the peritonæum. *b*, urachus. *c*, posterior, or recto-vesical cul-de-sac of the peritonæum. *d*, pubo-prostatic ligament. *e*, suspensory ligament of the penis. *f*, prostate. *g*, superficial perineal fascia. *g'*, superficial perineal fascia on the dorsum of the penis. *h*, inferior layer of the deep perineal fascia, or triangular ligament. *i*, superior layer of the deep perineal fascia, or triangular ligament. *j*, bulb of the urethra. *k*, membranous portion of the urethra. *l*, pelvic fascia. *m*, vesicula seminalis. *n*, prostatico-peritoneal aponeurosis. *o*, posterior, or recto-vesical cul-de-sac of the peritonæum. *p*, point at which the peritonæum is reflected on the posterior face of the rectum. *q*, summit of the bladder.

At their apex, the two layers of the deep perineal fascia are thin and firmly attached to the sub-pubic ligament and pubic bones, they then pass downwards and backwards, and are stretched between the pubic and ischiatic rami. The space between them, containing the

important parts already mentioned, is from half to three-fourths of an inch in depth. The vena dorsalis penis pierces the fascia half an inch, and the urethra usually at about three-fourths of an inch below the symphysis; but, according to measurements made by Mr. Thompson, the latter distance may vary from seven-eighths to an inch and a quarter; a difference of some importance as affecting the sub-pubic curve of the urethra.

The superior (or deeper) layer of the triangular ligament is continuous with the aponeurosis underlying the prostate gland (the prostato-perineal fascia). The inferior (or more external) layer, winding round the posterior edge of the superficial transversus perinæ muscle, advances forwards and becomes continuous with the superficial perineal fascia (Buck's fascia), which invests the penis.

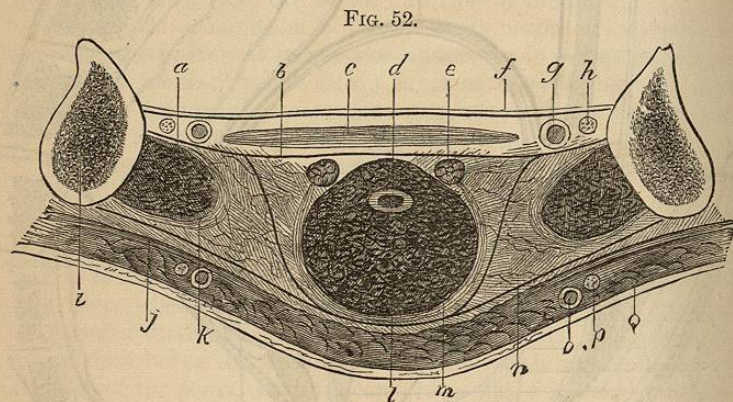


FIG. 52.
Diagram representing a horizontal section of the perinæum, designed especially to show the arrangement of the deep perineal fascia. (After Tillaux.) a, corpus cavernosum. b, inferior layer of deep perineal fascia. c, deep transverse perineal or Guthrie's muscle. d, section of urethra. e, Cowper's glands. f, superior layer of deep perineal fascia. g, internal pudic artery. h, internal pudic nerve. i, descending branch of the ischium. j, superficial fascia. k, erector penis or ischio-cavernosus muscle. l, bulb of the urethra. m, accelerator urinæ or bulbospongiosus muscle. n, superficial fascia. o, superficial perineal artery. p, superficial perineal nerve. q, skin.

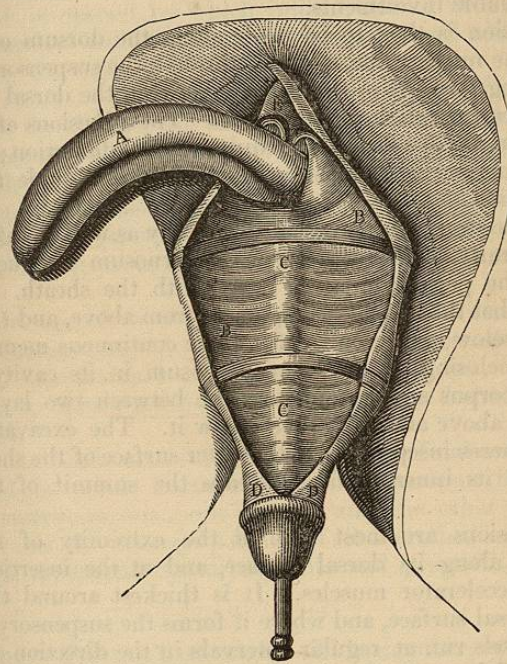
Superficial Perineal Fascia.—Strictly speaking, there are two layers of this fascia, the superficial and deep. The former consists of cellulo-adipose tissue, belonging to the general integument of the body. The latter is aponeurotic in its structure, and is chiefly important in its relation to the present subject. In accordance with frequent usage, it alone is intended by the term "superficial fascia of the perinæum." This fibrous structure corresponds in its general direction with the deep perineal fascia just described, but is situated upon a more external plane; behind the transversus perinæ muscle it is reflected upon itself, and, as already stated, becomes continuous with the anterior layer of the triangular ligament.

This reflection of the fascia, corresponding to the bi-ischiatic line, forms a line of demarcation between the anal portion of the perinæum behind and the urethral portion in front. Purulent collections gener-

ally respect this limit, so that, in the absence of other data, we may know with great certainty whether a perineal fistula proceeds from one or the other of these portions. Anal and rectal fistulæ are situated behind the line and urethral fistulæ in front. (Tillaux.)

At the sides the superficial perineal fascia is attached to the rami of the pubic and ischiatic bones. In front it is continued on to the penis, and sending off a layer which separates the corpora cavernosa from the corpus spongiosum completely surrounds this organ up to the base of the glans.

FIG. 53.



Buck's fascia. (After Buck.) A. The corpus cavernosum, enucleated from the sheath. B. The sheath, split up to the suspensory ligament, of whose anterior layer it is a continuation. C. The relations of the sheath to the corpus spongiosum urethræ, one layer of the fascia passing above it, and the other below it. D. Its relations to the glans penis, to which the sheath adheres inseparably by its outer surface, while by its inner surface it caps the corpus cavernosum. E. The dorsal arteries, veins, and nerves, raised with the sheath.

These relations of the superficial fascia to the penis were first fully described in the first volume of the *Transactions of the American Medical Association*, by the late Dr. Gurdon Buck of New York. As this paper is not generally accessible, and deserves to be preserved in memory of the distinguished surgeon who wrote it, I shall quote the greater part of it:

"The anatomical structure in question consists of a distinct membranous sheath investing the penis in the manner to be described, and forming a continuation of the suspensory ligament above, and

of the perineal fascia below, and will be best understood by a description of the mode of dissecting it.

"The penis and scrotum are to be circumscribed by an incision at the distance of three fingers' breadth all around, and crossing the perinæum at the anterior margin of the sphincter.

"The dissection of the skin and subjacent cellular and adipose tissues is to be made towards the penis, on the level of the fascia lata laterally, and of the perineal fascia posteriorly, and carefully continued to the body of the penis, as far as the corona glandis. By this means, the penis, as well as the suspensory ligament, is denuded of its loose movable investments.

"An incision is then to be made along the dorsum of the penis exactly in the median line, splitting through the suspensory ligament, and extending forward to the corona, between the dorsal vessels and nerves that run parallel on either side. The adhesions of the sheath along the dorsum are firm, and require careful dissection; the blood-vessels and nerves being raised with it, serve as a guide to show the line of adhesion.

"The dissection being prosecuted laterally as well as inferiorly and at the extremity, the entire corpus cavernosum is enucleated, the muscles of the perinæum being raised with the sheath. It is now clearly seen that the suspensory ligament from above, and the perineal fascia from below and laterally, form one continuous membrane with the sheath, inclosing the corpus cavernosum in its cavity, and embracing the corpus spongiosum urethræ between two layers, one of which passes above and the other below it. The excavated base of the glans adheres inseparably to the outer surface of the sheath, while by means of its inner surface, it caps the summit of the corpus cavernosum.

"Its adhesions are most firm at the extremity of the corpus cavernosum, along its dorsal surface, and at the insertions of the erector and accelerator muscles. It is thickest around the corona, along the dorsal surface, and where it forms the suspensory ligament. Zones of vessels run at regular intervals in the direction of the circumference of the penis, from the dorsal trunks to the corpus spongiosum, between the layers of the sheath. The cavity formed by the sheath, and occupied by the corpus cavernosum, is limited posteriorly by the triangular ligament (deep perineal fascia).

"That portion which covers the perineal muscles, and has been described by authors under the names of the superficial fascia of the perinæum, inferior fascia and ano-penic fascia, arises laterally from the ascending rami of the ischium, and descending of the pubis, as far forward as the inferior edge of the symphysis, where the two layers meet and form the suspensory ligament. Posteriorly, it is continued over the transverse muscle, and folding around its edges is prolonged upwards into the ischio-rectal fossa.

"It also sends off from its upper surface membranous septa between the accelerator muscles in the middle, and the erectors on either side,

to join the triangular ligament, and thus forms the three distinct and independent sheaths that are confounded anteriorly with the common sheath investing the corpus cavernosum."

M. Jarjavay afterwards confirmed Dr. Buck's observations, and gave full credit to the "Chirurgien de l'Amérique" for the originality of his discovery.¹

Richet,² while agreeing with Dr. Buck in the main, differs from him in some particulars. He states that the posterior portion of this fascia is quite loose and areolar upon the dorsum, where it cannot be distinguished from that covering the pubes; and that thus a communication is opened by which infiltrations of urine may gain the subintegumental cellular tissue of the penis and abdomen without perforating the fascia.

Pelvic Fascia.—The pelvic fascia is, in reality, the superior aponeurosis of the elevator ani muscle—a muscle which is lined with an aponeurosis on either side of it. This fascia is lost on the sides of the pelvis with the fascia of the obturator internus; within, it is attached to the rectum and the lateral fascia of the prostate. Although thin in structure, it is generally sufficient to prevent purulent collections formed above it from pointing in the perinæum, and *vice versâ*. (Tillaux.)

A knowledge of these fasciæ, which may be facilitated by a study of the accompanying figures from Tillaux,³ is essential to every surgeon who operates upon the genito-urinary organs. Their practical bearing is so clearly set forth by Tillaux, that I shall give it in his own words:

The three fasciæ above described, the superficial and deep perineal fascia and the pelvic fascia, circumscribe between them two chambers or reservoirs, viz., one inferior and the other superior. The first contains the spongy portion of the urethra and the corpora cavernosa, the second the membranous and prostatic portions of the canal.

INFERIOR PENILE CHAMBER.—This chamber is bounded by the superficial fascia of the perinæum below and the deep fascia above. We have seen that these two fasciæ are continuous with each other at the posterior edge of the transverse muscle. Its shape has been compared to that of a pistol, the but-end of which is below at the bulb.

This chamber contains the bulb of the urethra, Cowper's glands, the spongy portion of the urethra, and the corpora cavernosa. It is covered by the skin, the superficial fascia, and the subcutaneous layer of cellulo-fatty tissue.

It is generally in this compartment that ruptures of the urethra take place in consequence of strictures; hence the infiltration does not

¹ Jarjavay, *Traité d'anatomie chirurgicale*, Paris, 1854, t. ii, p. 576.

² Richet, *Traité d'anatomie medico-chirurgicale*, 2e ed., Paris, 1860.

³ *Traité d'anatomie topographique*, etc., Paris, 1877.