

CHAPTER XV

THE PROSTATE: ANATOMY, PHYSIOLOGY, EXAMINATION, TUBERCULOSIS, CONCRETIONS, FISTULA

ANATOMY

THE prostate (*προστατα*, standing before) is a sexual organ, partly glandular, partly muscular, lying in front of the bladder about the prostatic urethra (Fig. 67).

In shape the prostate is an irregular truncated cone. It has been aptly compared to a horse-chestnut. Its apex rests against the posterior layer of the triangular ligament. Its base, towards the bladder, is pierced above by the urethra, below by the ejaculatory ducts. Its upper (anterior) and lateral surfaces are rounded, its lower (posterior) surface presents a boss on each side of the median line. It is to this lower surface particularly that the title heart-shaped or chestnut-shaped applies.

The *diameters* of the prostate, as given by von Frisch¹ (and Thompson²) are: length, 33 to 45 mm. (25 to 30 mm.); width at the base, 34 to 51 mm. (32 to 40 mm.); thickness, 13 to 24 mm. (20 to 25 mm.). Its *weight* is 16 to 20 grammes. In *position* it is 8 to 12 mm. below the symphysis, and its apex is 30 to 40 mm. from the anus. Its long axis makes an angle of 20 to 25 degrees with the perpendicular.

The prostate is supported by the pubo-prostatic ligaments and the levator prostatae (anterior fibres of the levator ani).

It is fixed in its relations to the urinary organs by the urethra, which pierces it from base to apex, as well as by the decussation of its muscular fibres with those of the bladder and the urethra. It is separated from the pubic arch above and in front and from the rectum behind by a loose fascia containing the large prostatic plexus of veins.

The prostate is composed of two *lateral lobes* that develop inde-

¹ Nothnagel's Specielle Path. u. Therap., 1899, xix, ii, iii, 4.

² The Diseases of the Prostate, 1883, p. 5.

pendently during the first half of intra-uterine life, and then become united behind the urethra by the so-called *posterior commissure* (isthmus, pars intermedia), at the same time covering over the urethra by a thin layer, the *anterior commissure*. In the adult prostate the lateral lobes are felt as bosses on the under surface of the organ, the posterior commissure as the groove between them. The so-called *third or middle lobe* and the *prostatic bar* are products of senile and inflammatory changes, and are not found in the normal prostate (p. 256).

Structure.—On section the prostate is found surrounded by a dense fibrous capsule that sends thin septa inward between the glands and among the muscle fibres. The organ itself is composed mainly of unstriated muscle and glandular elements. There is a framework of connective tissue, which contains many elastic fibres. Authorities are curiously at variance as to the relative amount of muscular and glandular tissue in the organ. Thus Kölliker (von Frisch) states that from two thirds to three fourths of the organ is muscular; Rüdinger (*ibid.*) says that the glands occupy from one third to four fifths of the whole; finally, Walker insists that the glandular substance forms five sixths of the organ.¹ However this may be, it is acknowledged that the glands are densest in the lateral masses and the posterior commissure (especially its upper part), while in the anterior commissure the glands are few or wanting altogether.

The *muscular tissue* is arranged in so irregular a manner that no two observers are agreed as to its exact distribution. Walker believes that the

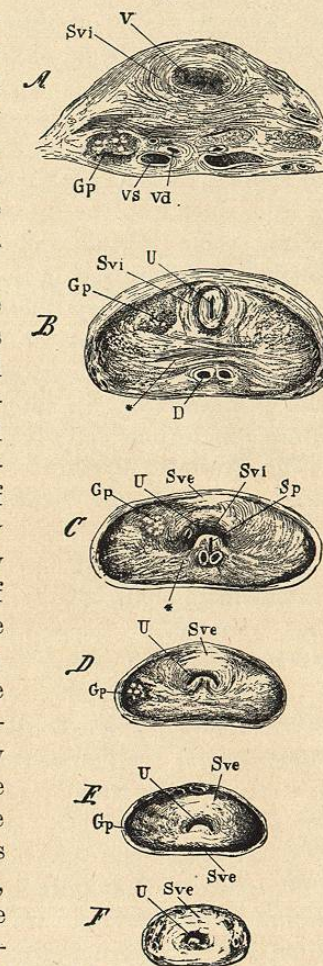


FIG. 67.—CROSS-SECTIONS OF THE PROSTATE IN A SERIES FROM BASE TO APEX.

V, urethral orifice of bladder; U, urethra; Vd, vas deferens; Vs, vesiculae seminales; D, ejaculatory duct; Sp, utricle; Svi and Sve, sphincter vesicae internus and sphincter prostatae externus; *, muscular septa.

¹ Johns Hopkins Bull., 1900, xi, 242.

prostatic muscle is so arranged as to compress the gland as a whole, and each individual lobule of it in particular, but is not calculated to compress the urethra. This view is in accord with the fact that women—who possess no prostate—have complete control of the bladder without any additional muscle to take the place of this gland.

The *glands* are of the compound racemose type with columnar epithelium, which may be flattened by pressure. They are collected into lobules, each lobule surrounded by a layer of muscle and emptying by a duct into the lateral portions of the floor of the prostatic urethra, some behind and some in front of the verumontanum. Walker has shown that in dogs all these ducts point towards the orifices of the ejaculatory ducts, so that the prostatic secretion is mingled with the semen at the moment of ejaculation. The lobules of glandular tissue are chiefly contained in the lateral lobes and the posterior commissure. In later life both glands and ducts commonly contain concretions (p. 246).

The Prostatic Urethra.—The urethra extends from the bladder downward and forward through the prostate, so that, although the major part of the gland lies below and behind it, the urethra emerges quite at the centre of the apex of the prostate. The prostatic urethra is fusiform in shape when dilated with fluid, crescentic when empty (Figs. 5 and 67). Its roof and lateral walls are smooth, pierced by but a few ducts. The floor consists of two lateral portions pierced by the prostatic ducts, and a central irregular part. This central portion rises slowly from behind forward to form a little mound, the *verumontanum* (*colliculus seminalis*, *caput gallinaginis*). The anterior slope of the verumontanum is hollowed out by a little cavity, the *sinus pocularis* (utricle), the analogue of the uterus. The ejaculatory ducts open upon the edges of the sinus.

Structure.—The epithelium of the prostatic urethra is squamous, like that of the bladder. Its muscle consists of a thin internal longitudinal and an external circular coat. From this latter is developed the internal (involuntary) sphincter of the bladder. Most authors place this muscle as an annular mass of fibres at the bladder orifice, the so-called neck of the bladder, and consider it an integral part of the prostate rather than of the urethra. In a recent publication, however, Kalischer¹ has brought to light several new and interesting facts. After a searching investigation of the literature and a series of observations on sections made from both the infant and the adult cadaver of each sex, he concludes (1) that the internal

¹ Die Urogenital Musculatur des Dammes, Berlin, 1900.

vesical sphincter is part of the urethra and quite distinct from both bladder and prostate, and (2) this muscle is made up of fibres that encircle the canal obliquely, so that (3) this sphincter muscle forms what is commonly known as the trigone of the bladder below, whence passing upward and obliquely around the urethra, (4) it is, on the roof of the canal, separated from the cavity of the bladder by the transverse layers of the bladder muscle. According to this theory the trigone of the bladder is in reality the lower part of the sphincter, and the neck of the bladder is constituted by bladder wall above and urethral sphincter below.

The *verumontanum* is analogous in structure to the prostate. It is a mass of glandular tissue surrounded by unstriated muscle.

PHYSIOLOGY

The prostate is the sexual heart. It has nothing to do with urination, and is quite passive during this act.¹ But towards the sexual function it acts as a muscle, a sensory organ, and a gland.

As a *muscle* it acts to open the ejaculatory ducts, thus permitting the escape of the semen into the prostatic urethra, to express its own secretion into the prostatic urethra, and probably to expel it into the anterior urethra. The accepted function of the verumontanum—viz., to close the vesical orifice and prevent regurgitation of semen into the bladder—has recently been denied (Walker).

The seat of *sensation* in the prostatic urethra is, perhaps, throughout its mucous membrane, but more probably it is confined to the verumontanum. When erection has been stimulated by friction of the glans penis the verumontanum becomes congested and irritated, perhaps by a spinal reflex, perhaps by the gradual influx of semen into the prostatic urethra, and ejaculation results. Thus it is quite logical that pollutions and premature ejaculations should be caused by hypersensitiveness in the prostatic urethra, and should be curable by treatment directed towards blunting the sensitiveness of that region.

The *glandular function* of the prostate is no less interesting. Many investigators confirm the observation that the spermatozoa are immobile in the testicle and the seminal vesicle. This immobility is in part due to the density of the semen, for dilution with any fluid provokes evidence of life in these micro-organisms. The prostatic

¹ For the various aspects of this disputed question consult, besides the authors already quoted, Rehfisch, Virchow's Archiv, 1897, cl, 111; Finger, Allg. Wien. med. Zeitung, 1893, xxxviii, 427, 439, 452.

secretion performs this function. But besides acting as a simple diluent it adds something to the semen that keeps the spermatozoa alive some twenty-four hours, whereas other diluting fluids keep them alive only three or four hours.

The *secretion* of the prostate is a thin, turbid fluid of watery consistency (not ropy or sticky), of slight acid reaction, and of seminal odour. Under the microscope it is seen to contain epithelia from the prostatic glands and phosphatic crystals. Concretions are occasionally met with. *Böttcher's crystals*, very rarely seen in normal prostatic juice, are said to be common in azoöspematous semen. They can be produced in any semen by mixing it with a 1% solution of ammonium phosphate. These crystals are dagger- or cuttle-fish-shaped, large, colourless, and transparent, and are found in sheaf-like clusters. Lubarsch¹ claims to have found them in the testicle, but Fürbringer² denies their existence there.

EXAMINATION OF THE PROSTATE

The examination of the prostate includes—

1. Rectal palpation.
2. Determination of the urethral length.
3. Cystoscopy, and
4. Combined examination.

1. **Rectal Palpation.**—Rectal palpation is of all these the most important. To examine the patient to the best advantage his bladder should be moderately full. He should stand facing a table or desk, with his left knee on the seat of a chair (to relax the buttocks and separate the thighs). He is instructed to lean well over the table, and he is then ready for examination. (Dorsal decubitus is also employed.) It is convenient to cover the examining index finger with a cot. The cot or the finger should then be anointed with vaselin and slowly introduced into the rectum. As soon as the finger has passed the internal sphincter it enters a pouch upon the anterior wall of which is felt the membranous urethra for perhaps half an inch, then the prostate.

The normal prostate is but faintly perceptible as a heart-shaped body $1\frac{1}{2}$ inches long, with its apex downward. It should be investigated for evidence of tenderness, hard nodules, enlargement, pulsation, and fluctuation. Above each lobe of the prostate lie the seminal vesicles; if healthy, these cannot be felt.

¹ Virchow's Archiv, 1896, cxlv, 316.

² Deutsch. med. Woch., 1896, xxii, 603, and Virchow's Archiv, 1896, cxlv, 644.

The so-called stripping or massage of the prostate is a manœuvre executed by rectal touch. The finger, pressing firmly but forcibly against the extreme upper point of one of the lobes, is carried slowly towards the apex with a to-and-fro sinuous course, all the while making firm pressure on the gland. This is repeated several times on each side. To reach the seminal vesicle for a similar procedure it may be necessary to make counterpressure on the abdomen.

2. **The Urethral Length.**—The urethral length or urinary distance is, clinically, the distance a catheter must travel from the meatus before drawing any water from the bladder. While the length of the urethra varies in the healthy individual between 16 and 22 cm. ($6\frac{1}{2}$ and 9 inches),¹ this variation is due to the length of the penis, and, in the great majority of cases, the length of the urethra, estimated by the distance at which the urine begins and ceases to flow when a catheter is pushed in and out, is between 19 and 21 cm. ($7\frac{1}{2}$ and $8\frac{1}{4}$ inches). Any increase in this distance indicates that the prostate is enlarged (p. 257).

3. **Cystoscopy.**—Cystoscopy is of no great value in the diagnosis of diseases of the prostate, although it is sometimes employed on the ground that certain peculiarities of the urethro-vesical fold are characteristic of prostatic hypertrophy.

4. **Combined Examination.**—If a stone-searcher is introduced into the bladder, inverted, and drawn tightly up against the neck of that organ, the prostate may be mapped out between the instrument and the finger in the rectum. This procedure is sometimes quite painful and may usually be dispensed with.

DEFORMITIES OF THE PROSTATE

Deformities of the prostate are exceedingly rare. Its roof is open in exstrophy of the bladder, but its floor seems never to fail. It is never wanting except in connection with extensive lack of development of the whole genital system.

INJURIES OF THE PROSTATE

The prostate by its position is well protected from ordinary casualties, and rarely suffers unless the general injury is very extensive, in which case its implication may be considered unimportant.

The *wounds* of the prostate are incised wounds made in the operation for stone, lacerated wounds in the same operation from the in-

¹ Am. J. Med. Sci., 1898, cxvi, 125.

troduction of dilating instruments or the extraction of a large, rough stone, and penetrating wounds (false passage) made by accident or design in trying to pass a metallic instrument of an improper curve through an obstructed urethra (p. 286). The prostate is a patient organ, and bears all these injuries well. Healing after stone operations is exceptionally rapid, and the prostate may even be punctured by a catheter without any evil consequence, unless it be the seat of chronic disease. Injuries to the prostate usually get well if let alone, even if abscess forms in the organ, and abscess is not frequent even after extensive laceration, although the parts be constantly bathed in purulent urine. Injuries of the prostate do not excite much constitutional derangement. Very different, however, is the case if the injury extends beyond the limit of the fibrous capsule of the gland. In such cases the worst complications (pelvic infiltration, abscess, peritonitis) are to be feared, and if the patient escape with his life he is fortunate. These consequences are more likely to occur in the operation for extraction of very large stone (p. 444). Large incisions and thorough drainage constitute the treatment of such injuries.

INFLAMMATIONS OF THE PROSTATE

For obvious reasons the inflammations of the prostate have been considered as complicating gonorrhoea (p. 72).

TUBERCULOSIS OF THE PROSTATE

Tuberculosis of the prostate is the central point, as it were, of genito-urinary tuberculosis. The point of origin of genital and urinary tuberculosis is much discussed (pp. 398, 735). Suffice it to say that I believe the prostate is usually primarily involved in the former, sometimes in the latter. But, however this may be, it is through the prostate that tuberculosis of the urinary tract reaches the genitals, and *vice versa*, and it is through tuberculosis of the prostate that the inflammation crosses from one testicle to the other.

Etiology.—Those who consider tuberculosis of the prostate a primary lesion find its chief cause in chronic gonorrhoeal prostatitis. Sexual excess, calculus, etc., have been incriminated, and in some cases the disease has evidently nothing to do with previous inflammation. Like other tubercular manifestations, it is commonest in the young adult of a tubercular predisposition. I cannot accept infection *in coitu*.

Morbid Anatomy.—Tubercularization seems always to begin just beneath the glandular epithelium. It goes through the ordinary

stages of caseation, abscess formation, and fistulization, or it may terminate by cicatrization.

At the beginning the disease is usually confined to one half of the gland, and to the genital apparatus of one side, viz., half the prostate, the vesicle, the vas, and the epididymis. These may all be involved for years before the disease crosses to the opposite half of the prostate. The usual course is thus typically unilateral for a long time, and finally bilateral. Direct extension to the bladder wall is not rare. The anterior urethra is not often invaded. When abscess forms, it may extend to the periprostatic tissue and may burst into the urethra, rectum, bladder, or perineum.

Symptoms.—The disease begins in one of four ways:

1. It is secondary to a chronic posterior urethritis, assuming its specific characteristics imperceptibly, and patient and surgeon are often unaware of the change until rudely aroused by some of the typical manifestations of tubercle.

2. It is apparently spontaneous. The patient comes complaining of gleet or dysuria for which he fails to account.

3. It is a minor feature of an epididymal infection. The patient complains of the enlarged testicle, and is not aware of the shreds or pus in his urine that testify to the prostatic inflammation.

4. Less frequently a spontaneous hematuria or a urethrorrhagia is the first sign of the disease.

Diagnosis.—The course of the malady is peculiarly slow, and it may for a long time simulate simple posterior urethritis. The features that serve to distinguish it from ordinary chronic urethritis are: 1. Tubercular antecedents. 2. Tubercular lesions elsewhere in the body. 3. The discovery of tubercle bacilli in the urine. 4. The discovery by rectal touch of several small hard nodules of tubercularization in the affected half of the gland. 5. A spontaneous tendency to hemorrhages. 6. A peculiar irritability, often so intense that any instrumentation may excite swelled testicle, simple or tubercular, abscess of the prostate, or at least a violent attack of dysuria. 7. The occurrence of tubercular abscess and fistula.

Prognosis.—The prognosis is bad. Death may ultimately occur from gradual deterioration of the patient, or from tubercular disease elsewhere; the latter, perhaps, being of the true miliary type. Recoveries are entirely possible under the continued efficient action of hygienic conditions and proper food. The course of the malady is always exceedingly slow.

Treatment.—Curative treatment is general rather than local. For local treatment the rules laid down for tubercular cystitis (p. 406) apply. The general measures are hygiene, fatty food, tonics,