SOME OBSERVATIONS
ON THE
ANATOMY AND PATHOLOGY OF THE
ADULT PROSTATE,
FOUNDED UPON FIFTY PREPARATIONS OF THE ORGAN,
DISSECTED BY THE AUTHOR, AND ACCOMPANYING
THE PAPER.

BY

HENRY THOMPSON, F.R.C.S., M.B., LOND.

SURGEON TO THE ST. MARYLEBONE INFIRMARY; ASSISTANT-SURGEON
TO UNIVERSITY COLLEGE HOSPITAL.

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THE observations recorded here are based upon upwards of sixty dissections of the prostate, made by myself during the last two years; but as it was not until after experience afforded by the first ten, that I arrived at a uniform plan of examination, the facts presented will be those derived from the fifty preparations of the organ which accompany this paper. These are exhibited, partly as a voucher for the labour performed, and partly for the purpose of illustrating some points referred to; but, as far as external form and size are concerned, they are now valueless, most of them having been cut through in numerous places by a Valentin's knife, while others have been altered by boiling and otherwise applying chemical reagents.

The method of examination has been, in all cases, as follows: The organ has been cleanly dissected out from the adjacent parts, removing the vessels lying upon its surface, a firm, well-defined fibrous capsule. At the neck of the bladder the muscular and other fibrous structures which surround the vesical orifice of the urethra have been pared away pretty closely, but some very small portions of these have perhaps been left, which may be regarded by some as not, strictly speaking, altogether prostatic tissue. Absolute definition here I believe to be almost, if not quite, impossible. I have been careful, however, to be so exact, that any small portions so remaining will not invalidate the conclusions drawn. The anterior limit, although not absolutely defined, is yet very nearly so; no difficulty, therefore, arises here.

The dissection being quite completed, the organ has been measured and weighed. Three measurements have been taken, in inches and decimal parts, viz.:

1. That from a line uniting the posterior extremities of the two lateral lobes, to the apex; the antero-posterior.
2. The extreme transverse.
3. The greatest depth; *i. e.*, from the pubic to the rectal surface of the organ.

The weight is recorded in drachms and grains.

After this the urethra has been laid open, the existence of "concretions" sought in the canal, and afterwards in various parts of the prostatic substance. In most specimens, fine sections have been made with Valentin's knife, and a series of microscopical observations pursued on the natural and unnatural conditions of the organ, and these are illustrated by about 100 such sections as have appeared worth preserving, and which I have accordingly put up in fluid cells, and which also accompany the paper.

It should further be added, that I have taken the greater part of these prostates from the bodies of elderly people as they consecutively appeared in the dead-house of a large metropolitan institution, containing a due proportion

of healthy and diseased lives, and that no kind of selection has been made; the object having been to obtain them from fair average lives, as occurring in that class of the community which is met with in such institutions. The particulars of age, weight, measurement, &c., will be found arranged in a tabular form, accompanying this communication.

The observations will be presented under five heads:

1. On the frequency with which enlargement appears in advanced age.
2. On the size and weight of the healthy adult prostate.
3. On the nature of a part commonly called "the middle" or "third lobe."
4. On the existence of distinct tumours in the prostate.
5. On the existence of minute "concretions," their mode of production, and their relation to calculous formations in the prostate.

1. On the frequency with which enlargement of the prostate occurs in advanced age.

The opinion has long been current that enlargement of the prostate is one of the changes natural to old age. Sir Everard Home so regarded it. Sir Benjamin Brodie, in the last edition of his 'Lectures on the Urinary Organs,' says—

"When the hair becomes gray and scanty, when specks of earthy matter begin to be deposited in the tunics of the arteries, and when a white zone is formed at the margin of the cornea, at this same period the prostate gland usually, I might perhaps say invariably, becomes increased in size." p. 163.

Mr. Busk has called attention to the fact that old age is by no means necessarily accompanied by this enlargement.

The specimens before us, however, present an opportunity of determining, as far as their limited number permits, the proportion of cases in which, after the fiftieth year has been reached, the organ is found to be enlarged.

Forty-three specimens are from individuals of fifty years old and upwards. Of these 43, 2 were unusually small, probably atrophied, and are struck out of this series, leaving 41.

Of the 41, 14 exhibit either enlargement or a tendency thereto, manifested by the presence of tumour more or less developed.

Of the 14, 9 exhibit it in a very slight degree, established only by anatomical examination. In the remaining 5, enlargement was considerable, and gave rise to symptoms during life. Only 1 died of the affection.

The following are the rates per cent. to which these results are equivalent :

Actual enlargement, or the tendency thereto, exists in about 32 per cent. of men above 50.

Enlargement to a notable extent exists in about 12 per cent.

The following facts are worthy of notice :

The average age of the 9 cases in which enlargement was slight was sixty-four years.

The average age of the 5 cases in which enlargement was notable was sixty-nine years, none being younger than sixty-one.

The average age of the persons of fifty years and upwards, not affected by any enlargement, was sixty-four years.

Among the 29 *unaffected*, were individuals of greater age than any among the affected portion ; for example, 1 at ninety, one at eighty-five, two at seventy-nine. Among the affected but one reached seventy-nine, and the tendency in that case was slight.

It may then be regarded as established by the facts before the Society, that enlargement of the prostate, so far from being a change natural to old age, is an exceptional condition. And it may be further regarded as highly probable that a slight tendency thereto, almost, if not quite, unrecognisable during life, may occur in about 1 out of 3 individuals after fifty years ; and that a marked enlargement may be found in 1 out of 8, rarely, however, before sixty years of age.

2. On the weight and size of the healthy adult prostate.

Weight and size.—From the 50 cases examined, 14 must be deducted as enlarged or as exhibiting some tendency thereto. Three others were unnaturally small. The remaining 33 were healthy adult prostates, and do not vary much in weight or size. The *prevailing* weight and the *average* weight are almost the same, the latter being 4 dr. and 38 gr. This is considerably less than is usually stated in anatomical works, where it is often represented as from 6 to 8 dr.

Of the three unnaturally small prostates, the first was taken from a young man who died of phthisis, greatly emaciated. It weighed 2 dr. 46 gr. The others were, one from a man aged sixty, weighing 2 dr. 57 gr.; the other, aged seventy-three, weighing 2 dr. 58 gr.

Atrophy has been alleged to be an effect of old age, when hypertrophy is not present. These observations do not bear out the accuracy of this remark. The weight of six prostates which in this, the healthy series, belonged to men in the prime of life, average 4 dr., 32 gr., or six grains less than the general average of healthy organs of all ages, a weight sufficiently near, however, to be regarded as identical. This series shows then, 27 prostates from elderly men, that is, at ages from fifty to ninety, *unaffected either by atrophy or hypertrophy*.

Measurements.—The transverse diameter is almost always the greatest, exceeding the antero-posterior by about a fifth or a sixth. These relations vary very much. Sometimes the organ is much compressed from before backwards. Much less commonly is the transverse measurement decreased. The usual measurements given in our anatomical works are corroborated by my inquiries, which may be expressed in average terms as follow:

	inch.	inch.
From base to apex	$1\frac{1}{4}$	to $1\frac{1}{2}$
Greatest transverse diameter, about	$1\frac{1}{4}$	
Greatest thickness, about	$\frac{3}{8}$	to $\frac{7}{8}$

These are smaller than those given by Dupuytren, who re-

presented, in his work on 'Bilateral Lithotomy,' the prostate as measuring 20 to 24 lines transversely, and 10 to 12 in thickness, and on these estimates his calculations were based.¹

The interesting and important result as regards lateral lithotomy is the measurement in a direction outwards and downwards from the centre of the urethra (which may be regarded as corresponding in the operation with the bottom of the groove in the staff), to the outer border of the vesical extremity of the organ. This direction may be considered as midway between the horizontal and vertical lines, forming with each, therefore, an angle of 45°, when the patient lies in the position for lithotomy. It may be accurately deduced from the form and measurements given, and has been verified by numerous actual sections of the organ :

Average measurement of healthy prostate in direction described,	$\frac{7}{8}$ ^{inch.}
Measurement of small prostate, weighing under 4 drachms	$\frac{3}{4}$

3. On the nature of a part commonly called "the third" or "middle lobe."

By most authorities in this country, I believe, since the time of Home, the existence of a third or middle lobe, lying beneath the vesical orifice of the urethra, and between the posterior extremities of the two lateral lobes, is accepted as a fact in normal anatomy. I must confess that I have not been able to detect a portion of the healthy organ in this situation, sufficiently defined by form or position to entitle it to such distinctive appellation. In discussing the subject it may be well to revert briefly to its origin just alluded to. Sir Everard Home accorded the title to the part in question after five examinations of the organ by dissection performed by Sir Benjamin, then Mr. Brodie, and he announced the result as the "discovery of a middle lobe" to the Royal Society, Feb. 20th, 1806; the inquiry having been first instituted, to use the words of his paper, only two months before. "Previous to this investigation," says Sir E. Home, "it was not known to me that any dis-

¹ 'Mémoire sur l'Opération de la Pierre,' p. 21, Paris, 1836.

tinct portion of the prostate gland was situated between the vasa deferentia and the bladder. These ducts were considered to pass in the sulcus between the two posterior portions, in close contact with the body of the gland.”¹ Notwithstanding this remark, the vasa deferentia had been described as perforating the posterior portion of the prostate by several of the anatomical authorities of the time, as Sir E. Home afterwards learned—a fact admitted in his first volume on the ‘Diseases of the Prostate,’ published five years subsequently, viz., in 1811. Respecting the five dissections spoken of, the author says, “the appearance was not the same in any two of them.” The first preparation appears to have been from the person of an elderly patient “who had died in consequence of this part being diseased; the nipple-like process was very prominent.” In the next, “there was no apparent glandular substance” at all in the spot indicated. All that is said of the third is, that “there was a lobe blended laterally with the sides of the prostate gland;” but that there was really no distinct portion marked off as a lobe is clear, from the importance attached to such formation being detected in two subsequent cases. The most distinct appearance was found in two subjects of twenty-four and twenty-five years of age respectively, and *upon the condition of the organs in these two* his account seems to have been based. Whatever may have been that condition (and it must be admitted that at all events no change similar to that of senile enlargement was likely to have been present in either) the presence of a distinctly marked portion, of a spheroidal form, situate between the ejaculatory ducts and the verumontanum or inner meatus of the urethra, is so rare an occurrence in early or middle life, as to mark an unusual state, whether congenital or acquired. Had the researches extended to a large number of bodies, it is certain that these cases must have appeared to be exceptional, as my own researches indicate such to be. Any appearance

¹ ‘Philosophical Transactions,’ 1806, paper viii. “An account of a small lobe of the human prostate gland, which has not before been taken notice of by anatomists.” By Everard Home, F.R.S.

of a lobe in this situation must be regarded as belonging not to normal but to morbid anatomy, a slight development of it being usually attended with some signs of obstruction to the function of micturition. And, so far from being overlooked, it is in this light that it has been regarded after very careful examination by the earliest labourers in pathological anatomy, who have left to us the records of their observations. Thus Morgagni, in that vast collection of cases which forms his work '*De sedibus et causis morborum*,' refers to it in several places as to a morbid growth causing retention of urine, in one of which he describes it, from his own dissections, in the following remarkably precise terms :

"A roundish protuberance of the bigness of a small grape, covered over with the internal coat of the bladder. What this protuberance was I readily supposed; and by forcing the knife into it, I cut through this and the contiguous prostate gland at the same time lengthways, and showed that it was of the same nature with the gland; that it was very evidently continuous from it, and that there was no doubt but, if it had grown out to a greater degree, it must have been a very considerable impediment to the discharge of urine."¹

In another case he describes the same appearance, pronouncing it "beyond a doubt an excrescence of the prostate gland."² He quotes several similar cases from Valsalva, Thomas Bartholin, of Padua, and Valisneri, who, indeed, speaks of an enlargement, "as it were, a kind of lobe from the glandular substance" (of the prostate) "which rose up within the bladder of the shape and size of a walnut, and not on the anterior part, but on that which lies adjacent to the intestinum rectum." He enumerates others, mostly from the '*Sepulchretum*' of Bonetus,³

¹ '*De sedibus et causis morborum per anatomen indagatis*,' by J. B. Morgagni, 2 vols., folio, letter xli, article 18. Venice, 1761.

² *Ibid.*, letter xxxvii, article 31.

³ '*The Sepulchretum sive Anatomia practica*,' by Theophilus Bonetus M.D., book iii, sections 24 and 25. Lyons, 1700.

besides alluding prospectively to another case which was subsequently detailed in the next letter of his own work ; and then makes the following generalisations from the whole :

“ If you attentively examine those examples which I have pointed out . . . you will observe that they were all from old men ; and in like manner if you examine all my observations, in which there was the beginning of an excrescence, you will find that this was found to grow out in the very middle of the internal and upper circumference of the gland posteriorly ; but whether all these things happened by chance or otherwise, future observations will show.”¹

Some considerable time after this, Morgagni returned to the investigation of this subject, and the cause of his doing so is of great interest in relation to the present inquiry. It appears that “ a celebrated anatomist ” of the time (Morgagni refers by these words without doubt to Lieutaud, although he does not mention his name, which he states to be his invariable custom when he proves a contemporary to be mistaken) declared that an eminence at the neck of the bladder was not a morbid growth, but “ a small part quite natural and common to all bodies,” calling it the “ uvula vesicæ.” Morgagni, therefore, devotes great part of the 66th and the whole of the 70th letters to the refutation of this view. In the former, stating that during forty-four years as anatomical professor he had carefully dissected 60 or 70 bodies, and found it only in 4 ; that he had made vivisection for the express purpose of seeking it there ; but in vain ; and that he had decided that it could be nothing but “ a morbid excrescence of the prostate gland appearing in old men . . . not rare, but not so frequent.” That Valsalva, Pohlius, and his friend Santorini regarded it in the same light, the latter presenting it in a drawing as a body “ prominent in diseased bladders,”² besides referring

¹ ‘ De Causis,’ &c., letter xli, article 19.

² ‘ Observationes Anatomicæ,’ by Jo. Dom. Santorini (Venice, 1724), chap. x, “ De virorum naturalibus.” In explanation of tab. ii, fig. 2, sections 20 and 22, pp. 201—5.

to it as "a circumstance which is diseased and unfrequent, and does not deserve to be exhibited as perpetual and constant, to the great detriment and misleading of younger practitioners."

Lastly, the 70th letter Morgagni devotes to the purposes of giving the result of his forty-fifth year of teaching anatomy, in relation to this very subject, stating that he had dissected in public five subjects, and in none of them, although he had sought it most carefully, was there any trace of this "roundish protuberance" or "uvula."

John Hunter similarly regarded it, after independent examinations of the organ, stating that "a small portion of it, which lies behind the very beginning of the urethra, swells forward like a point, as it were, into the bladder, acting like a valve to the mouth of the urethra."¹

It seems remarkable, considering the very slight grounds upon which the existence of a distinct third lobe, as a normal and ordinary constituent of the prostate, was affirmed by Sir E. Home, that it should have been so generally received without question by English anatomists to the present day. It is denied by most, if not all, French observers. Cruvelhier expresses the general opinion when he says that the ejaculatory ducts being received into a groove or channel in the substance of the prostate, a portion of variable size is indicated by them, but that it has no title to be called a lobe. It is not, he says, an isolated piece, and should be called "the median portion."²

The conformation of the organ appears to be as follows: Two principal lateral divisions or lobes make up the greater part of the mass or body. Each may be supposed to resemble in form a truncated cone with a convex base. These being placed side by side with a small interval for the urethra, their substance is continuous above and below that canal; in the first-named situation forming a stratum which ex-

¹ 'Treatise on the Venereal Disease,' p. 170. 1788.

² 'Anat. Path. du Corps humain,' livr. xvii, p. 3 (Paris, 1835-42); also, 'Traité d'Anat. Path. générale,' par J. Cruvelhier, tom. iii, p. 46. Paris, 1856.

tends forward to the apex, but not quite to the base of the organ. Below the urethra another stratum extends throughout the whole length of the lateral lobes, and is thus nearly a third longer than the upper stratum. It is, as a rule, thicker also, and more so behind than in front. In the centre of its base the two ejaculatory ducts, closely applied to each other, side by side, perforate its substance, entering usually about three or four lines beneath the posterior urethral orifice. That portion of this stratum which lies above and upon the ducts, is that to which the name of "third lobe" has been given, and this it is which appears to increase most rapidly, when disposition to enlarge is present; whether, because it is the only part of the organ which is free from pressure, limitation or resistance by other parts, as has been suggested, or otherwise, may not be easy to determine. It then becomes more or less spheroidal or pyriform, by development upwards towards the cavity of the bladder, but under ordinary circumstances it does not affect this shape. Like other portions of the prostate, it sends its ducts directly to the urethra, and when it is enlarged, these also become more distinct. I cannot avoid, therefore, regarding the term "median portion," or better still, "posterior median portion," as more correctly indicating the part referred to; and at all events as not involving assent to the disputable theory which assigns to it an independent anatomical character.

4. On the existence of distinct tumours in the prostate.

It is very common in examining an enlarged prostate to find certain nodular projections from some part of its surface, indicating, as a very slight dissection will easily verify, the existence of isolated ovoid or spheroidal masses in the substance of the organ, it may be, wholly embedded or partially projecting from its surface. Sir E. Home observed the appearance, and described them as a species of apoplectic clots, marking the occurrence of internal hæmorrhages, to which he believed the organ extremely liable.

More recently they have been found to be composed, for the most part, of tissue identical with that which forms the greater part of the organ itself, viz., the organic muscular fibre, more or less interwoven with areolar fibres; some other specimens, exhibiting with various degrees of distinctness, elements which correspond to the secreting structures belonging to the prostate.

Their presence is much more common in the prostate of advanced age than, I suspect, is generally believed. I shall attempt to show that enlargement is very frequently associated with the development, more or less marked, of such growths in some one of three forms; in fact, that the production of defined tumour is, more frequently than otherwise, the essential element of the pathological condition generally known as hypertrophy of the prostate. I shall further attempt to show that a considerable analogy may then be traced between the "fibrous" formations and hypertrophies of this organ, and those which are so familiar to us in the female economy affecting the uterus.

We have seen that 14 prostates, in the series before us, are affected with unnatural development in some form or another. Of these, 6 exhibited numerous fibrous tumours in the substance of the lateral lobes. The others show polypoid enlargements, single, binary, or multiple, springing from the posterior median portion.

Of 70 specimens of enlarged prostate in the Museum of the Royal College of Surgeons, in 17 the isolated or embedded tumours are so clearly discernible, that the careful observer cannot fail to see them in the preparations as they stand in the containing vessels. There can be no doubt but many more would be found similarly affected could the test of dissection be applied. In a large proportion of the remaining preparations, there is a pyriform out-growth from the posterior median portion.

These tumours, as far as my examinations enable me to judge, naturally divide themselves into three principal or typical varieties.

The first is a simple fibrous tumour, seldom much larger

than a pea, often much smaller; it is generally firmer and of lighter colour than the surrounding prostatic substance. It is sometimes, perhaps, completely isolated. I have usually found a point at which vessels enter, or at which there appears to be some continuity of tissue between it and the organ in which it is embedded, but it appears to have very little vascularity. There is sometimes, but rarely according to my experience, a special enveloping cyst. The tumour is very easily enucleated, and then exhibits a smooth surface, and a form slightly ovoid and usually somewhat flattened. Occasionally it projects considerably from either lateral lobe into the cavity of the bladder, carrying with it an enveloping layer of prostatic substance. Microscopical examination shows it to be made up of closely packed organic muscular fibres with some areolar or connective tissue. The fibres appear to be sometimes arranged in concentric circles or whorls, which are characteristic, and have been frequently described and figured as peculiar to those "fibrous" tumours, the type of which that found in the uterus is considered to be.¹ But this I believe to be rare.

2. A tumour composed of the same elements as those just described, but containing in addition some of the glandular structure of the prostate, more or less imperfectly developed. This also may be embedded in the organ, and have a cyst, but its periphery is differently limited in different examples, appearing sometimes to be without a complete envelope, and to partake more of the character of a local enlargement limited to a small portion or lobule of the prostatic tissue, but not sufficiently isolated from the surrounding parts to be regarded as a defined tumour. The examples of this class appear to correspond very much with those local and limited hypertrophies which are seen to affect similar relations with the surrounding structures in the mammary gland. Although separating this class from

¹ *Vide* 'Gluge, Atlas der patholog. Anat.' part iv, tab. iv, fig. 14, 15.

Bennet 'On Cancerous and Cancroid Growths, under the head of Desmoid Tumours,' p. 188.

the previous one for facility of reference, it is more than probable, I believe, that the two nearly merge into each other at their adjacent limits; the latter approximating to the former by insensible gradations; so that some tumours which may appear to be purely fibrous at first, may be found to exhibit slight traces in part of its structure of the glandular element. In all, however, the basis is *muscular fibre*.

3. A tumour composed entirely of the ordinary structures of the prostate fully developed (the glandular being still in smaller proportion than natural) and enjoying activity of function in common with the rest of the organ. It assumes a pyriform shape even in its earliest stage, and springs from the posterior median portion. Often single, there are sometimes two or even three such outgrowths apparently simultaneously developed from this part. One usually predominates, and ultimately entirely or partially obscures the others. It has its own special ducts, which traverse the pedicle to open in the urethra, and in its substance may be almost invariably detected those concretions which are found in the adult prostate. It may vary in size from a pea to a middle sized pear; and at the outset exerts a perceptible influence on the neck of the bladder, the lower or posterior border of which is gradually elevated as it increases. Ultimately it finds its way into the cavity of the viscus, where it is truly polypoid in shape.

Analogies of a remarkable kind exist between the characters and relations of these three forms of tumour and those which affect the uterus. Velpeau called attention to the fact some years ago. His views may be found in the 'Leçons Orales,' and in other of his writings.¹ He rested the analogy upon the correspondence which he assumed to exist in the two sexes between the uterus and the prostate, from a belief that the two organs originated from the same centres of development in the early condition of the ovum,

¹ Tome iii, p. 478. Paris, 1841.

coupled with the fact that both are liable to exhibit similar forms of tumour in after life.

The ground of analogy which is derived from regarding the uterus of the female and the prostate of the male, as the morphological equivalents in the two sexes, is not, perhaps, the strongest that might be adduced. I shall indicate one which I think is still more conclusive, as well as other points of analogy, the combined result of which will render the correspondence more obvious.

First.—In studying the typical plan on which the entire genito-urinary apparatus of the two sexes is constructed, the most recent labours of modern philosophical anatomists confirm the view that the analogue of the uterus (or perhaps of the uterus and vagina combined) in the male is the prostatic vesicle or utricle. This is the view taken by Leuckart, in a recent article written for the ‘Cyclopædia of Anatomy and Physiology.’ It has been also adopted by Dr. Simpson, in a very elaborate memoir on ‘Hermaphroditism and Sexual Malformations Generally,’ which first appeared in the same work, but which he has just republished, with considerable additions, in the second volume of his ‘Obstetric Memoirs and Contributions.’¹ The prostate, then, though not of itself the absolute equivalent of the uterus, contains in it the utricle, situated as this cavity is in the very centre of the organ.

Secondly.—The point, however, on which I would lay greater stress is, that the prostate and uterus are organs whose bulk is constituted by the same tissue, viz., the organic muscular fibre. No other organ in the body besides these two is similarly constructed by thick masses of this tissue; elsewhere it is distributed in very thin layers. This analogy of structure is, in relation to the pathological question before us, stronger than that of identity of origin in early foetal life, since it has more influence, doubtless, in determining the appearance of tumours and outgrowths of similar character than any other circumstance.²

¹ Vol. ii, p. 684. 1839.

² Professor Kölliker showed, a few years, since that the prostate was

Thirdly.—The two organs thus similarly constructed exhibit growths identical both in external and histological characters. Thus in the uterus we find tumours nearly or completely isolated, made up of organic muscular fibres, embedded in the parenchyma of the part, or standing out in relief from either surface. In the prostate we meet with precisely the same tumours, and they are similarly disposed. But while in some of the prostatic tumours a very small proportion of partially developed gland-tissue may be found intermingled with the muscular basis, this circumstance should be regarded, I think, rather as an accident of situation than as indicating any material difference between them and the purely muscular tumour.

Again, in the uterus we are familiar with another form of tumour, having the same elementary constitution as the preceding, which, springing from the interior and forming a polypoid growth there, is much more intimately connected with the uterine structure than the variety above described, perfect continuity of tissue existing between it and the polypus. So from the posterior median portion of the prostate, we meet with an outgrowth, truly polypoid in form, which continues its development in the direction of least resistance, and exhibiting complete continuity of structure with that of the prostate itself. It contains also the glandular elements proper of the prostate, which exist in small proportion as compared with the organic muscular

very largely composed of organic muscular fibre, this tissue constituting at least two thirds of the organ. And more recently, Professor Ellis, of University College, has examined its structure, and concludes that it "is less of a glandular than a muscular body, and is only a largely developed portion of the circular muscular layer that invests all the urethra behind the bulb or the spongy portion." And again, "As only so small a portion of the prostate is glandular, the propriety of calling that body a gland is rendered doubtful, for the small secreting glands contained in it are but appendages of the mucous membrane, which project amongst the muscular fibres in the same way as the other glands of the urethra extend into the surrounding submucous tissues." 'Med. Chir. Trans.' vol. xxxix, pp. 331-2.

tissue, forming as this latter does in the normal condition not less than two thirds of the organ, probably more.

It may further be observed that all these tumours, but especially those of the simple "fibrous" (muscular) kind, may remain of so small a size, both in the uterus and in the prostate, that the bulk of the organ is not sensibly increased as in preparation No. 43, and no signs indicating their existence during life are produced; while, on the other hand, they may increase to an enormous extent, so as to exceed, by very many times, the natural size and weight of the organ in which they originated, and give rise to the most alarming derangements of function.

Fourthly.—The two organs are subject to considerable hypertrophic enlargement, mainly consisting of their constituent fibrous and muscular elements. And in both, this condition may be associated with some tumour formation, or it may exist independently of it. In the latter case, the hypertrophy may be general or local, affecting the whole or certain parts of the organ; and when thus local, affecting particular spots more commonly than others. All these remarks apply equally to the prostate and to the uterus.

Fifthly.—The two organs are liable to these changes after the prime of life has passed. Bayle, whose observation is quoted by Rokitansky and verified by Dr. Robert Lee, says that 20 per cent. of women after thirty-five years have fibrous tumours of some size in the uterus. I have found prostatic tumour in 30 per cent. of males after 50. In women, however, the tendency to this formation declines after fifty, although it cannot be said to cease. Nevertheless, it is exceptional after that period. It is generally regarded as most active during the term of uterine functional activity, or during the latter moiety perhaps of the time. The age at which the reproductive function of man is most vigorous is certainly not that at which a like tendency in the prostate is evinced; but, on the other hand, it may not be forgotten that the term of productiveness is not limited in the case of the male as in the opposite sex. And still further it may, I think, be fairly admitted that our acquaintance with the

prostatic function is not at present sufficient to forbid the supposition that it is even possible that its activity may not at all diminish during the middle and later years of life, when the hypertrophic disposition is manifested. One thing is certain, the prostatic secretion, whatever its purpose, does not appear to be then less plentiful, judging from the state of the organ after death, than at any previous age.

5. On the existence of minute "concretions," their mode of production, and their relation to the formation of prostatic calculi.

When an adult urethra is laid open, we frequently observe in its prostatic part, lying around the verumontanum, and in the orifices of the prostatic ducts especially, numerous little brownish or blackish bodies, the largest of which ordinarily met with are about the size of poppy seeds. They do not lie free in the canal, but generally just within some of the orifices alluded to, sometimes beneath the epithelial layer of the mucous membrane of the urethra barely visible over them. Again, when a section of the prostatic substance is made, especially if the knife be directed backwards and outwards on either side of the verumontanum, many of the same bodies may frequently be seen. Indeed they may be dispersed through all parts of the organ, although they do not attain, except in rare instances, the size named in situations very remote from the urethra. These bodies are exceedingly well known, and have received the name of prostatic concretions. They have in their origin no relation to urinary calculi, nor should they be confounded with the hard, white, porcelain-like masses, which are peculiar to the prostate, and from which they differ also. They are not generally observed before middle or advanced age; but, although, as a rule, to which there are occasional exceptions, no examples visible to the naked eye can be detected during the period of youth and early manhood; the microscope reveals them of small size *at all ages except that before puberty*.

In the series of prostates referred to, after a minute and

careful examination, I have detected these bodies in *every instance*. I have found them also in one specimen at fourteen years of age, and I have failed to find them in childhood. There is great difference, however, as to their number in different cases. In most, after fifty years of age, they are obvious enough to the naked eye in the urethra around the verumontanum as soon as the canal is laid open; in others it is necessary to make section of a lateral lobe, to scrape the surface and place the milky fluid under the microscope, when they may be seen sometimes in small, sometimes in large number.

At other times it may be necessary to make several such sections before finding any. They are smaller, paler in colour, or even almost destitute of it in young subjects, and *vice versâ* in aged; but there is by no means an unvarying relation in regard of number, size, &c., between their development, and the age of the subject. In No. 40 of the series of preparations, from a man aged sixty-six years, I found more than in any I have ever examined, including subjects from eighty to ninety. I estimated the number of dark-coloured concretions visible to the naked eye in this specimen as amounting to several thousands.

In the early stages of formation they present very beautiful microscopic objects, varying in size from the $\frac{1}{1000}$ th to the $\frac{1}{100}$ th of an inch, mostly oval in form, sometimes angular, and then apparently from the result of mutual pressure. They have a yellowish hue varying between the faintest tint and a deep orange, evidently acquiring intensity of colour with age or increase in size. They have a well-defined outline, as if limited by a kind of cell-wall, and exhibit numerous concentric rings in their interior, which, although the object is more or less translucent, suggests the appearance of a uric acid calculus when cut, a resemblance which no doubt originally caused them to be confounded with formations of this class. (Plate I.) The central part has usually a cellular appearance, as if constituted by a conglomeration of corpuscles partially fused together. (Pl. I. f.)

Sometimes the concretion appears to consist almost

entirely of these, others exhibit very few in proportion to the concentric rings, in which latter no trace of corpuscular arrangement can be detected. It is easy to trace a series of these small semitransparent bodies, as it were, in successive stages, until they gradually become the dark, almost opaque forms at first described. Even in the latter some remains of the concentric arrangement may be occasionally observed; but, generally speaking, they are too dark and opaque to transmit light; and only appear as dark brown masses of spheroidal form, with enough of translucency to enable the eye to detect easily, at their edges, that they have really a deep orange or red colour. In consistency they have also considerably changed, being at first soft, they become hard and even brittle.

Their chemical actions are peculiar. The small, soft, pale, and yellow bodies are not acted on by acetic, nitric, or hydrochloric acids, cold, nor by sulphuric ether, liquor potassæ, or ammoniæ. The larger, hard, and brownish concretions I have found to be unaltered by alkalies, except that they become rather more translucent. By nitric and hydrochloric acids they are sometimes influenced, giving off a few bubbles of gas, and slightly diminishing in size. Sulphuric acid liberates gas more rapidly, and sometimes after the other acids have ceased to act. Occasionally they become soft, and disintegrate into amorphous matter, losing very little of their colour or bulk by immersion in sulphuric acid.

In order to obtain an exact qualitative and quantitative analysis of these bodies, I submitted about 200 of the hard, dark-coloured concretions to my friend Dr. Squire, who, after a careful investigation, has furnished me with the following report:

“Immersed in acetic acid the concretion resists its action, but if broken before this agent is applied it becomes slightly softened and swollen. Nitric acid, cold, has no effect; when hot it dissolves the concretion entirely, producing a very slight yellow tint. A section of the concretion treated with a solution of iodine does not change colour. Sulphuric

acid and sugar do not produce any effect characteristic of protein. When treated with a solution of potash, hot or cold, there is no change, and on adding an acid no precipitate is formed in the alkaline liquid. When the concretion is heated, a strong ammoniacal odour is evolved.

"From these reactions I conclude that the organic constituent of the concretion is not a true protein body, but most probably belongs to that class of nitrogenized substances, sometimes termed protein derivatives, of which fibroin, gelatin, and chitin are examples.

"The following results were obtained by incineration: Concretions, .0244 gramme, yielded of ash, .0112, which equals 49.5 per cent. of residue. This consisted chiefly of phosphate of lime, with a small quantity of the carbonate."

Is the presence of these concretions in the prostate gland to be regarded as a natural or as an abnormal circumstance?

Generally speaking they have been considered abnormal. One of the most recent writers on the subject, Wedl, regards them as the product of enlarged prostate.¹ From the fact of their presence in every one of the fifty specimens, I cannot but conclude that their existence is a necessary result of the performance of natural functions on the part of the prostate, although there does not appear to be any evidence to show that they ultimately disintegrate, and yield up some elements to the natural secretion of the organ, as has been suggested.

In examining by the microscope the fluid contained in the prostatic ducts, I have observed that, in addition to the corpuscles, obviously epithelial or glandular, which are found in it abundantly, there are always present also, and in considerable number, some small yellowish bodies, in appearance sometimes granular, sometimes homogeneous, about the size of red blood-corpuscles, but not so uniform, being from about $\frac{1}{5000}$ th to $\frac{1}{2500}$ th inch in diameter; possess con-

¹ 'Rudiments of Pathological Histology,' by Carl Wedl, translated by G. Busk, F.R.S., p. 269, 1855.

siderable refractive power, nearly so much as to give them a resemblance to oil-globules (Plate II. fig. 5). They are not acted on, however, by ether, nor by the other reagents already named. They are not only found in the prostatic fluid, but may be washed from sections of the organ, and may be found lying in clusters in various parts of it.

Further, it is common to see small ducts and cæcal pouches stuffed with these bodies, as well as with yellow granules of smaller size, several marked examples of which are seen (Pl. I. *ii*, and Pl. II, fig. 1, 2). In the larger masses occupying crypts or follicles of the glandular structure, they may be seen not only cohering but fused together, and then an appearance is presented identical with that which is observed occupying the centre of the larger concretions. Judging from these appearances, and the frequency of their occurrence, I cannot but conclude that the coalescence of these yellow bodies or granules, their partial fusion into a mass more or less homogeneous, the stratification, perhaps, in part of this mass itself, or more probably the deposit upon its surface of fresh layers of fluid matter, similar to that which originally constituted the yellow bodies; and finally some additions of earthy matter to it, either by infiltration or accretion, are the steps by which the formation of a prostatic concretion is very frequently accomplished.

The appearances thus described are very accurately shown in the accompanying drawings by Mr. Tuffen West; and the identical parts there represented were placed beneath microscopes for the purposes of comparison and examination.

Perhaps all these yellow bodies are originally composed, that is, in their earliest stages of formation, of purely organic matter, and that matter a product of the secreting structures of the prostate. At a very early period, however, they seem to be impregnated with the earthy constituent, in some form or proportion which does not much impair the translucency of object. Most appear to remain in this condition, although liable to considerable increase in size after their formation, which probably at first depends on that of the cavity in which the aggregation occurs.

When circumstances give rise to an addition of *opaque* earthy matter to the concretion their size increases, not only by such addition, but by that also of the organic matters with which such deposits are associated. It is then that they acquire density, opacity, and give proof of the presence of mineral constituents, in large quantity, to chemical reagents.

The acquisition of this opaque earthy matter may be thus explained. A concretion having formed within a follicle, and the size having greatly increased by fresh layers of secretion it becomes sooner or later a kind of foreign body, and as such creates a certain degree of irritation. Now, from mucous membranes throughout every part of the body, illustration may be derived of a mode of action by which they deposit opaque earthy matter under certain forms of irritation, this product in all cases consisting chiefly of phosphate with a little of the carbonate of lime. The secreting membrane of the follicle appears to produce a fluid from which earthy salts are precipitated upon the nucleus until its size has increased from that of a microscopic object, it may be under favorable circumstances, even to that of a grain of pearl barley, or of a pea, or even larger. Before arriving at this condition, the walls of the containing follicle have become absorbed and have disappeared, other concretions from neighbouring cavities have come into contact with it, and thus several may be found occupying together a single sac, in which the work of deposition ceases. Here the concretions, or calculi as they may be now considered, may lose their spheroidal form, and acquire facets by attrition and juxtaposition.

Thus it happens, then, that at various stages of its formation, the chemical analysis of a prostatic concretion will exhibit a different result, being found to contain a larger proportion of organic matters in the early period when only visible to the eye as a dark point, and more of inorganic when as large as those of the extreme sizes just described. Analyses of the latter have frequently been made, as by Wollaston, Lassaigne, and others; and the inorganic

matter amounted to 85 per cent. instead of $49\frac{1}{2}$, as found in the smaller kinds examined here.

What the small yellow bodies are, I am not able to state with absolute certainty. Whether they are themselves altered secreting cells from the gland-follicles, or whether only the product of secretion by these structures, does not at present clearly appear. Thus much I have observed, that the small fusiform and spheroidal epithelium lining the prostatic ducts, is often loaded with yellowish granular matter, appearing to be identical with that seen in a free state elsewhere, which seems to favour the view that it is a gland-secretion (Plate II. fig. 3, 4). It may be added, that I have found similar yellow granules in the fluid of the vesiculæ seminales also, in which, at all events in elderly persons, they appear to be more constant than are spermatozoa (Plate II. fig. 6). In this situation, bodies which are evidently the same, have been described in a recent article on the vesiculæ seminales by Mr. Pittard, in the 'Cyclopædia of Anat. and Phys.,' as "very numerous insoluble globules which have a great tendency to coalesce, and appear very much like oil; their refractive power is, however, less, and there are other reasons for doubting that they are really globules of oil." Besides these, the same writer finds "suspended little conglomerated masses of transparent solid, just visible to the naked eye," which have, under the microscope, the appearance of "a nodulated mulberry-like surface, as if composed of smaller balls;" these he thinks are made up by a coalescing of the minute globules above mentioned.

Virchow believes these concretions to be derived from a peculiar insoluble protein-substance mixed with the semen. Wedl, before referred to, regards them as identical with certain bodies found abundantly in the enlarged thyroid gland, and with those met with in the brain and spinal cord, especially in elderly subjects, and named "Amyloid bodies" by Kölliker and Virchow. He believes all these to be the result of a pathological exudation frequently occurring in various organs in advanced age, and which he terms "colloid" matter, on account of its resemblance, in

physical characters, to liquid glue, and he proposes to call the concretions in question "concentric colloid corpuscles," He regards them as "principally composed of an organic substance, and consequently that the names of 'stones' and 'concretions' are inappropriate;" although he has occasionally observed that the colloid matter is deposited upon some of the rounded or nodular forms of calcareous salts which are found scattered in the parenchyma of the prostate, and which thus form the nuclei of some few of the concretions.¹

Reviewing, however, all that has been ascertained respecting the mode of formation of the constitution of these bodies, I see no objection to the use of the term "concretions," at all events to the smaller formations which have been described. Nor perhaps would it be easy at present to employ a better, since it is one which involves no theory except the simple one, that the mode of aggregation of their component parts is mechanical rather than organic in its essential character. When they have arrived at a size sufficient to occasion, as sources of irritation, the deposit of earthy matter in the manner above referred to, they may be regarded as belonging to the category of calculus rather than of concretion. The inorganic component now becomes predominant; the formation increases in size, and although there is no exact period at which it can be said to cease to be a concretion and to become a calculus, yet there can be no hesitation as to which of the two terms should be applied to most examples met with of either kind.

¹ 'Rudiments of Pathological Histology,' by Carl Wedl, translated by George Busk, F.R.S., for Sydenham Society, 1855, pp. 38 and 271.

TABULAR VIEW OF FIFTY PREPARATIONS OF THE PROSTATE FROM THE ADULT; SHOWING ITS SIZE, FORM, WEIGHT, AND OTHER PARTICULARS RELATIVE TO ITS EXTERNAL AND INTERNAL ANATOMY.
Accompanying a Paper on the Anatomy and Pathology of the Adult Prostate, by HENRY THOMPSON, M.B., F.R.C.S.

PROSTATES.

No.	Age.	In what respect abnormal.	NORMAL.			ABNORMAL.			Remarks.		
			Weight. drms. grs.	Length. inches.	Breadth. inches.	Thickness inches.	Weight. drms. grs.	Length. inches.		Breadth. inches.	Thickness inches.
1	79		4 48	1.4	1.45	.85				Numerous dark concretions in the urethral orifices of the prostatic ducts, and in substance of organ.	
2	71	General enlargement slight, chiefly of posterior median portion "middle lobe." Left lobe larger than right.					6 40	1.65	1.9	.9	Concretions in substance of organ.
3	72						5 18	1.3	1.7	.9	Numerous concretions in prostatic ducts.
4	42		3 37	1.3	1.4	.6					Concretions.
5	47		4 57	1.8	1.7	.65					Numerous concretions in urethra.
6	85		4 44	1.25	1.55	.95					Numerous concretions in urethra.
7	47		5 33	1.4	1.7	.9					The form of the organ is peculiar, being as it were compressed from before backwards.
8	63		4 35	1.35	1.7	.7					From a large subject; a full-sized prostate.
9	56	Very small tumors, exhibiting glandular structure, with a large proportion of organic muscular fibre.					5 22	1.55	1.75	.75	Concretions.

10	50	A small tumor attached to verumontanum. Organ normal in weight and size.	4	34	1.5	1.7	.65
11	54		4	8	1.25	1.8	.75
90							
52		The "utricle" here admitted a No. 12 catheter and was three quarters of an inch long.	4	58	1.25	1.85	.85
12	54		4	13	1.5	1.75	.6
13			4	37	1.5	1.75	.7
14							
	66						
15	63		4	27	1.4	1.5	.65
16	73		4	3	1.35	1.5	.65
17	79		2	58	1.1	1.8	.6
18	54		4	2	1.4	1.6	.55
19			2	57	1.2	1.45	.55
20			4	50	1.5	1.7	.7
	70						
21	56		4	55	1.4	1.8	.7
22		General enlargement. Lateral lobes projecting into the urethra.					
23	61		4	56	1.4	1.7	.75
24	56		4	4	1.3	1.6	.7
25	21		4	16	1.3	1.6	.8
26			3	56	1.25	1.75	.75
27		Atrophied. Patient died of phthisis, with great emaciation.	2	46	1.25	1.3	.55

Concretions.

Polypoid tumour from verumontanum, made up of muscular fibres, connective tissue, and fusiform cells. About five eighths of an inch long, directed backwards to the bladder. Abundance of concretions in urethra. Numerous concretions in urethra.

Concretions.

As concretions were found in every specimen examined, and in nearly one half of the cases, lying not only in the ducts and follicles of the gland-tissue, but also in the mouths of the ducts in the urethra, so as to be seen on opening the canal, the facts will not be again noted separately in this table.

A number of prismatic crystals of the triple phosphate were seen in the anterior portion of the organ on making section.

6 0 1.3 1.8 1.0

No.	Age.	In what respect abnormal.	NORMAL.				ABNORMAL.				Remarks.				
			Weight. drms. grs.	Length. inches.	Breadth. inches.	Thickness inches.	Weight. drms. grs.	Length. inches.	Breadth. inches.	Thickness inches.					
28	21	Posterior median por- tion enlarged and two or three small glandular tu- mors in right lateral lobe.	3	34	1.3	1.4	.7	7	15	1.8	1.7	.85	On opening the bladder, a nipple- shaped body was seen behind the in- ternal orifice of the urethra. On making section of the organ it was seen to be formed of a pyriform out- growth from the posterior median portion, with a narrow neck, reaching <i>an inch</i> from the point at which the <i>vasa deferentia</i> enter. It was glandu- lar.		
29	40														Died of cystitis from enlarged pros- tate.
30	62			4	30	1.55	1.6	.75							
31	74	Full of tumors, fibrous only. See vol. vii, 'Trans. Path. Soc.' where the spe- cimen is drawn and de- scribed.	5	2	1.4	1.75	.9	12	30	2.25	2.4	1.75			
32	64		5	20	1.55	1.75	.8	7	15	1.5	2.0	.8	The consistence of this prostate is unusually solid.		
33	50	General enlargement, chiefly of posterior median portion.													
34	73														
35	61	Enlargement of pos- terior median portion. Lobular hypertrophy of lateral lobes well marked.	4	48	1.6	1.8	.6	7	25	1.5	1.9	1.0			
36	73		4	46	1.4	1.9	.55						The ducts throughout this prostate show remarkably well what is not unfrequently seen, viz., that they are		
37	50		5	4	1.5	2.0	.55								
38	46		4	35	1.5	1.75	.6								
39	66														

40	66		4	6	1.5	1.65	.6						stuffed with small concretions, and with the elements of which concretions appear to be formed.
41	64	Three small pedunculated outgrowths from posterior median portion.						6	20	1.5	1.9	.75	Two or three cavities in the organ near the verumontanum size of grain of wheat, filled with small black concretions. There were literally thousands of these in this prostate. These outgrowths are glandular. No symptoms during life.
42	75	General hypertrophy with numerous small tumors, and enlarged lobules of the organ not quite isolated.						9	50	1.7	2.1	1.0	Some little difficulty in micturition during life. Many cavities containing concretions. Many triple phosphates also.
43	79	No enlargement, but numerous very small tumors, fibrous only.						4	36	1.3	1.75	.8	
44	50	Pyrriform growth from median portion.						5	50	1.3	1.8	1.0	Occasionally slight difficulty in micturition latterly. Outgrowth glandular in structure.
45	65	Pyrriform growth from median portion.						6	18	1.5	1.7	1.0	Glandular in structure.
46	65		4	24	1.4	2.0	.6						
47	55	Full sized, but not morbid.	5	30	1.3	1.8	.85						
48	62	Two small elevations from posterior median portion, glandular. One tumor on each lateral lobe, purely fibrous.						6	5	1.4	1.9	1.0	Cyst-like cavities as large as a pea, containing many concretions.
49	54		4	48	1.4	1.75	.7						
50	61		4	54	1.3	1.75	.75

Magnified 150 diameters.

Fig 1

Fig 2.

Fig 3.

Fig 4.

Fig 5.

Fig 6.

Magnified 150 diameters.