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ON THE
ANATOMY AND PHYSIOLOGY

MALE URETHRA,

AND ON THE

PATHOLOGY OF STRICTURES OF THAT CANAL.

BY

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MEDICAL SOCIETY OF LONDON, &c. &c.

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P R E F A C E.

THE Council of the Medical Society of London having done me the honour to appoint me its Lettsomian Professor on Surgery for the Session 1851-2, I was induced to select the subjects treated of in the following Lectures, from having paid more than ordinary attention to them, and from feeling that many obscure points connected with the physiology and pathology of micturition were capable of more satisfactory explanation than had been previously given. I trust that my efforts will be considered worthy of imitation, and lead others to employ their more powerful abilities in the same direction. Allusion is made in the first lecture to the omission of my name in the article "Urethra," published in the *Cyclopædia*

of *Anatomy and Physiology*, the entire credit of the discovery of the muscularity of the urethra being therein awarded to Kölliker, of Wurtzburg. It is due to the author of the article in question, as well as to the Editor of the *Cyclopædia of Anatomy and Physiology*, to take this opportunity of stating, that since this book has been printed, they have taken every means which kindness and good feeling could dictate to remedy the omission.

59, Harley-street, Cavendish-square,

11th May, 1852.

LETTSOMIAN LECTURES.



LECTURE I.

ON THE MUSCULARITY OF THE URETHRA.

MR. PRESIDENT AND GENTLEMEN,—It may not be generally known that the late Dr. Lettsom bestowed by deed of gift upon the Medical Society of London, certain premises in Bolt-court, Fleet-street, all profits accruing from such premises to belong to that Society so long as its members exceeded twenty; but in the event of the number of fellows falling below twenty, and continuing so for six months, the property in question was then to pass to the heir-at-law, the Society losing all interest therein. At the amalgamation of the late Westminster with the Medical Society of London, it was considered that essential service would be rendered to the conjoint Society if the entire interest in the premises in question were obtained; or, in other words, if the heir-at-law would resign his reversionary interest therein. Accordingly a deputa-

tion was appointed to wait upon this gentleman. He received that deputation with the utmost courtesy, and at once yielded to the request, thus constituting the said premises a freehold property of the Society.

Your council for the time being, anxious to do honour to the name of Lettsom, and to show their sense of the liberality of the grandfather and grandson, instituted two professorships to be held annually, one by a physician, the other by a surgeon, each of whom has to deliver a course of three lectures upon some subject connected with his branch of the profession. Your first Lettsomian professors appointed under these regulations were Dr. O. Rees and Mr. Guthrie. Your second and present are, Dr. Forbes Winslow, and the humble individual who now has the honour of addressing you.

Believe me, I completely recognize the responsibilities I incur in undertaking the duties of the important and honourable post which you have so kindly imposed upon me,—the difficulties of which are so greatly enhanced from the fact of my succeeding such men as my predecessors.

I cannot forget, and you all must doubtless have a vivid recollection, of the position, talent, and reputation of your late surgical Lettsomian professor, who, to the wisdom and experience of age, added the fire and energy of youth; and, with that indomitable perseverance which has characterized his career through life, stepped forward, at our request, to do honour to the Medical Society of London, and delivered a course of lectures, which for excellence, careful preparation, and benefit to science, it would be most difficult to equal—impossible to excel. Succeeding such a man, I feel deeply my own unfitness for the post; and I fear that the subject which I have selected, from

the manner in which it was treated by Mr. Guthrie, and the no less admirable manner in which the collateral subject of the pathology of urine was considered by Dr. Owen Rees, may be deprived of the freshness of novelty, and lay me open to the charge of presumption, in attempting to follow in their steps, and to offer you some few remarks upon the physiology of micturition, and the pathology of strictures of the urethra.

In the lecture delivered by Mr. Guthrie, he adverted principally to strictures of a permanent character, or to those depending on some positive alteration in the structure of the walls of the canal; he confined his remarks upon transitory, or what are usually denominated "spasmodic" strictures, to a very few observations, limited to those of an inflammatory nature, attacking young men during the progress of a gleet or gonorrhœa; and indeed the attention of the profession has been so much restricted to the more permanent form, that it has almost become a matter of course to consider difficulties of passing urine as depending upon organic impediment, or changes of structure, and closure of the canal; and treatment founded upon this error is commonly resorted to, to the too frequent detriment of the patient.

We have seen that Mr. Guthrie for the most part considers transitory or spasmodic strictures as inflammatory. Mr. Lawrence takes a somewhat similar view; as does Mr. Wilkinson King, who goes beyond every other author, and ascribes all strictures, of whatsoever kind they may be, as caused by and depending upon inflammatory action, and requiring a corresponding mode of treatment. There cannot be a doubt that many strictures termed spasmodic, may with greater propriety be considered-inflammatory; but I believe that we confine our observations to much

too narrow limits, if we ascribe all strictures of a transitory character to inflammation, or even spasm; as a more careful examination of the subject will convince us that the passage of urine may be impeded, or even totally arrested, from causes extremely remote from, or even opposed to, inflammatory action. I prefer the term "transitory or temporary impediment" to that of "spasmodic stricture," for, as Mr. Abernethy justly remarked, "a stricture from spasm is not a stricture;" whilst the term "spasmodic stricture" implies a forced, irregular, and abnormal muscular contraction, leading to closure of the canal; whereas I believe that the impediment to the passage of urine very frequently results from some lesion of function, without any organic or structural obstruction existing even for a time. Micturition may be interrupted from various causes, which may exert a mere temporary influence, producing the form of disease at present under consideration; or they may, by their combined and continued action, give rise to alteration of structure, or formation of new tissue, and thus constitute the more serious and usually recognised form of permanent stricture or narrowing of the canal.

The influence of the mind; mental anxiety; general irritability; nervous excitement; indigestion and torpid action of the liver; inflammation on the one hand, and want of tone on the other, influenced also by various conditions of the urine,—may all and each induce the former or temporary class of the disease; whilst we must look to actual disorganization; diseased condition of the urethra; the deposit of new structure; the presence of calculi; enlargement of the prostate gland,—as the most prominent causes of the permanent form.

With so many exciting causes, some of which are so

obstinate and intractable, presenting symptoms and results so various and capricious, (depending doubtless upon the versatility of those exciting causes,) we cannot feel surprised at the anxiety and distress which they give the patient, and still less for the difficulty of generalization or laying down any one fixed rule of treatment, for cases so variable in their symptoms, so influenced by extraneous and collateral circumstances, so uncertain in their results, and the symptoms of which, whilst bearing a close resemblance to each other, very frequently arise from directly opposite causes. And, therefore, however favourably we may be inclined to view any one particular line of treatment which may have succeeded, or we may have imagined to have succeeded, in our own hands—we should be cautious how we condemn the practice of others opposed to our own; and still more, how we ascribe improper and unworthy motives to those who may advocate a course of treatment which they may have found beneficial, and which, after all, may be as well, if not better, entitled to consideration and credit, as that upon which we may have pinned our faith; particularly when we recollect that, from the causes alluded to above, what may succeed well in one instance may not merely fail altogether, but prove actually injurious, in another. To propose, therefore, to treat such a disease by one process, whether by constitutional remedies; the usual one of gradual dilatation, or the more recent one of rapid and forced dilatation; the application of potassa fusa or caustic; internal division, whether superficial or deep; or the no less heroic plan of perinæal section,—is to take an unphilosophical and narrow-minded view of the subject, and one which no efficient and sound practitioner would be willing to admit.

In the following remarks, I propose to consider, first,

those impediments to the passage of urine arising from mere atony, mental anxiety, nervous excitement, or, in other words, from lesion of function of the parts engaged.

Secondly, those depending upon vascular congestion; and lastly, those resulting from inflammation, the presence of foreign bodies, with their consequences.

Before, however, we enter upon this inquiry, it will be necessary to devote some little attention to the mode by which the functions of these parts are performed. Opposing opinions are entertained and published, and the descriptions of some, even of the most important points, are so vague and unsatisfactory, and the reasoning so incorrect, that our time will be well employed in endeavouring to investigate the subject further, and to remove existing doubts and obscurity. The reason for this imperfect knowledge is to be traced to ignorance of the true character of the structure of the parts; for until I brought the results of my investigations before the profession in the early part of last year, when I first submitted them to this Society, the muscularity of the urethra was for the most part ignored and denied—reasons for what took place were obliged to be sought; erroneous theories were promulgated, and upon these false foundations equally false structures were raised.

It will doubtless be in the recollection of many of those whom I now have the honour of addressing, that in February last I announced to the Society the discovery I had made of the muscularity of the urethra—a discovery, it must be admitted, of very great importance, as accounting for many of the symptoms and phenomena met with in the treatment of strictures of that part, the character of which we did not know and could not explain. Mr. Hunter (p. 162), with that sagacity for which he was so

eminently distinguished, from observation, arrived at the conclusion that the urethra was muscular; but his opinions, but with few exceptions, met with little support. He distinctly asserted "that the urethra is muscular, and is, therefore, capable of contracting its canal similar to an intestine." "This," he adds, "makes it subject to diseases peculiar to muscle in general, which is indeed the only proof we have of its being muscular." Sir E. Home also, from the microscopical investigations of M. Bauer, conceived the idea that the urethra was surrounded by muscular fibres; and had the instruments employed possessed a higher magnifying power, and the use of the microscope been better understood, it is very probable that M. Bauer's researches would have been definite and conclusive; but, as it is, he assigned a wrong locality for the muscular fibres, placing them immediately external to the thin membrane of the urethra, whereas they are separated from it by elastic and non-elastic cellular tissue, to the latter of which his representation of what he called his muscular fibres bears the greatest resemblance. Mr. Wilson also, (at page 149,) asserts the existence of muscular fibres between the urethra and corpus spongiosum, and that he had repeatedly seen packets of longitudinal fibres connected to each other laterally in such a manner, and putting on so marked an appearance, that he could entertain no doubt of their being muscular. And (at page 363) he goes so far as to assert that these fibres are apparent to the naked eye. What Mr. Wilson imagined was muscular fibre, is in fact principally non-elastic cellular tissue, as the muscular fibres, though sufficiently apparent under the microscope, are much too delicate to be distinguished by the naked eye. Although Mr. Wilson made this statement, he does not appear to have taken any means of verifying

it by microscopical investigations, but to have remained satisfied with what M. Bauer had previously done.

I was induced to enter upon the examination from having a patient under my care, whose urethra clasped the bougie with more than ordinary firmness, and that at so short a distance from the orifice, that I was convinced it could not arise from any influence which could be exerted by the acceleratores urinæ, or Guthrie's muscles, as these did not reach the spot; and from further consideration of what I had met with in other cases, the usual explanations of which were equally obscure and unsatisfactory to me, I felt convinced that something more was to be discovered in or around the urethra than what had previously been known and described; and I accordingly requested my friend Mr. Hogg to assist me in the investigation, the results of which I will presently allude to. I have here stated the reasons which induced me to enter upon the inquiry, in order to show that they were not speculative, nor derived from the desire of appropriating to myself the discoveries of others, but that they emanated from a legitimate anxiety to explain points which I had met with in my own practice, and which I did not previously understand; and moreover, other names have been so mixed up with mine in the matter, that many have been led to deny me that degree of credit which I feel I am entitled to, assuming, I suppose, that I was appropriating that which did not belong to me.

In a paragraph immediately following Mr. Guthrie's Lettsomian lecture, published in *The Lancet* of the 24th May last, is the following:—"Since the delivery of the lecture, Mr. Guthrie has ascertained that the involuntary muscular fibres of the urethra and prostate described by Messrs. Quekett and Hancock, had been previously noticed

by Kölliker, of Wurtzburg. The labours of these gentlemen have been, however, totally distinct and unknown to each other, and they are alike entitled to the approbation of their fellow-anatomists."

I have not, however, met with the same degree of consideration from other writers, for in the article "Urethra," contained in the *Cyclopædia of Anatomy and Physiology*, the entire credit of the discovery is awarded to Kölliker, although my description of the parts had appeared in *The Lancet* three months before the number of the *Cyclopædia* containing the article in question was published. I have no wish in any way to detract from the value of Kölliker's discoveries, but it is due to myself that I should submit to you what he has written upon the subject, and my account thereof, side by side, that you may take the same into your mature consideration, and award credit where credit is due. I would only observe, that whilst I willingly concede to Kölliker the priority of *noticing* these fibres, I claim for myself the credit of *describing* their situation and arrangement, and their importance as bearing upon practical points. The following is Kölliker's account. After observing that the prostate gland and that part of the urethra which lies in it are the most remarkable for their richness in muscular fibres, that the yellow longitudinal of the crista galli appear to join the lower end of the trigone, and contain only a few scattered muscular fibres, he continues,—

"That on both sides of the caput gallinaginis, and as far as the anterior wall of the urethra, there appear, further, similar yellowish longitudinal fibres, which form a strong layer towards the neck of the bladder, whilst, on the other hand, towards the pars membranacea they become more delicate.

"This longitudinally-fibrous layer of the pars prostatica

is connected internally to the sphincter vesicæ by a weak and indistinct layer of fibres, with a few longitudinal bundles of the muscular coat of the bladder lying at the side of the trigone. It has, however, for the most part, no connexion with the muscles of the bladder, and consists half of cellular tissue with many nucleus fibres, and half of organic muscular fibres with their characteristic nuclei. Upon this layer follows, secondly, towards the outer side, a thickish layer of yellow circular fibres, of muscular and elastic structure. Here are found, as Valentin has said, a great mass of reddish fibres, the bundles of which join plexuses, yet run for the most part radially; and the glandular mass and ducts of the prostate; the first of these are almost all muscular. Their elements are very beautiful, being an abundance of organic muscular fibres of moderate length and considerable breadth, similar to those of the bladder.

“It may be readily comprehended that, under these circumstances, any muscular coating of the vesicles and ducts of the gland would be quite superfluous; they therefore possess only a coating of cellular tissue. In the *pars membranacea urethræ* the organic muscular layer is less developed. There is, under the mucous membrane, whose cellular tissue is distinguished by its richness in elastic structure, a layer of longitudinal fibres, which are connected with those of the *pars prostatica*. They consist for the most part of cellular tissue, containing nucleus fibres and a small number of wavy, contractile, organic muscular bands, which are sometimes partly isolated, and are more easily found in fresh preparations than in those which have been acted on by acetic acid, in which they are obscured by the many nucleus fibres of the cellular tissue. Upon these longitudinal fibres follow externally transverse fibres in a considerable layer, which for the

most part belong to the *musculus urethralis*. A part of these, however—viz., the inner layer, show pretty strong bundles of organic muscle, with cellular tissue and nucleus fibres, and partly mixed with animal bundles of the *urethralis* muscle.

“ Still less developed in general are the organic muscles in the *pars cavernosa* of the urethra: sometimes they are to be found just like the longitudinal fibres of the membranous part; in other cases longitudinal fibres may indeed be recognised under the mucous membrane, but no muscles at all among the cellular tissue and its nucleus fibres. At a certain depth, however, we always meet with longitudinal fibres, with a larger or smaller admixture of organic muscles, which fibres cannot be regarded as *trabeculæ* of the *corpus cavernosum*, since there are no venous spaces between them; but they form a continuous membrane, which limits the proper *corpus cavernosum* towards the urethra.

“ This layer might be regarded as belonging to the *corpus cavernosum*, and the existence of a muscular membrane belonging to the urethra, at this part, might be altogether denied; but it seems more natural to regard the whole *corpus cavernosum* as a very much developed muscular investment provided with peculiar vessels. For these are found in the *trabeculæ* of this spongy body as far as the *glans penis*, mixed with cellular tissue, containing nucleus fibres, vessels, and nerves, and a great quantity of organic muscles, which render the whole structure eminently contractile.”

This is the entire account of the muscularity of the urethra, as given by Kölliker. I will now, as succinctly as possible, give you my own version of the subject: it is essentially the same as that which I announced in February last; but having since then bestowed considerable pains

upon it, I have been enabled more completely to convince myself of the correctness of my views, and have therefore more confidence in submitting them to you.

The organic muscular fibres in the prostate gland, connected with the urethra, are continuous with those of the internal muscular coat of the bladder, whence they may be traced by careful examination, passing forwards through the prostate gland. These fibres, destined to invest the membranous and other portions of the urethra, appear to me to be entirely distinct from the organic muscular fibres found in large quantities throughout the gland, particularly around the sinus pocularis in the verumontanum or caput gallinaginis, where the principal excretory ducts of the gland, with the common ejaculatory ducts, open. Organic muscular fibres surround the various ducts which permeate the gland in all directions, and may, in the instance of the common ejaculatory ducts, be traced into the gland from the vas deferens, where they may readily be seen, as in the annexed figure.



FIG. I.—Transverse section of vas deferens, showing disposition of muscular fibres, also shape of canal.

The same arrangement obtains around the proper excretory ducts of the gland, and is beautifully shown where calculi are present in any quantity or size, in which case the foreign body may be seen impacted in the duct or cell, with a circle of these organic fibres surrounding it.

FIG II.



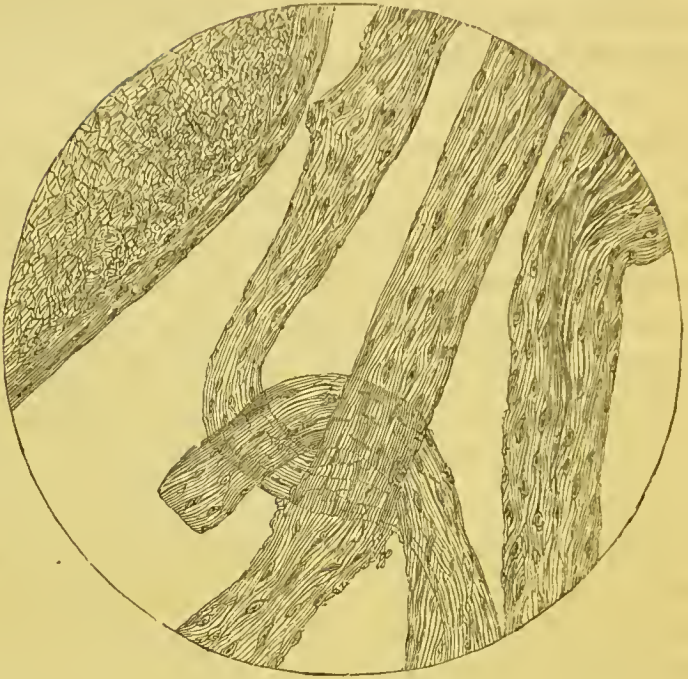
Portion of prostate gland, showing duct surrounded by muscular fibres, and filled with calculi; also two larger calculi in neighbourhood, magnified 350 diameters.

The muscular fibres of the prostate are best seen in the prostate of a foetus of between six and nine months, at which age the muscular fibres are very distinct, having large nuclei. In old age the muscular fibres, though readily traced, are not so distinct, owing to the phosphatic deposits and fatty degeneration which take place in the prostate gland at that period of life.

The organic muscular fibres found generally throughout the prostate gland, belong in a great measure, I believe, to the numerous vessels and ducts which ramify so freely through this body, as Mr. Guthrie has pointed out; and Mr. Quekett has proved the existence of muscular fibres in the coats of arteries; but these general fibres are, as I have before observed, distinct from those derived from the inner layer of the muscular coat of the bladder, and which form a layer surrounding the prostatic portion of the urethra, separated from it merely by elastic and non-elastic areolar tissue. (Kölliker says these fibres for the most part have no connexion with the muscles of the bladder.) The outer layer of the muscular coat of the bladder, on the contrary, passes forwards on the outside of the prostate gland, and laterally and inferiorly joins the fibres derived from the inner coat in front of the prostate gland, to assist in forming the organic muscular covering of the membranous portion of the urethra. Whilst, superiorly, or on the upper surface of the gland, these external longitudinal fibres are arranged in two or more bundles, which are attached, as Mr. Guthrie pointed out in the year 1830, to the pubes near its symphysis. From the front of the prostate the conjoined layer of organic fibres passes forwards to the bulb, investing the membranous portion of the urethra, covered by, but distinct from, the common muscles of the part, the latter being inorganic, voluntary, or striated; these, being organic and nucleated. Arrived, however, at the bulb, these two layers again part company and extend forwards through the whole length of the spongy portion of the urethra, the internal layer running between the corpus spongiosum itself and the urethra, but separated from the latter by areolar tissue; the external lying on the outside of the

corpus spongiosum, separating the proper spongy tissue from its fibrous investment. Upon reaching the anterior extremity of the urethra, these two layers again unite, and form a circular body or band of organic muscular fibres, constituting that peculiar structure usually denominated "the lips of the urethra," and which had previously been considered by Mr. Guthrie as surrounded by a peculiar dense structure, analogous to that which forms the edge of the eyelid, and which he believed was requisite to maintain the patency of the opening: so that not only have we the urethra supplied by a coat of organic or involuntary muscular fibre, but the spongy body itself lies between its two layers of involuntary muscle, an arrangement, doubtless, of very great importance in relation to the due performance of the functions of the part. And, as regards the urethra, this arrangement holds good wherever we find the spongy tissue, whether the quantity of that tissue be small or great; for, at the glans, which is formed not only by increased development, but also by a folding back, as it were, of the corpus spongiosum upon the corpora cavernosa, we have these muscular layers multiplied; whilst, on the upper surface of the urethra, where there is merely a narrow portion of corpus spongiosum, the same arrangement holds good. Independent of these layers of organic muscular tissue, nucleated fibres may be found distributed occasionally throughout the spongy tissue, but I think they belong more properly to the arteries of the part.

FIG. III.



Muscular fibres surrounding the urethra, as seen under a magnifying power of 350 diameters.

When I commenced this inquiry, and when I submitted the results thereof to your notice, I was not aware that the subject had previously met with any attention. I had never seen or heard of Kölliker's discoveries; I knew that the muscularity of the prostate gland had been hinted at, but I was not aware until I spoke to Mr. Quekett upon the matter, that, although he had not published, he had some years previously established the fact, but had not pursued the matter further. Therefore, as regards the prostate gland, the credit of priority is due to this gentleman.

From the two accounts which I have submitted to you you will observe that, although Kölliker noticed muscularity

fibres in the prostate gland, over the membranous portion of the urethra and the corpus spongiosum, he has not traced any connexion between them, nor has he attempted to reduce them to anything like a systematic arrangement. He has not, for instance, traced the connexion between the muscular fibres of the prostatic portion of the urethra and those of the bladder—a point of the greatest importance, as I shall hereafter prove to you in the physiology of micturition. He does not trace the external layer of the muscular coat of the bladder over the outer surface of the prostate gland itself. He deprives the vesicles and ducts of the prostate gland of their muscular investment, whilst he almost denies a muscular membrane to the spongy portion of the urethra, observing, “that it seems more natural to regard the whole corpus spongiosum as a highly developed muscular layer provided with peculiar blood-vessels.”

Now, I repeat, that I claim the credit of having done what Kölliker has omitted to do—traced these muscular fibres continuously from the inner and outer layers of the muscular coat of the bladder to the distal orifice of the urethra, showing of what the lips of the urethra consist. I have shown that the vesicles and ducts of the prostate gland are surrounded by the muscular fibre, those of the ejaculatory ducts being derived from the muscular coats of the vas deferens. I have shown that the spongy portion of the urethra has its muscular membrane or coat equally with the other regions of that canal, and I have also proved that we cannot correctly regard the whole corpus spongiosum as a highly developed muscular layer, but as consisting of two muscular layers, with an intermediate layer of erectile tissue. The distinction between these layers may readily be seen by the microscope, as

well as by injection; and I must confess I do not understand how we are to reconcile Kölliker's theory (which has been adopted without comment by the author of the paper upon the urethra, to which I have already alluded,) with the functions of the part. I do not understand how a muscle, however highly developed that muscle may be, can by any possibility perform the functions of the corpus spongiosum. The corpus spongiosum is not merely an urinary apparatus, but a genito-urinary organ; it has not merely to surround and influence the urethra, but to form part of, and that a most important part of the genital organ, and to qualify that organ for the due performance of the sexual functions; and to enable it to fulfil this double office, it requires its conditions of relaxation and erection. I shall hereafter have to notice the influence exerted by the muscular fibres of the urethra over micturition, which is ordinarily performed, or at all events most readily performed, whilst the corpus spongiosum is relaxed. I need scarcely allude to the difference in size between the corpus spongiosum in a state of relaxation and in the opposite condition of erection, when it is enlarged in all directions, not only in length and in depth, but in breadth also; and I would fain ask in what other instance in the body does this obtain?—in what other organ do we find, under any circumstances, healthy muscular fibre, whether organic or inorganic, increasing in bulk in all directions during its period of action? On the contrary, this theory of Kölliker's is opposed to one of the fundamental laws in physiology, regulating muscular contractility, that what a muscle during action gains in breadth it loses in length, and *vice versâ!*

We can, however, much more readily understand what I have demonstrated, that in the corpus spongiosum we

have two layers of muscular fibre with intervening erectile tissue; we can readily reconcile this fact with the functions of the part; and I believe that whilst the inner layer influences micturition, the two layers combined, when the state of erection is no longer required, serve to compress the erectile or spongy tissue between them, and squeeze the blood from the cells and blood-vessels, thus restoring the part to its ordinary and relaxed condition.

But whilst I am anxious to assert my own claims, I am equally desirous of acknowledging the obligation I am under to my friend Mr. Hogg, who has throughout pursued these inquiries with me, and rendered me the greatest aid in carrying out my investigations and confirming my views.

Before we consider how this discovery of the muscularity of the urethra bears upon the question of the pathology of strictures, and to what extent it may serve to explain the various phenomena which they present, I would refer you to the opinions expressed by some of the more distinguished authors who have written upon this subject. By these gentlemen, strictures of the urethra have for the most part been arranged in two groups—viz., “spasmodic,” comprising all those the cause, symptoms, and pathology of which could not be explained; and “permanent,” or those in which change of structure existed, and made evident the true character of the complaint. It is upon the former that the knowledge of the actual structure of the urethra will throw most light, and will most satisfactorily explain what has hitherto been veiled in obscurity and doubt. Sir B. Brodie places this point very forcibly before us. He says: “But here, as on most other occasions, morbid anatomy affords us but an imperfect lesson in pathology; and it is only from the

PLATE I.

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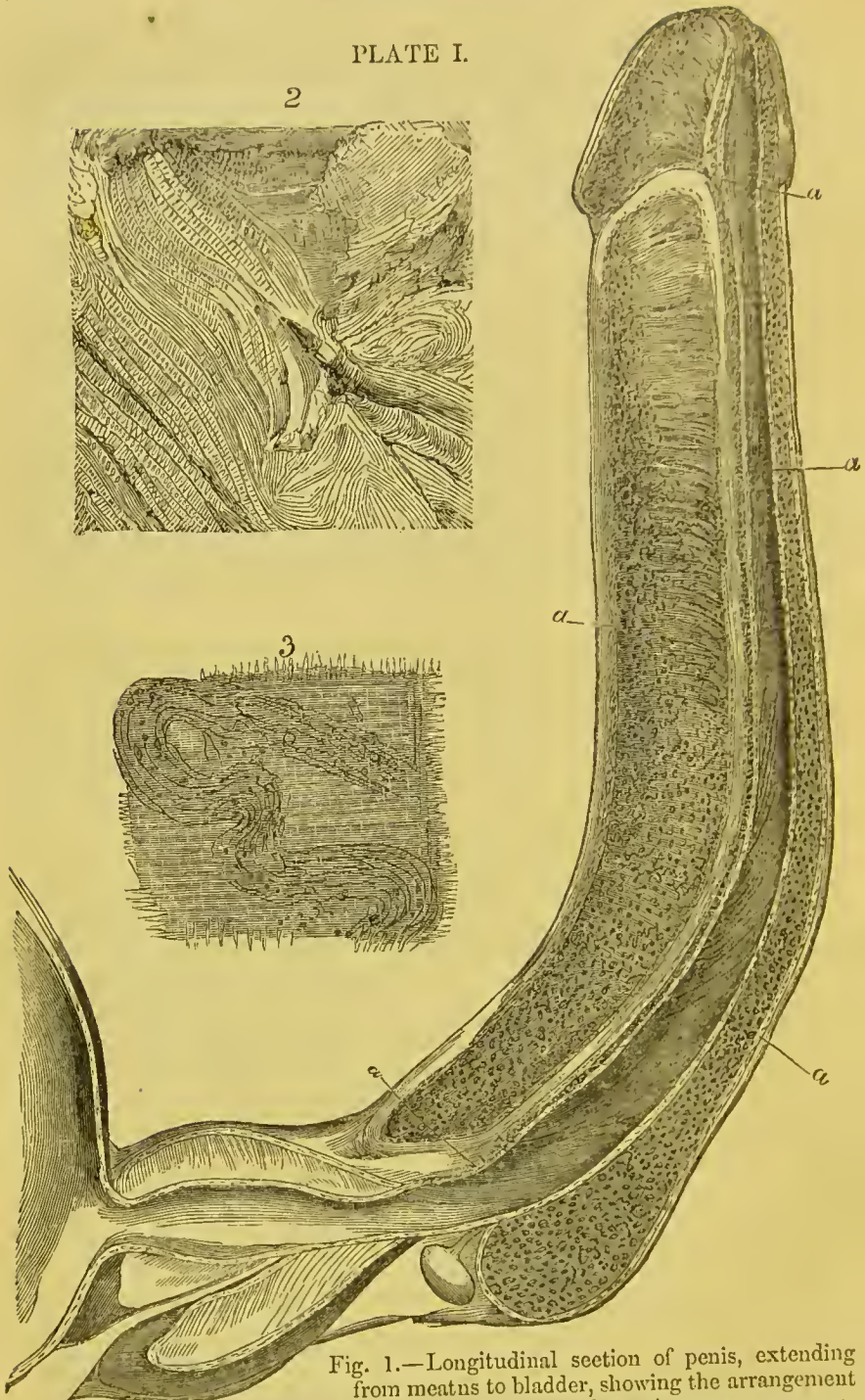
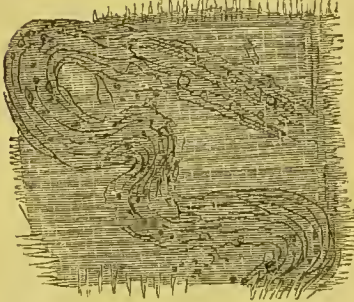


Fig. 1.—Longitudinal section of penis, extending from meatus to bladder, showing the arrangement of muscular fibre, and its relative position through the entire organ *a a a a a*.
 Fig. 2.—A portion of false membrane taken from an old stricture, magnified 250 diameters.
 Fig. 3.—Appearance presented by a section of calumnar bladder, from a patient with an enlarged prostate, magnified 250 diameters.

observation of what happens in the living body, that we can learn one of the most important circumstances in the history of the disease." While in some cases there is from day to day but little variation in the size of the stream of urine, we find that in others it varies greatly; so that a patient who one day voids his urine with so much facility that he is scarcely conscious of the existence of any impediment to his doing so, on the following day may void it only in drops, or even be unable to void it at all. The change, moreover, may take place in a very small space of time. The difficulty of micturition may almost immediately follow too copious libations of those liquors which cause the urine to be loaded with an excess of lithic acid or lithate of ammonia—such, for example, as punch or champagne; and, as I shall more fully explain hereafter, it may subside even more rapidly than it took place, after the pressure of a full-sized bougie against the anterior part of the stricture, or the application to it of nitrate of silver. The permanent alteration in the condition of the urethra which is disclosed to us by dissection, will not account for these phenomena; and we are compelled to refer them to some power of contraction which exists in the living body, and is wanting in the dead. A multitude of facts which you will meet with in practice, can be no otherwise explained; and no one conversant with these cases, will doubt that the distinction between spasmodic and permanent stricture is well founded. What I am about to mention, seems to throw some light upon this subject, Spasmodic stricture is always situated in the membranous portion of the urethra, where the canal is surrounded by a sort of sphincter muscle, of no inconsiderable size; and it seems not unreasonable to suppose that it is the real seat of these spasmodic affections. We

find nothing like spasmodic stricture in the anterior part of the canal, where there are no muscular fibres in immediate contact with it.

Mr. Guthrie, in the year 1836, (at page 91 of his work,) wherein he ascribes, as indeed he did in his Lettsomian lectures last year, spasmodic stricture to inflammation, makes some equally forcible remarks. "The difference," he observes, "between a spasmodic and permanent stricture is this: the spasmodic is supposed to depend upon some muscular contraction, of a temporary nature, in or exterior to the canal itself. If the theory laid down by Hunter could be maintained, and the circular or longitudinal muscular fibres described by Sir E. Home and M. Bauer could be satisfactorily demonstrated to be muscular, nothing could be more simple than the manner in which a stricture might be formed; and it is this simplicity which has won the belief of so many surgeons in that which they could not see, but from its appearing so very satisfactory, they even wished to be the case." And (at page 97) in reference to a case, he further observes: "In these cases, there is really no spasm; the part contracts by its vital elasticity, by which I understand something like that property possessed by the middle coat of an artery, a property very observable during life, but which is lost after death." It is now well known that this middle coat is muscular.

Sir C. Bell (p. 94) says:—"I shall now endeavour to show you how this idea of the spasmodic nature of a stricture has arisen, and that it has proceeded from a false data. By confounding the effect of the proper muscles of the urethra, the whole lining membrane of that canal has been imagined to possess a muscular property." And in his "Institutes" (p. 294) he observes:—"When I asserted, and to the unbiassed in judgment proved,

that the membrane of the urethra was not muscular, Home and his immediate pupils sneered at the doctrine. Nor is it to be wondered at that they should, as it overturned much of their opinions and practice."

Mr. B. Phillips (p. 146), in alluding to the first division of strictures of the urethra in the classification of Daran, where that author describes some strictures as produced by the contraction of the fibres of the lining membrane of the urethra, remarks:—"An opinion which, like that of Home, is perfectly untenable, for it would imply muscularity where no muscular fibre has ever been demonstrated."

Mr. Samuel Cooper, on the other hand, remarks (first lines, p. 526),—"I cannot help thinking that the evidence of reason is decidedly in favour of the muscularity of the membrane of the urethra. No anatomist will decidedly maintain that a canal, a tube, or a vessel, is not muscular, because he cannot see muscular fibres. The functions of the part afford him a better criterion."

Mr. Liston merely recognises elastic tissue, which he says no doubt accounts for the unyielding nature of many strictures, and for the firm retention of any instrument introduced through them (p. 468); whilst Mr. Miller ascribes spasmodic stricture to turgescence of the lining membrane analogous to the erection of erectile tissue. That such opinions as the above should have been promulgated prior to the actual proof of the existence of muscular fibres around the urethra, was not to be wondered at; but notwithstanding I demonstrated them before you as far back as last February (1851), their existence is still denied by some surgeons.

Mr. B. Cooper, a very, if not *the* most recent author of a work on surgery, published since that period, observes:—

“I believe that the doctrine of spasmodic stricture has been founded upon a supposition that the urethra is, throughout the whole of its length, partially composed of muscular fibres. Of this there does not, however, appear to be any proof. Mr. Howship considered that the existence of muscular fibres in the urethra is proved by the power which it possesses to expel spontaneously a very moderately sized bougie. This action he attributed to muscles; but it may result from the excitement in the erectile tissue of the urethra, the consequence being an increased flow of blood to the part, which causes a contraction in the calibre of the urethra. The expulsion of a bougie is the effect of this contraction. In the same manner, spasmodic stricture is produced when from some morbid cause a sudden distention of erectile tissue occurs; when the contractions, however, occur in the bulb or membranous portion of the urethra, muscular fibre may be secondarily affected, as both these parts are under the influence of muscle, although muscular fibre does not enter into the composition of the urethra itself.”

That these opinions are erroneous as to the non-existence of muscular fibres influencing the urethra throughout its whole extent, has been already proved. And I am inclined to believe that as regards the sudden distention of erectile tissue producing the effects alluded to, and being the common cause of spasmodic stricture, they are capable of considerable modification. The term spasm implies irregular, forced, and sudden contraction of muscular fibre, and consequently it is only in those situations where such structure is present, that this peculiar form of stricture or obstruction can exist. It was probably the consideration of this circumstance that led Sir B. Brodie to express himself so decidedly, that anything like spasmodic stric-

ture was never met with anterior to the bulb. If Mr. B. Cooper's theory is correct, the term "spasmodic" is a misnomer; "strictures of congestion," or "congestive strictures," would be more appropriate. The knowledge of the anatomy of the urethra which we hitherto possessed, was insufficient to account for the various phenomena met with in parts supposed to be merely elastic, erectile, or cellular; it was all very well, therefore, with that extent of knowledge, to talk of vital elasticity, or sudden flow of blood, but these terms, it must be admitted, appear extremely vague and unsatisfactory, when we attempt to account, not only for the suddenness and violence with which an instrument is sometimes clutched or grasped, in these affections, but also for the firmness with which it is held. The contraction of elasticity would not be sudden but gradual, under such circumstances as that of introducing a bougie into the urethra. If we take a tube of india-rubber, for example, and draw its sides asunder from without, and then suddenly let them go, the tube will as suddenly contract to its original calibre; but introduce any body within the tube capable of slightly stretching it, as a bougie would the urethra, the action upon that body would not be sudden and grasping, as in the case of the urethra upon the bougie or catheter, but it would be at the same time gradual, yielding, but adhesive; nor would the instrument be so firmly, and if I may use the term, solidly held as it is. If the contraction depended upon vital elasticity, that elasticity would develop itself in a certain degree of yielding, which we do not find to be the case. Again, if these spasmodic strictures depended, as Mr. Cooper insists, upon the sudden flow of blood, sudden distention of the erectile tissue, and consequent closure of the canal, would the seat of spasm be so restricted or

limited? Would it not pervade the whole extent of the canal in connexion with that erectile tissue? Would the flow of blood be limited to one portion of the erectile tissue without pervading the whole? And, moreover, would the tendency of this distention always be inwards towards the urethra, without at the same time proceeding outwards towards the skin? And, lastly, in spasmodic stricture, when such forced occlusion of the canal takes place, when the impediment, upon whatever it may depend, so entirely resists the forcible efforts at micturition, can sufficient blood be suddenly injected into the erectile tissue to produce such effects, without at the same time producing enlargement of the whole virile organ, with consequent erection of excessive degree? For it will be remembered that the urethra is not commonly closed or impermeable in the ordinary degree of erection. But we find this does not obtain; the existence of spasm does not exert any appreciable influence over the size of the organ; it is as frequently observed when the organ is below the natural average size, as when it is above, and my impression is that I have more frequently met with it among the former than among the latter; I have also met with it more frequently in winter than in summer. I have had it induced by a patient getting out of bed in a cold room in winter, and have been obliged to apply warmth to subdue it. I have known it caused by the introduction of a cold metal sound, whilst a warmed one would pass readily; and if the spasm in reality depended upon the rush of blood, is not the practice of placing the patient in a warm hip-bath, by causing an increased determination of blood to the part, likely to prove prejudicial rather than beneficial, as we commonly find to be the case?

Spasmodic stricture may now, however, be readily ex-

plained: the existence of this muscular layer continuous throughout the canal, offers the most simple, and at the same time, satisfactory solution of our difficulties, and we have no longer occasion to attribute to sympathies what we can now prove to be muscular contractility. True spasmodic strictures have been ascribed to the spasmodic contraction of the *acceleratores urinæ* and Guthrie's muscles, whilst the phenomena met with in those situations to which these muscles did not extend, were attributed to sympathy, to sympathetic contraction, or sympathetic irritation, a species of pseudo-contraction; and we frequently found the sympathies as difficult of management as the actual and exciting diseases. We now find, however, that these contractions are not spurious or false, but actual and *bonâ fide* muscular action of abnormal character, excited no doubt by morbid irritability of some portion of the canal. That these may exist, and probably do exist, coeval with spasmodic contraction of the *acceleratores* and Guthrie's muscles, I do not deny; but I believe, in opposition to what has been advanced by Sir B. Brodie, that a spasmodic contraction of these organic fibres may take place in the anterior part of the urethral canal, even within an inch from the orifice, and also that it may exist as a primary and independent affection, without a spasmodic stricture necessarily existing at the same time in the membranous portion. These spasmodic contractions frequently accompany organic strictures; and I have at the present time a gentleman under my care who has had organic stricture of some twelve years' standing: it is a cartilaginous stricture of, as nearly as I can judge by careful examination, about an inch in length, but the principal difficulty against which I have had to contend, has been a spasmodic contraction of ex-

treme irritability about three-quarters of an inch from the orifice; this resists the instrument for some little time, but by gentle pressure it gradually yields, and I have then but little difficulty in getting through the original stricture, which feels as though the instrument was passing through tough unyielding structure. At first the pain produced by any attempt to pass the spasmodic contraction was so excessive that the patient roared with agony, and there was no managing him; but by applying caustic once or twice, this has been allayed, and we now get on very well.

In another patient the instrument is arrested about half an inch from the orifice, but after pressure for a short time the spasm gives way, and the bougie then passes into the bladder without my being able to detect any further obstruction; and this patient complains, when the instrument is in, of a grasping sensation at the point of obstruction, but at no other part of the urethra. The instrument is certainly held, and I have observed in this patient, when the sensation was most severe, that the lips of the urethra have worked and wormed around the instrument, precisely similar to the vermiform undulations of the intestines, although of course in a minor degree. These cases, I submit, go far to throw doubt upon the dependent character of these contractions in the anterior portion of the urethral canal, and tend to prove them as independent contractions of the muscular fibres of the part, sympathetic with, and probably influenced by, irritation of the urethra elsewhere, but not necessarily coeval with, or depending on, spasmodic contraction of the inorganic muscles of the urethra, as is so insisted upon by some authors. Mr. Adams, for instance, in the article "Urethra," says the term spasmodic stricture can only,

with strict propriety, be applied to a temporary contraction of the muscles investing the membranous portion, as no action of the *acceleratores urinæ* is equal to the complete closure of the spongy part. The common seat of spasmodic stricture is therefore the membranous part; and he goes on to observe:—"Although genuine spasm is confined to the membranous, yet the remainder of the urethra is liable to temporary contraction from general irritation of the mucous surface. This condition probably depends on the irritability of those fibres, be they muscular or not, which enter so largely into the structure of the outer layer of the urethra."

I am certainly somewhat surprised at the doubt here implied, of the muscularity of the fibres surrounding the spongy portion of the urethra; but be that as it may, I differ from the doctrine which limits the seat of spasmodic stricture to the membranous portion of the urethra, and confines the cause of that spasm to morbid action of the inorganic muscles of that part; and I also differ from what is here attempted to be inculcated—that the temporary contractions of the other parts of the urethra depend upon the general irritability of the mucous surface, which would imply that the impediments here met with to the passage of instruments are of a general, congestive, clinging character, rather than of the sharp, grasping, clutching kind, confined to certain limits, which we so frequently meet with. I have no hesitation in saying that I have met with as distinct a spasmodic contraction within an inch of the orifice of the urethra as I ever did at the membranous portion: indeed, it was a case of this kind which first led me to examine the minute structure of the part microscopically. It may be urged, that in the cases to which I have just alluded, by the application of caustic

to the anterior stricture, the irritation of the whole urethra was allayed, accounting for the absence of difficulty in passing the instrument through the rest of the canal. But, allowing this to be the case, it is rather an argument in support of my views, that these spasmodic contractions may occur independently in any part of the canal, and need not necessarily be secondary to, or depending upon, a stricture, either organic or spasmodic, at the membranous portion; for analogy bears me out in the assertion, that in no instance do we find, that by attacking sympathies or effects, we can conquer or remove the exciting cause.

LECTURE II.

ON NORMAL MICTURITION.

A PREVAILING error connected with strictures of the urethra, is, that of whatever form or character they may be, they must inevitably depend upon some substantive and mechanical morbid impediment or obstruction to the flow of urine. We are told, for instance, that in permanent stricture, the urethra is thickened, fibrin is deposited without the canal, pushing it in, diminishing its calibre, until at length some accidental cause, producing increased flow of blood to the part, or spasm of the acceleratores or other inorganic muscles, gives rise to complete retention. Have we spasmodic stricture—we are told that it is for the most part inflammatory, accompanied with congestion or thickening, and consequent closure of the canal; or that from sudden excitement of the erectile tissue causing unusual distention, by an increased flow of blood to the part, spasm is induced, and the tube for the time being is closed. Indeed, Mr. Bransby Cooper, at page 544 of his work, appears to measure the extent of obstruction by the quantity of blood present, since he observes, “A partial determination of blood to the part produces, therefore, a certain amount of obstruction, and constitutes what I

consider spasmodic or irritable stricture." I would not for one moment deny the existence of actual obstruction or morbid change of structure in the permanent stricture; nor would I deny that many cases of spasmodic stricture are accompanied by congestion or inflammation; but what I would submit is, that there are frequent cases of impeded micturition, wherein patients are incapable of passing their water, except with the greatest difficulty, and then only by drops, not in a stream—and even where micturition is completely prevented—without any organic lesion or actual organic construction of the canal.

We cannot limit the vital functions of the body to laws, however scientific, comprehensive, or definite those laws may be, however desirous we may be—and it is a very laudable and natural desire, and one exerting a most beneficial influence over the welfare of suffering humanity—to trace cause and effect, and to sift them by the ordeal of certain and approved rules; still, in the study of parts endowed with vitality—with life—there is a point at which the most anxious thought and subtile reasoning are arrested, and we are obliged to admit that we are but mortals, incapable of fathoming or unveiling the wonderful designs of our Maker.

Were the bladder and urethra a mere cistern and pipe, made of metal or any other material or inanimate substance, the pipe bearing the same relation to the cistern as the urethra to the bladder, not a drop of water would be retained beyond a given quantity or elevation, unless a tap were added to the pipe, or it were plugged up by artificial means. Yet the bladder shall be full, and the urethra free, and not a drop of urine will escape.

A man in the full vigour of life and health, with every function unimpaired, receives an injury to his spine, pro-

ducing concussion or compression of the spinal marrow ; up to a certain point has complete retention of urine—not a drop escapes. We pass a catheter, and draw off several ounces—sometimes two or three pints. There is no stricture, no impediment to the escape of urine ; but still we know, that so surely will the fluid remain in the bladder, and there become decomposed, that we are obliged to draw it off by artificial means, to prevent destruction or disorganization of the bladder itself.

It may be urged that the bladder, in this case, is paralyzed, and deprived of that assistance it would, in the healthy state, derive from the abdominal muscles. But we shall find the influence exerted over the bladder by these muscles is much more limited than is commonly supposed ; and I shall be able to prove to you, that, under some circumstances, these muscles, so far from favouring micturition, actually prevent the flow of urine—a point to be considered in the management of retention of urine. The bladder must be unusually distended before it is sufficiently raised above the pubis for the parietal abdominal muscles to exert any direct pressure upon it ; whilst the influence exerted by these muscles in front—the diaphragm above, and the levatores ani below—through the medium of the intestines, is much less than is usually ascribed to these parts. Were the bladder placed in the pelvis, unprotected by any arrangement for its safety, the pressure made by the intestines upon it would doubtless, in a great degree, affect the passage of the urine ; but this pressure is very much modified by the reflexions of the peritonæum and pelvic fascia, forming what are called the ligaments of the bladder, which spread out laterally, and shelter it, as it were, from this pressure, diminishing its power. The intestines are neither solid nor stationary ;

they are elastic, buoyant, and gliding, and are, therefore, bad conductors of force or pressure; and fortunate it is that this arrangement obtains; were it otherwise—were the bladder subservient to the influence of these parts—it would no longer be capable of acting as a reservoir, but the urine would constantly dribble away; for when we consider the relative strength of the different parts, we can scarcely imagine the bladder and urethra capable of offering any effectual resistance, even when assisted by the perinæal muscles, particularly under circumstances requiring the employment of great muscular exertion.

But the truth of what I am now asserting—that the abdominal muscles have little or anything to do with healthy micturition, beyond probably raising the bladder by the levatores ani, to enable it to get rid of the last drops—is proved by what so often obtains in disease. A man has retention of urine succeeded by incontinence: we introduce a catheter; we do not find the bladder empty, although the incontinence has persisted for a considerable time, amply sufficient to have emptied the bladder over and over again. On the contrary, we find it more than ordinarily distended, and draw off more than the usual quantity of urine. Now, in these cases, although the muscular fibres of the bladder may for the time have lost their power of acting, the abdominal muscles have not; and we cannot say that these latter muscles are opposed by the stricture or urethral impediment, whatever this may be. For if this were the case, how would the urine dribble away at all? If the abdominal muscles did possess the great degree of influence over micturition which is commonly ascribed to them, how is it that this large quantity of urine remains in the bladder? But the fact is, their influence is only to a certain extent, and that

a very limited one. It is only when the bladder is over-distended that they act upon this viscus, and then they cannot do so effectually; they cannot empty it, and hence the reason why in these cases any sudden impulse, such as coughing, sneezing, or any other sudden and violent effort, produces a flow of urine.

Again, we are sent for to cases of retention of urine: we find the patients straining and exerting their abdominal muscles to the utmost to empty their swollen bladders, but in vain. The catheter is introduced with ease, without meeting with any mechanical or organic impediment, or any other appreciable obstacle capable of resisting the force exerted by the patients, in their violent efforts at overcoming the retention, if in reality these muscles did act decidedly upon the bladder.

I was consulted by a gentleman for inability to urinate. He told me that he was in the greatest misery, for his desires were so sudden and urgent, that he was obliged instantly to leave whatever he was at the time engaged upon, and rush to the urinal; but when arrived there he would have to stand for nearly an hour straining so violently, that, as he said, the perspiration streamed from him before he could get the water to flow, and then it would merely come by drops, or in a very small stream; yet this gentleman had no urethral obstruction; at all events I never passed an instrument for him, and he soon got well.

But although I do not attribute much assistance to the abdominal muscles in micturition, I am much more inclined to believe that in many instances they add to the difficulty in producing the straining and undue efforts of the patient. Indeed, I am in the habit of warning my patients suffering from stricture or enlargement of the

prostrate gland against exercising the voluntary muscles at all, if they can possibly avoid doing so, as I have so frequently found that when, by violent straining, patients could not pass a drop, by remaining quiet they could micturate with comparative comfort. I am inclined to attribute the benefit accruing from opium and the muriate tincture of iron, as much to allaying these efforts, as to any specific influence they may exert upon the stricture or urethra; for having narrowly watched many cases of retention of urine where the efforts of expulsion have been most violent and uncontrollable, I have never seen the urine flow or dribble until these efforts had subsided, and the patient had become tranquillized.

Whilst engaged upon this lecture I met with a case in point. A gentleman, a captain in the navy, with enlargement of the prostrate gland, said to me one morning:—“Doctor, how is it when I first get out of bed I have great pain, and although I try as much as I can, my urine flows with difficulty and by a very small stream; but in about ten minutes I try again, and although I make no effort, the stream of urine is much larger, and is unattended with pain?” I said, “Sir, the reason is obvious; your straining only impedes your water instead of assisting it. Avoid straining in future, and you will be much more comfortable.” He followed my advice, and derived great benefit from it.

I will now endeavour to explain how in retention of urine, where the bladder is distended, the abdominal muscles by their action tend to maintain that retention, and oppose the flow of urine. It is a circumstance arising from the anatomy of the part, and one which has not met with that attention from authors which I believe its importance deserves. The urethra is attached to the body

and ramus of the pubis by strong and dense fascia, and by the suspensory ligaments of the penis, so that it is an error to imagine that it only becomes fixed where it passes through Camper's ligament. A careful examination shows that an equal length is attached to that which is pendulous; if a man has four inches and a half of pendulous urethra, he will have four inches and a half of attached, a point of considerable importance in the manipulation of instruments. The result of this arrangement is, that where the bladder is distended so as to be raised out of the pelvis beyond its usual limits, it forms with that portion of the urethra behind the suspensory ligament of the penis, a species of inverted cone, the apex of which is formed by the membranous portion of the urethra, as it lies beneath the sub-pubic ligament. Hence, when the patient strains or makes undue efforts at micturition, the posterior and middle fibres of the levatores ani muscles tend to raise the bladder, and tilt it still more forwards; whilst the anterior fibres, drawing up the prostrate gland, must compress the membranous portion of the urethra against the unyielding sub-pubic fascia and ligament, and thus obliterate the canal for the time being. Under these circumstances, if we attempt to introduce a catheter, we should always do so with the patient lying on his back, and not in the upright position. And this, moreover, explains how it so frequently occurs, in case of stricture, that the greater the efforts, the greater will be the pain and difficulty of micturition, and the smaller the stream.

Ordinary micturition may be considered to be performed by the bladder and urethra combined, not by the bladder alone, or by the urethra alone, but by the two together, assisted to a certain extent by the abdominal muscles. From ignorance of the existence of muscular

fibre around the urethra, opposing actions have been ascribed to the bladder and urethra, that of the former being expulsive, that of the latter retentive, or merely passive. The bladder has always been considered a species of reservoir, capable in health of retaining urine, and by its contraction of expelling it when required to do so; whilst the urethra has been looked upon as a kind of passive tube, capable of expansion merely, but exerting no direct influence upon the expulsion of the urine. These organic muscular fibres, however, point out to us that the urethra is not a tube of this passive character—that it does exert considerable influence over the function of micturition; whilst the connexion of these fibres with those of the bladder would suggest combined, instead of opposed action of the parts, and tend to controvert existing theories upon the subject.

Mr. Hunter says the urethra is naturally passive whilst the bladder is acting, and further on he adds:—

“It is to be understood, that in a sound state of parts, these two parts—the bladder and the urethra—the contraction of one produces a relaxation of the other, and *vice versâ*; so that their natural actions are alternate; and they may be considered as antagonist muscles to one another. Thus, when the stimulus of expulsion of the urine takes place in the bladder, which immediately produces contractions in it, the urethra relaxes, by which means the urine is expelled from the bladder, and allowed to pass through the urethra; and when the action ceases in the bladder, the urethra contracts again, like a sphincter muscle, for the purpose of retaining the urine which flows into the bladder from the kidneys, till it gives the stimulus for expulsion again.”

These were Mr. Hunter's views, and they have more or

less prevailed since his time; but when we consider the nature of the muscular fibres which surround the urethra, when we recollect that they are not only similar to, but continuous with, the muscular fibres of the bladder itself, when we trace the analogy which the bladder and urethra bear to some other parts of the body, not merely in structure, but also in function, we can scarcely admit the soundness of these views, even though emanating from so high an authority.

With the exception of its proper glands, the structure of the stomach differs but little, if at all, from that of the bladder; with the same exception, the urethra differs but little in structure from that of the small intestines: these latter have their folds; so has the urethra, arranged longitudinally, it is true, but constituting the folds of Sir E. Home, or what have been more recently denominated rugæ by Quekett. The small intestines have their papillæ; so has the urethra. The intestines have their epithelial scales; so has the urethra: and, lastly, the intestines have their muscular coats; so we now find has the urethra. Nor does the analogy end here: the stomach has its pylorus, joining it to the duodenum; so has the bladder its neck, surrounded by a mass of elastic and non-elastic tissue, and joining it to the urethra.

With such similarity of structure, we cannot be surprised at having similarity of action or function, and so long as the parts possess their integrity, their functions proceed with regularity; but interfere with this integrity, —produce atony, irritation, or inflammation, and this regularity no longer obtains. Irritate the mucous membrane of the intestine, and diarrhœa comes on; irritate the mucous membrane of the urethra, and the patient is constantly called upon to void his urine; but deprive the

muscular coat of its usual stimulus on the one hand, or over-excite or inflame it on the other, and in the one instance we have constipation—in the other retention of urine. And here is a point which we cannot explain. In inflammation of the intestines we have no closing of the canal; a patient may take as much fluid as he pleases, but not a drop will he void per anum, however he may try or feel inclined to do so. The stomach and a portion of the intestines, continuous though they may be, and the canal through which is uninterrupted by any mechanical barrier or impediment, may remain empty or over-distended by flatus.

Desault and Richter have remarked that inflamed muscles are not prone to contract; for, on examining the bodies of those subjects who die of enteritis, we find the intestines preternaturally distended, not contracted. It may, I am aware, be objected that the contraction, if any did exist, would cease when death took place; that, therefore, it would not be discovered by post-mortem examination. But the distention of the intestines is frequently so great and so forcible, that it is capable of overcoming or counteracting the action of the abdominal muscles. We can, therefore, scarcely imagine that the muscular fibres of the intestines would be capable of resisting a force of such a powerful character.

A man, a patient of the late Mr. White's, in the Westminster Hospital, whilst I was house-surgeon to that institution, had scirrhus of the rectum, extending some three or four inches into the gut. It was not ulcerated, but indurated, and so contracted the gut that Mr. White deemed it requisite to introduce a bougie, which he did with the greatest gentleness, passing the instrument just beyond the constricted parts. The patient complained of

no pain at the time, nor indeed of much afterwards ; but towards evening his abdomen began to swell, and it continued to do so until his death, which took place three days after the introduction of the bougie, during which time nothing passed per anum, his complaint being not of pain, but of the excessive distention. After death, beyond the local mischief, no morbid anatomical traces of inflammation could be discovered. The intestine was not injured or perforated ; but the whole canal was blown up by gas, whilst the fluid he had taken before death remained in the stomach and part of the small intestines.

The intestines are not antagonists to the stomach ; neither are the arteries antagonists to the heart ; nor are they mere passive tubes ; on the contrary, by their muscular contractility, they assist the passage of their contents along them, and in this way aid their propelling organs, to which they assimilate, by being, like them, propulsive, although in a minor degree. It is somewhat surprising that so acute an observer as Mr. Hunter should have overlooked the fact, that so far from the condition of the urethra and bladder being that of opposition to each other, during repose and action, it is, in point of fact, identical. When the urethra is said to become contracted, it is when the bladder, having expelled its contents, has become contracted also. And it is only when the bladder again becomes distended, that it calls upon the urethra to become distended also, and to assist in the function of micturition. And the degree of distention of the urethra appears to be greatly regulated by the degree of distention of the bladder ; as, when from abnormal condition of the urine, the bladder and urethra are called upon to act more frequently, the quantity passed each time being small, the size of the stream will be less than natural ; the same

cause which irritates the bladder at the same time influencing the muscular fibres of the urethra: and therefore I am inclined to believe that in many cases of difficulty of micturition the cause is not to be looked for in the urethra alone, but should equally be sought in the bladder itself. When we amputate the penis, removing the pendulous portion, the patient can still retain his urine, but he has no longer the power of ejecting it away from his person, down which it dribbles and drains each time he voids it, a fact strongly disproving Hunter's theory of the passive condition of the urethra during the performance of that function; whilst the idea that the urethra acts in opposition to the bladder, serving as its sphincter, is also much weakened, if not altogether negatived, by the perinæal operation for stricture; for here the opening in the urethra is made sometimes as far back as the front of the prostate gland, but incontinence of urine is a very rare result.

Whilst, on the one hand, I deny that the urethra is merely a passive organ, or if active that it opposes the bladder, alternately acting with that organ and serving as its sphincter—whilst, on the contrary, I urge that the actions of the two are sympathetic and combined, I must endeavour to explain how, according to this view, the urine is retained in the bladder—what prevents it from continually dribbling away—and how it is expelled.

To enable me to do this the more satisfactorily, I would in the first place endeavour to point out the analogy which the functions of the bladder and urethra bear to those of the other hollow viscera of the body; and in so doing, to direct your attention to the no less interesting fact, that organic muscular fibre is especially devoted and restricted to hollow viscera and their tubes, ducts, or canals: to those parts, in fact, whose office it is to contain, retain,

modify, or expel their contents, whether fluid or solid. The heart and arteries, trachea and bronchi, stomach and intestines, kidneys and ureters, bladder and urethra, uterus and its appendages, and the various ducts for the conveyance of fluids and the secretions, are those parts to which the organic muscular fibres are confined. In no other parts of the body do these fibres obtain, for the fibres lately discovered by Rainy, in the eye, do not militate against this position. With this coincidence in structure between these several parts, all destined to perform analogous functions, we may observe a similarity of action and direction of that action throughout.

In all hollow viscera the longitudinal muscular fibres are disposed in greatest quantity at that point most remote from the orifice of exit or ejection; whilst the circular, transverse, or oblique, are more concentrated and arranged around or nearer to this latter opening. And although there may be peculiar adaptation, according to the peculiar requirement of each organ, we find, as a system, that this arrangement invariably obtains.

In the stomach, where actions peculiar to itself are carried on, where the food is not merely retained, but is reduced to pulp and mixed with gastric juice, some peculiar apparatus is required to counteract the gastric muscles, and prevent the food from entering the duodenum before chymification is complete. Hence we find a distinct valve at the pylorus, but the longitudinal fibres are principally at the larger extremity, whilst the circular, transverse, or oblique, arrange themselves nearer to the pylorus.

The heart, on the other hand, has nothing to do with retention. Its sole and constant duty is to receive and propel the blood: it therefore is made up of longitudinal fibres, strong bands of which, in the ventricles arranged

spirally, extend from the apex to the base of these cavities; and as both are required to act synchronously, we find a very beautiful though simple contrivance, in the spiral fibres enclosing both of the cavities in their embraces, more particularly towards their bases. Another very beautiful arrangement also strikes us when we compare the functions of the heart with those of the stomach, bladder, uterus, &c. The ventricles of the heart have to expel their contents at once, and by one contraction, not by a prolonged series of vermiform or rhythmical contractions, as is the case with the latter organs. In the former, therefore, the muscular fibres are not generally spread out in short lengths, and having independent action. But although short fibres are to be met with, they are but accessories to the majority, which are long, and arranged in strong bands, the fibres extending in one continuous and uninterrupted length, in a spiral direction, from the apex to the base, and around the two cavities. And that there should be no interruption to their action, no impediment to the escape of the blood, there is also a general absence of cellular tissue, whether elastic or non-elastic.

In the auricles likewise the fibres are longitudinal as regards the direction of their action, commencing from a given point, the annulus of the venæ cavæ and pulmonary arteries; and the same arrangement to secure harmony of action obtains as in the ventricles.

These are the two principle organs destined to receive and expel their contents to circulate within the body. Let us now turn to those organs whose duty it is to receive, retain, and finally to eject their contents from the body altogether. Of these the principal is the uterus, which receives the ovum, allows it to germinate, accommodating itself to its increased development, but retaining and shel-

tering it, until that development is completed, when it sends it forth into the world. I will not here pause to inquire why the muscular fibres of the uterus admit of distention for nine months before they contract, whilst those of the heart will not submit to a distention for a period even less than a second of time; that is a fact beyond the power of man to explain. All that I would attempt to do, is to examine the arrangement of these muscular fibres, and enquire what similarity they bear to those of other organs endowed with analogous functions, although in a somewhat different degree.

Dr. Murphy has beautifully demonstrated this muscular arrangement in his valuable Lectures on Parturition. He has shown that the fibres on the external surface form two broad fan-shaped muscular layers, spreading from the round ligaments over the fundus uteri. Here, then, are the longitudinal fibres. On the external surface there are three sets of fibres, two around the orifices of the Fallopian tubes, the third around the body of the uterus; whilst Sir C. Bell adds a fourth, which passes in a vertiginous direction from the fundus to the mouth of the womb.

Again, in the colon and rectum, the fibres are almost entirely longitudinal, until we approach the orifice of expulsion, when we find circular and transverse fibres, which have been described as an internal sphincter muscle.

And so likewise in the bladder: the longitudinal fibres are more developed and stronger towards the fundus, whilst towards the middle and neck we find circular and transverse in greater abundance. But I am not inclined to consider either these, or the analogous fibres round the lower part of the rectum, in the light of sphincter muscles.

The functions of the uterus are entirely beyond the control of the will, but not so those of the bladder and rectum. We have the power of controlling the latter by arresting their expulsive faculties for a shorter or longer period; in some instances, in fact, until we overcome the organic efforts, and suspend their functions altogether for the time being; for Nature, jealous of our comforts as well as of our actual necessities, has endowed these parts with special sphincter muscles of the voluntary class, to enable us to retain our urine or fæces until it is convenient to us to eject them.

Having thus endeavoured to trace this analogy of the muscular arrangement in the several organs endowed with a similarity of function, let us in the next place extend our inquiries, and endeavour to ascertain what analogy exists in the mode in which these several organs perform their particular functions.

In all, the process of expansion or reception may be considered as passive, as far as the organs themselves are concerned. The power of retaining is regulated very much by the especial duties of the particular part. We have seen that the stomach has to act and to retain at the same time; we have, therefore, an especial and indisputable sphincter muscle. The heart has not to retain at all; here consequently we find every arrangement in the fibrous margin of its orifice of exit, as well as in the course of its muscle, to ensure speedy and uninterrupted passage. In the uterus and rectum, the contents of which may for the most part be looked upon as solid, the liquor amnii being contained within its proper membrane, we must have a certain degree of distention before the muscular fibres receive their wonted stimulus; whilst in the rectum, retention is to a certain degree regulated by the

external sphincter muscle. In the bladder, where the normal contents are entirely fluid, where the position of the organ, upon superficial examination, may be deemed as altogether favouring the escape of its contents. some surgeons, Sir C. Bell, Meckel, Boyle, &c., have endeavoured to explain the normal retention of urine by endowing the neck of the bladder with a special sphincter muscle; others, as Guthrie, Tyrrel, &c., by the existence of a particular tissue, endowed with vital elasticity, but non-muscular; whilst others again ascribe this office to the verumontanum and uvula of the bladder. Mr. Harrison, for instance, ascribes this office to these parts, and allots bands of muscular fibres especially to depress the uvula, and thus to open the vesicle orifice of the urethra; whilst Mr. Liston says that the neck of the bladder in its normal condition is closed by a quantity of cellular tissue, arranged under the mucous lining, and also by the collapse of the sides of the prostate; and that, on the other hand, the passage is opened by the action of the fibres of the levatores ani muscles inserted into the gland, the "compressor prostaticus," as it is termed.

It is extremely doubtful whether either of these explanations is the correct one. Anatomy does not demonstrate any distinct sphincter muscle; and although the sub-mucous cellular tissue at this region may be very abundant, the microscope does not disclose any distinguishing features between it and the elastic tissue met with at other parts of the body.

The verumontanum can scarcely exert any influence; its situation in the widest part of the prostatic urethra, with the expansion of the urethra on either side, and the mode in which it tapers towards the orifice of the bladder, indicate provision against impediment rather than the

function of closing the vesical aperture. The uvula of the bladder, when enlarged by disease, doubtless impedes micturition, but in that state we have not to deal with it at present. In its healthy condition it is not of sufficient magnitude to exert much influence, except secondarily through the action of the muscular fibres surrounding the parts, and then in no greater degree than would be exerted by the cellular tissue and mucous membrane of the part.

I believe that the normal or healthy retention of urine in the bladder is partly involuntary, partly voluntary. That it is maintained or carried out, under ordinary circumstances, by the peculiar arrangement and organic muscles of the part, uninfluenced by any mental control; or where the retention is more urgent and forced, although healthy, then by the assistance of the voluntary or inorganic muscles of the urethra: precisely in the same way that we find the function of respiration, when normal, is carried on without any effort, and imperceptibly to ourselves, by certain arrangements destined for that purpose; whilst in forced respiration we are obliged to call in the aid of other muscles more immediately under the control of our will, to carry out the function of the part. The normal retention of urine may be explained in the following manner:—The bladder, like the uterus and the rectum, requires a certain volume of contents before its efforts at expulsion will be stimulated. Mr. B. Phillips says that the quantity of fluid which that organ ordinarily contains, without inconvenience, is from a pint to a pint and a half, but the correctness of this assertion may reasonably be questioned. Mr. Guthrie has pointed out that the bladder in the healthy state of the viscus, when moderately distended, sinks downwards and backwards on to the rectum,

so that the neck or orifice of the bladder being fixed, and incapable of shifting, is higher than the fluid, which cannot consequently escape, were there no other provision to prevent its doing so. And in the next place, where the quantity of urine is greater, I believe that its retention is due to the bladder itself, rather than to an especial sphincter muscle or to any particular vital elasticity. To make myself more clearly understood, I would also remind you that the bladder, like the stomach, has its intervals of action and repose, that after expelling its contents, its muscular fibres are drawn together. I would also remind you of the shape of the bladder, its attachment to the prostate gland, and the arrangement and direction of its muscular fibres; some being longitudinal, others oblique, others circular, whilst others, again, are more or less transverse. The shape of the bladder also is peculiar, unlike any other viscus in the body, excepting, perhaps, the gall-bladder. It is triangular, round, ovoid, or pear-shaped, according to the degree of its distention, its sides being drawn together at its neck, like a bottle made of india-rubber. With the exception of its serous, its coats invest it pretty equally on all sides. Its mucous coat lines it, and its muscular surrounds it. But we have seen that the muscular fibres become more aggregated towards the prostate gland, those of the outer layer surrounding the gland, whilst those of the inner become still more drawn together, and pass forwards through the gland surrounding the urethra, to invest that canal in the remainder of its course. Now, I believe it is the contraction of this circle of fibres,—which is not, recollect, a distinct sphincter, but part and a continuation of the inner coat of the bladder,—acting upon the pad of the elastic and non-elastic cellular tissue which surrounds the neck of the

bladder, combined with the consent of the other muscular fibres of the bladder to remain quiescent, which retains the urine under ordinary and healthy circumstances. But if, when the desire to micturate is induced, it be not convenient to indulge it, we are then obliged to call the voluntary muscles of the perinæum to our assistance, and thus resist and arrest the natural functions. This leads us in the next place to inquire how micturition is effected, and how the urine is expelled from the bladder? We must here bear in mind the *modus operandi* of organic or involuntary muscles; with voluntary muscles the action of their fibres is combined and synchronous; in involuntary, though harmony exists as to the result to be obtained, the action to produce that result is not so harmonious, but independent and consecutive, so that the whole organic fibres of a vital organ are not thrown into action at one and the same time, but separately and consecutively, in rhythms or undulations, one portion succeeding another, so as to propel their contents to a given point. This is the case in most, if not all, of the hollow viscera. Were it otherwise in the bladder, it is evident that the same degree of contraction which goes on at the fundus would take place at the neck of the organ, and at the same time, and thus the passage of the urine would be entirely prevented.

They differ also from voluntary muscular fibres, in being most contracted at the time when the organ they supply is most in a state of repose. When the stomach is empty and at rest, it is diminished in size by the contraction of its muscular coat, and still more marked is this condition in the uterus: and so it is with the bladder. When these fibres are not resisted by substance, they persist in contracting to their utmost, and thus diminish the cavity of the viscus to its smallest limits. Indeed, the involun-

tary muscular fibres may also be said to differ from the voluntary, in being endowed with an additional period of contraction, in having, in point of fact, two periods of contraction, with one of relaxation; the one period of contraction being passive, the other active; the former succeeding the latter, persisting whilst the viscus is empty, and preceding the period of relaxation; the latter succeeding the period of relaxation, and persisting as long as anything remains to be expelled from the organ. But we shall now see how they act upon the contents of their organs, and how they are now enabled to expel that which their previous state of passive contraction had enabled them to retain. Those authors who endow the neck of the bladder with an especial sphincter, opposed in action to what they denominate the detrusor urinæ muscle, attribute to this detrusor the power to dilate the sphincter, at the same time that it presses the urine forwards. Mr. Harrison, in describing the longitudinal fibres of the bladder, observes:—"This tunic must have the effect of compressing the bladder towards the ossa pubis, and of course urging the contents of the cavity in that direction; while at the same time some of its fibres will expand the orifice of the urethra by drawing out the sphincter above and on either side, and below by depressing the verumontanum and uvula." Very little consideration will prove the incorrectness of this theory; for were it the true one, how could normal or healthy retention of urine exist at all? If by their contraction these longitudinal fibres acted directly upon the neck of the bladder, immediately drawing upon it and expanding its orifice, the same would obtain when the bladder was empty as when it was full, though in the former instance the expansion would be greater, the longitudinal fibres being then in a state of

forced contraction. But, as I shall endeavour to prove, the contractions of these fibres in the empty organ, or when the organ is full, in what I have noticed as the passive or the active states of contraction, are entirely distinct, and bear no analogy one to the other; and it will be better to banish the idea of a sphincter muscle altogether. That circular fibres do exist, has been too clearly demonstrated to admit of doubt; but to consider them as mere sphincters—to limit their duties to the mere office of closing the neck of the bladder—is to detract from their importance to a very unjust extent. We have seen that these circular fibres are limited, for the most part, to the neighbourhood of the orifice of exit, which is at the most contracted part of the organ; and although elastic, the circumference of this orifice is the most dense and firm; this holds good in all instances except the heart, where the cavities not being retaining, have the orifices of exit at their bases or largest extremities. Dr. Murphy has very clearly shown the mode in which the fibres of the uterus act to expel the contents. He has shown how the uterus is raised and fixed by the longitudinal fibres; how its contents are propelled and directed towards the os uteri by the muscular fibres of the fundus and those around the Fallopian orifices; how the forces of these latter converge to and cross at a given spot towards the upper and middle point of the uterus; how these forces are antagonized and resisted by the circular muscular fibres of the organ; and how the contents of the viscus thus placed within and subjected to the sphere of action of these circular muscular fibres, are assisted by them towards the orifice of the womb, and finally expelled therefrom. We have seen what takes place when the muscular fibres of these hollow viscera contract, when these latter are empty, the same contraction which obliterates or diminishes their cavities,

at the same time closing their orifices of expulsion. We have now to account for the manner in which these orifices are opened to admit of the expulsion of the contents. This we find is effected, not by any especial muscle or muscular arrangement, but simply by the pressure and expansive force exerted by the contents themselves in every direction from within outwards upon the neck or orifice of the organ; for as Dr. Murphy has justly observed, the forces exerted by the fundus and sides of the uterus upon the contents, rendered elastic by the presence of the liquor amnii, are in the same degree reflected from the uterus upon the os uteri, and in this way tend to dilate its mouth. What takes place in the uterus, I believe to be the true explanation of what occurs in the bladder to expel the urine. The fluid is compressed and directed towards the neck by the longitudinal fibres; but the contents being entirely elastic, the sides of the viscus would bulge, and the power of these fibres be proportionably weakened, were it not for the assistance derived from the circular fibres, which likewise, by preventing lateral bulging at or within the neck of the bladder, not only prevent any impediment to the flow of urine, but have a decided and marked effect in directing it on its proper course towards the orifice of the urethra—a tendency which is constant, even after operations for lithotomy. So far, therefore, from considering these circular fibres as sphincters, we observe that they exert considerable influence in aid of the expulsion of the urine, by strengthening and supporting the longitudinal fibres of the bladder, thus preventing the bulging of the sides of this organ, and preserving its shape of an inverted cone.

The difficulty attending this part of our subject has arisen partly from ignorance of the continuation of the

muscular fibres of the bladder along the urethra, but principally from the practice of regarding the bladder as a single hollow muscle, endowed merely with the functions appertaining to an ordinary muscle—viz. a single synchronous contraction, succeeded by relaxation, more or less influenced by the will or volition. The oldest anatomists, with Sir C. Bell, naming the muscular fibres of the bladder the “*detrusor urinæ* muscle,” opposed it in action to the muscles of the perinæum, and this opinion has more or less obtained ever since. Entertaining such opinions, it is not surprising that surgeons were obliged to seek for sphincter muscles or vital contractility or elasticity to support their views. Sir C. Bell did not distinguish sufficiently between voluntary and involuntary muscle, in his views of the bladder and urethra. He does not appear to have had the most remote idea that involuntary muscle could exist in these parts: he introduced a small ivory ball into a man’s urethra, and desired him to use his utmost endeavours to force it out; and because he could not do so, he at once came to the conclusion that the urethra could not be muscular, and he ridiculed the idea accordingly.

No voluntary action can with truth be ascribed to the bladder; its muscular fibres are of the organic or involuntary class, and so are its actions. Whatever control we may be capable of exerting over micturition is due to the influence we possess over the voluntary abdominal muscles, and those surrounding the membranous portion of the urethra. I would again repeat, what I have just been endeavouring to explain, that the contractions of the bladder should not be regarded as simple contraction, followed by relaxation of the entire viscus, as of a single muscle, but rather as a series of contractions and relaxations of its independent muscular fibres, sympathetically

combining with or succeeding to each other, and so propelling the urine forwards, at the same time exerting a force upon that fluid, which force is, in its turn, reflected from the fluid upon the fibres beyond, thus producing relaxation and expansion of the neck of the bladder. As the food is propelled from the stomach into the duodenum, and so along the intestines, so is the urine propelled from the bladder along the urethra, and so likewise is the fœtus expelled from the womb.

I have dwelt thus at length upon this part of my subject, as I have felt that, without such consideration and explanation of the structure and functions of the bladder and urethra, we could scarcely approach the more difficult questions of the lesions of function of these organs with any hope of giving a satisfactory explanation, or of arriving at any definite conclusion upon the subject.

We have seen how the normal retention and expulsion of urine are effected; we have also observed, that in the healthy state a certain quantity of urine must have collected in the bladder before that viscus receives its wonted stimulus; but under irritation either of the urethra or of the mucous membrane of the bladder, the irritability of the latter becomes greatly exalted, and it will no longer retain any urine, but will eject it as soon as it flows from the ureters—and this not with the usual effort at expulsion, but with sharp, irregular, and spasmodic contractions. Prolong this excitement, convert this irritation into actual inflammation of the muscular fibres, or, on the other hand, produce atony, or over-fatigue, or divert or interfere with the nervous influence over the part, and then, so far from having increased or exalted action, we get no action at all; the functions of the part are arrested for the time being, and complete retention is the result.

LECTURE III.

ON STRICTURES OF THE URETHRA.

HAVING, in the preceding lectures, endeavoured to explain the structure of the urethra and the physiology of micturition, founded upon the improved knowledge we now possess of such structure—having endeavoured to explain the healthy functions of the bladder and urethra—I propose, upon the present occasion, to call attention, in the first instance, to cases of departure from these healthy functions simulating stricture; and, subsequently, to offer a few observations upon certain points connected with the pathology of the actual and permanent form of that disease.

When we consider the sympathy which exists between the brain and other organs of the body—when we remember how the due performance of the functions of each depends upon the integrity of the other,—we can readily understand the influence exerted by the brain and nervous system generally, over the organs of micturition; and it may, perhaps, serve to elucidate certain points which would otherwise be difficult of explanation, to bear in mind that though the bladder and urethra are supplied with nerves from the cerebro-spinal system, they, like all

other parts composed of organic muscles, and consequently endowed with involuntary action, are largely supplied with nerves from the organic or sympathetic division; which, to a certain extent, render the parts independent of the cerebro-spinal nerves, whilst they, at the same time, serve to maintain their sympathies with the other organs of the body, and show how departure from health, in any other organ however remote, may induce sympathetic irritation in these parts, and produce affections simulating stricture.

In describing healthy micturition, I endeavoured to show the analogy existing in the muscular arrangement of parts possessing organic muscle; and we find the same analogy obtains as to the nerves supplying these parts, especially in those instances endowed with a compound function, partly voluntary, partly involuntary. And wherever there is the necessity of maintaining or inducing harmony between these voluntary and involuntary actions, we have a combination of nervous supply from the cerebro-spinal and sympathetic systems of nerves: witness the pharynx, with its glosso-pharyngeal nerve and pharyngeal plexus; the larynx, with its recurrent, internal laryngeal, and laryngeal plexus; the rectum, with its branches from the sciatic nerve and hypogastric plexus; and lastly, the bladder and urethra, with their nervous supply from the same source.

Whatever interferes with the nervous system, at the same time influences the functions of the urinary organs, either by exalting, diminishing, suspending, or altogether destroying their normal irritability, and so rendering their actions uncertain, irregular, or arresting them altogether. These causes demonstrate their effects in various ways; sometimes in constant and urgent desire to micturate,

accompanied with increased flow of urine, unattended with pain—as in fear, anxiety, or mental excitement; at other times in constant and uncontrollable micturition, so uncontrollable as almost to be unvoluntary, attended with great pain; the bladder ejecting the water in gushes as soon as it receives it from the ureters; at other times, again, in irregular contractions of the muscular fibres surrounding the urethra, unaccompanied either by inflammation or disorganization, constituting true spasmodic stricture, capable of producing retention of urine, varying in duration and degree.

All who have had much experience in cases of stricture, recognise the influence of the mind upon the disease, and of the disease upon the mind. The instrument will pass easily to-day, but before the next visit the patient may have had cause for anxiety, and we then find all attempts to introduce the same, or a much smaller one, in vain; and I believe such attempts prejudicial, and better abstained from.

The following case will illustrate the effect of mental anxiety upon this disease:—

Some years since, a gentleman, a captain upon half-pay, came to me with obstinate stricture, having for the preceding fourteen months been under the care of a surgeon recently dead. He was extremely desponding, his urethra very irritable, and his urine came away merely in the smallest stream, whilst he was tormented with constant desire to micturate. He told me that he had seen his surgeon daily for the whole fourteen months; and so impressed was he with the necessity for doing so, that although I urged him to the contrary, he insisted upon coming daily to me also. After the next visit, having talked his case over with him, and having persuaded him

to allow me to omit passing the instrument,—which I found had been done daily for the preceding fourteen months, down to the stricture, but no further,—he offered me the fee, which I declined, telling him frankly, that as he would be much better if he came to me every second day instead of every day, I did not feel justified in taking money for that which I considered was prejudicial to him, but that if, after what I had said, he was determined to come, of course he was at liberty to do so. The next day he came again, and the instrument passed readily into the bladder. “Oh!” he said, “Doctor, you have made quite a different man of me already. For the last fourteen months I paid a guinea daily, and to enable me to do so, I was obliged to sell out a portion of the little I had in the bank; and I assure you I have been most unhappy from anxiety lest my money should not hold out until I was cured, as I did not make any progress.” He returned home cured in the course of five weeks.

I have also met with cases wherein anxiety of mind has produced well-marked symptoms of spasmodic stricture, in urethras free from organic impediments or previous disease. Retention of urine in some instances depends upon the non-action of the vesical muscular fibres alone, this non-action or passive condition, whether temporary or permanent, resulting from the arrest, for the time being, of the nervous influence controlling them. In this class I would include all those cases of retention of urine depending upon shocks or injuries to the nervous system, without any local irritation to the bladder or urethra. A man's thigh was amputated: he had complete retention of urine, requiring his water to be drawn off for several days. Another patient was run over, and his knee severely crushed: he suffered from complete retention until he

died, three days after. I lately attended a gentleman with gangrena senilis. He ultimately died: and for some days preceding his death, he had complete retention of urine. The same obtains in certain cases of fevers; whilst those instances resulting from direct injury to the brain and spinal marrow are too well known to require further comment here.

Retention of urine may also depend upon aberration of the mind producing an absence of that necessary harmony which should exist between the voluntary and involuntary muscles of the part: an absence of volition on the one hand, or such continued suppression of that volition on the other, that unnatural distention of the organic muscular fibres takes place, and they are, for the time being at least, deprived of their power of action, although micturition is not permanently arrested—it is only postponed; the organic muscular fibres still retaining the capability of resuming their power of action. For this reason we can scarcely look upon such cases as those of paralysis of the bladder, although Sir B. Brodie has arranged them under this head in his valuable work on Diseases of the Urinary Organs; and I would draw this distinction between the two affections: that in those now under consideration the power exists, but the guiding or exciting will is either perverted or wanting; in true paralysis of the bladder, the will may be present, but it is the power to obey that will which has been destroyed.

In some instances the cause is confined to the voluntary muscles of the urethra; in others, it commences in these muscles, but is prolonged and sustained by the non-action of the bladder. As examples of the former, I would cite cases of retention of urine occurring in hysterical females. Here this arrest of volition may continue for many hours,

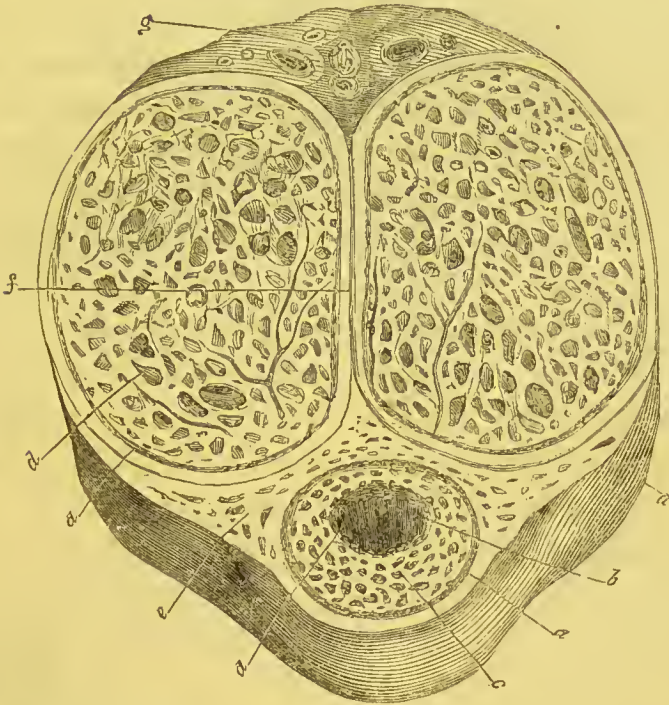
even for some days, but the bladder retains its power of contraction; and it would appear in these cases that the same cause which for the time arrests volition as to micturition, also exerts considerable influence in diminishing the secretion of urine; for if left to themselves, when the bladder becomes well distended, and the stimulus of micturition is excited, volition returns to the voluntary muscles of the urethra, and they no longer oppose the passage of the urine. If, on the other hand, we artificially interfere by withdrawing the water, we prevent the accession of the natural stimulus, we suspend volition, and so long as we interfere, so long we continue hysterical retention. It is unusual in other cases, for retention to persist for so lengthened a period, without the muscular fibres of the bladder becoming over-distended by the quantity of water secreted.

Of the second class, or where retention commences in the voluntary muscles of the urethra or perinæum, and is sustained by the bladder, we have examples in those cases where the natural functions are kept so long in abeyance by the will, that they are at length unable to perform their part. The remarkable case of the lawyer, related by Sir B. Brodie, belongs to this class. He had doubtless suppressed his natural desires in the first instance; whilst the intensity of his application and the interest of the business in which he was engaged, had so totally alienated his mind from those desires, that they passed by unobserved, and so over-distention and temporary loss of power of the bladder ensued. The most surprising fact connected with this case is the total absence of all volition—the absence of sensation in the bladder. For we read, that after two days, when the patient recollected he had not voided his urine for so long a time, his attention was not

arrested by any desire to micturate, but merely by the consideration that he ought to do so. In ordinary cases, although the bladder may have become over-distended, it retains sensation, and the sufferings of the patients cause them to exert very violent efforts of the abdominal and other voluntary muscles, which, as I have before observed, in the majority of cases only increase their difficulty.

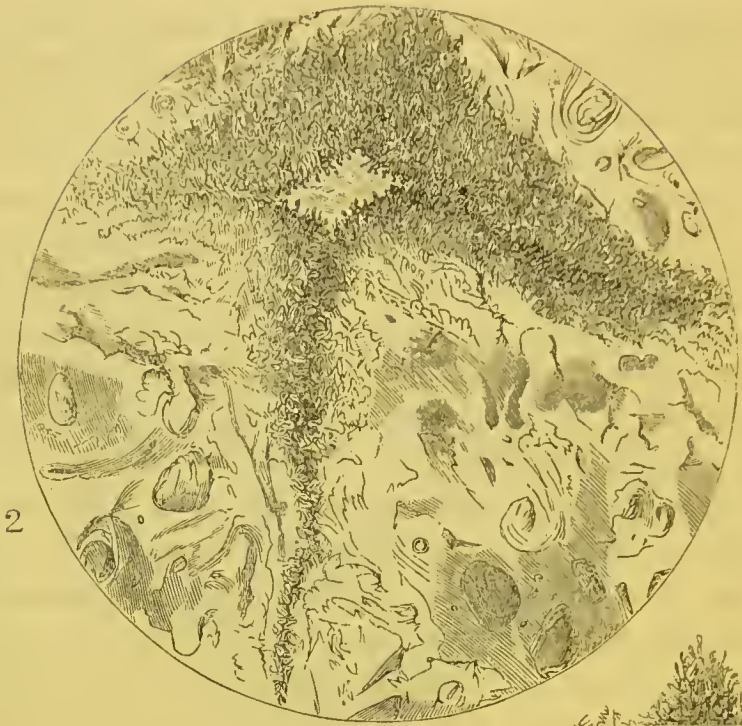
Patients sometimes have partial retention of urine, with well-marked symptoms of spasmodic stricture, whose sufferings, however, are aggravated instead of relieved by the employment of instruments. Such cases require selection, discrimination, and an acquaintance with general pathology, equally with every other affection to which the human frame is liable; and it cannot too forcibly be impressed, that while on the one hand symptoms of stricture are often present without the actual disease, the disease itself may be induced and established, if at the onset the true character of the complaint is mistaken, and the patient is subjected to an improper course of treatment. The introduction of a bougie, however carefully and dexterously performed, can never be effected without some violence to the lining membrane of the urethra. However smooth the instrument, however light the hand of the surgeon, more or less bruising of the delicate papillæ must result, with consequent liability of inflammation, thickening, &c. The urethra is not a mere tube, neither is its inner surface smooth. The former, as has lately been demonstrated by Mr. Quekett, is thrown into rugæ towards the bulb (*See Fig. 4,*) whilst the latter, as was pointed out by Mr. Hogg and myself, is covered by papillæ, some of which present loops, others being more or less tuberculated.—(*See Plate II, p. 64.*)

FIG. IV.



A transverse section of penis near bulb, magnified; *a* represents the arrangement of the muscular fibres; *b*, the rugæ of urethra; *c*, spongy body surrounding the urethra; *d*, corpora cavernosa, with vessels permeating entire structure; *e*, cellular tissue; *f*, septum; *g*, vessels and nerves.

Mr. Quekett, however, was forestalled in his discovery of the folds or rugæ of the urethra, by the late Sir E. Home, who figured them (though more roughly than Mr. Quekett has done) in his work on Strictures. When, from any cause, the muscular fibres of the urethra are thrown into an irritable condition, or into a state of undue contraction, these rugæ must of necessity be approximated closer together, and the papillæ probably dovetailed one with another, a condition which must be materially aggravated by the co-existence of congestion of the lining membrane, as in those cases denominated inflammatory spasmodic stricture. Now, if we bear in mind that it is in



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PLATE II.—Fig. 1.—Transverse section of injected urethra near the meatus, showing arrangement of papillæ, magnified 60 diameters. Fig. 2.—Transverse section two inches below glans, showing the form of urethra lined with papillæ, magnified 60 diameters. Fig. 3.—Longitudinal section of injected urethra one inch below glans, showing the looped appearance of papillæ more highly magnified than the former—150 diameters.

such cases of functional strictures or impediments, unaccompanied by change in structure, that the muscular contraction is greatest, and the approximation of the rugæ and villi closest,—for where such disorganization exists, the muscular contraction is weakened instead of strengthened at that point,—we can readily understand that those instances in which the employment of instruments is contra-indicated, are exactly those cases in which the opposition to the passage of such instrument would be greatest; and so we find in practice.

A gentleman applied to me, some months since, on account of difficulty in passing his urine. He informed me that for above twelve months he had experienced great suffering from inability to micturate, that he had almost constant desire, and that he would suddenly be seized with such urgent want that he would imagine he could scarcely control it; but that upon endeavouring to pass his urine, although his sufferings were most severe from his almost uncontrollable efforts at expulsion, he would have to remain in this condition for above half or three-quarters of an hour before the urine began to flow, which, however, it never did in a stream, but merely guttatim. His sufferings had increased so much of late, that he had been obliged to give up all society. He wound up the relation of his case by adding that he had been told that he had stricture, but that he dreaded the passage of an instrument so much, he was sure he should die if I attempted to employ one. He had never suffered from gonorrhœa. His pulse was very quick and irritable; he had a peculiar twitching of the muscles of his face and eyelids; and I knew that his avocations were those attended with great mental labour, frequently with anxiety. I concluded that it would be better to soothe him into good health than to

attack the local symptoms; and I accordingly prescribed some hyoscyamus with hop and camphor mixture at bedtime, with twelve drops of the muriated tincture of iron thrice daily. In about a week he came to me in high spirits, and informed me that he was very much better; that he could now sleep through the night without being disturbed; that he had almost lost the frequent and constant desire to micturate; and that when he required to do so the delay and difficulty were much less. I advised him to continue the treatment for a short time longer; he did so for two or three weeks, when he informed me he was quite well.

Again, there are instances where the difficulty of micturition appears to depend upon a relaxed and flabby condition of the urethra, and general want of tone, probably accompanied by more or less want of contractile power of the bladder itself. Such cases are characterized by the general symptoms of stricture, though, in point of fact, there is no stricture present; the patient, by dint of straining, is able to squeeze his urine out by drops, or in a very fine stream. Should the surgeon be misled by these symptoms, and employ a small catheter or bougie, he will rarely succeed in its introduction, whilst his attempts in most instances will be followed by alarming hæmorrhage. On the other hand, a large-sized instrument readily enters the bladder, without any impediment whatever to its introduction. In a case where I was consulted, I was told that nothing would pass, that upon two or three occasions, after futile attempts with small instruments, the bleeding had been so excessive, that no further trial could be made for some weeks, when, unfortunately, the same degree of bleeding ensued: I passed a No. 12 with ease. But there is a point connected with this form

of stricture which is worthy attention : it is, that here a much larger-sized instrument is required to effect a cure than in the ordinary cases of stricture, whether spasmodic or otherwise ; for whereas in the latter instances the urethra will rarely admit a larger-sized instrument than a No. 13 or 14, in those to which I now allude, a No. 20, or even larger than that, will sometimes be required, before the patient experiences any great degree of benefit. I have known patients who have had a No. 14 passed with complete facility, express their surprise and disappointment at the slight effect produced upon the flow of urine or the size of the stream, they even now being able to micturate merely in drops. In fact, it is not until the urethra has been stretched to its utmost without violence to the part, that any decided benefit is derived or to be expected. And here the same rule applies as in ordinary cases—that we may, and indeed should, increase the size of the instrument so long as the orifice of the urethra admits of its introduction without over-distention or the production of pain.

Patients who suffer from this form of disease are mostly of irritable temperament, more or less subject to dyspepsia, or have been exposed to excessive mental anxiety. Great attention, therefore, should be paid to the general state of health, at the same time that the local symptoms are treated ; whilst the urine should be examined and tested from time to time, to ascertain its condition, as any departure from the healthy and natural standard presents a very decided obstacle to a cure.

A gentleman consulted me for inability to pass his urine, excepting in a very small stream, accompanied with a sensation of weight and discomfort in the course of the urethra and perinæum. He had not suffered from gonor-

rhœa, but had been exposed to intense mental anxiety, arising from the failure of his father in business, and his endeavours to carry on the same with very inadequate resources. He had been under the care of a surgeon of eminence for several months, and that gentleman had endeavoured from time to time to introduce a No. 2 or 3 bougie or catheter, but without any other result than profuse hæmorrhage. The patient was much excited whilst relating his case; he could not keep himself still for one instant; his arms and legs were in constant motion, and he appeared to vomit his words rather than to utter them—they would hardly flow fast enough to please him. His pulse was very small and rapid, his tongue furred, and his breath hot and offensive. I concluded that he had no permanent stricture, but that the urethral symptoms were merely sympathetic of general debility, and of the derangement of the digestive organs caused by the mental depression under which he had been suffering. After considerable persuasion he allowed me to introduce a No. 10, which at once entered his bladder. However, he derived but little relief from its introduction, nor could he void his urine in a stream, or with anything like comfort, until a No. 19 had been passed some two or three times: attention was at the same time paid to his health generally, and he left me very much better. I heard nothing more of him until last summer—a period of nearly six years having elapsed. He again consulted me for a return of his former symptoms, produced, I have no doubt, by the sudden death of a near relative. I could readily introduce his former full-sized instrument; but his digestion was very much out of order, and his urine loaded with the urate of ammonia. I did not repeat the introduction of the instrument; but by paying attention to the other

points, the urethral symptoms subsided, and he was shortly enabled to leave town on a journey, perfectly restored to health. Again, a gentleman lately applied to me for a dull heavy pain in his loins, weight in the perinæum, and difficulty in passing his urine, which flowed only in a very fine stream. Though a large, bulky man, his face was pasty, his muscles soft and flabby, and his pulse weak and small. He denied having ever contracted gonorrhœa, or ever having suffered from discharge of any kind from the urethra. However, from the symptoms, I considered it prudent to examine his urethra with a sound, and accordingly attempted to introduce a No. 8. It entered readily, and the pendulous portion of the urethra being very long and flabby, all but about an inch of the instrument passed, but without entering the bladder: it appeared to be prevented by something soft, unlike the firm resistance of an ordinary stricture, either permanent or transitory; whilst, at the same time, the endeavours to reach the bladder caused the penis to recede, and gave rise to considerable bleeding. From the impression given, as though I was pressing against a piece of soft and elastic structure rather than a firm substance; from the general appearance of the patient; the recession of the penis; the non-precedence of gonorrhœa or gleet; the profuse hæmorrhage,—which, taken collectively, would appear to be diagnostic of this particular malady,—the impediment to micturition appeared to me to depend upon a flabby state of parts emanating from debility; and I therefore took a No. 12 metal bougie, which passed without any pain to the patient. I ordered him quinine, with the citrate of iron. Two days afterwards I passed a No. 13, and in another two days No. 14, and so on until he was cured. This, I believe, is an unusual case. I have frequently

met with instances wherein a No. 6 or 8 would pass where smaller instruments would not; but I have never before seen a case where the flabbiness of parts has been so great as to prevent a No. 8 entering the bladder, whilst a No. 12 passed readily.

The preceding are instances of retention of urine, independent of disease or local mischief, but traceable to abnormal condition of the mind or nervous system, and consequent want of sympathy in the action of the several parts. Complete retention of urine, however, will sometimes occur from local irritation, or from irritation in the parts adjacent to the bladder. And it is curious, that although this obtains, although operations on the rectum, as well as ingesta within that viscus, will produce complete retention of urine even of some days' duration, still the bladder will bear foreign bodies within its cavity without anything like retention taking place. The case I am now about to relate will also demonstrate that a viscus may contain a foreign body capable of causing or inflicting severe, nay, fatal mischief on neighbouring parts, without at the same time suffering any appreciable organic injury itself.

I tied hæmorrhoids for a gentleman; the operation was not more severe than ordinary, but he had retention of urine for more than ten days: and we know very well that the irritation of piles alone will sometimes induce retention of urine without any operation at all; and the following case will show how worms in the intestines will occasionally affect the urinary bladder, and what fatal mischief will sometimes ensue.

A patient was admitted under my care into the Charing-cross Hospital with retention of urine. He had for some ten months previously suffered from symptoms of stone

in the bladder. His urine was drawn off without difficulty, and I afterwards examined him for stone, but soon found that his sufferings did not arise from that cause; and therefore supposing that they might possibly depend upon some ingesta in the rectum or large intestines, I ordered him a dose of turpentine and castor-oil, which acted freely, and dislodged a round worm about five inches long. His symptoms for the time were materially relieved, but on the following day he had another attack of retention of urine, and the catheter drew off about a pint and a half of clear urine. His tongue was furred and dry; skin hot; pulse 120, small; bowels confined; he had passed a bad night. To have a mild aperient, with nourishing diet and four ounces of wine. The next day: Has not had any more retention of urine; on the contrary, he has been able to pass his water in a continuous stream; his tongue is furred, but moist; skin hot; no appetite; his bowels acted freely from the medicine, but without any further appearance of worms. On the day after he was much worse, irritative fever having set in; tongue brown and dry; lips parched; skin hot and dry; abdomen tympanitic; pulse 120, very small; could not pass his urine, which was high-coloured, small in quantity, and very offensive when drawn off. To have bark and ammonia, and the nourishing diet, with wine, to be continued. He never rallied, however, from this state, but died in the course of the following night.

Post-mortem Examination.—Upon laying open the abdomen, the peritonæum presented symptoms of general inflammation, with effusion into the cavity. The subperitonæal cellular tissue around the bladder, and between the bladder and rectum, was infiltrated with pus. The mucous membrane of the bladder showed signs of chronic

inflammation. The kidneys, though gorged with blood, were otherwise perfectly healthy, as were the intestines and the remaining viscera.

If I had not watched this case very attentively myself, I might have imagined that some mischief had been done by the catheters, or in sounding: but there never was any difficulty in introducing the instruments; neither did he on any occasion, either at the time or subsequently, complain of pain being caused by their introduction.

The time that remains is obviously too limited for me to enter into anything like a detailed account of permanent stricture or its treatment. I shall therefore confine myself to a few remarks upon the pathology of such strictures, being the result of microscopic investigations which I have recently made.

We have seen, in this as well as in the preceding lecture, an analogy existing between the several hollow viscera in the body, not only as regards their functions, but also their structure, the arrangement of that structure, and nervous supply. If we inquire still further, and study the pathology of these parts, we find the same analogy may be traced, especially as regards the particular affection under consideration. I will not detain you in endeavouring to explain why permanent strictures of the urethra occur more commonly at the junction of the bulb with the membranous portion of the urethra; for,—setting aside the consideration that this portion of the urethra is the spot of all others most acted upon in the different conditions of erection and relaxation of the corpus spongiosum, and that spot, consequently, at which we should naturally expect stricture or mischief to occur,—if we turn to such affections in other parts of the body, we find that for the most part they seem subject to a general law—that stric-

tures, when single and organic, taking place in canals possessed of varied dimensions, are commonly met with at those points where the larger portion of the canal merges into a smaller one, or *vice versá*. In the alimentary canal, for instance, this commonly obtains. Strictures of the œsophagus almost always take place opposite the cricoid cartilage, or fifth cervical vertebra, where the pharynx merges into the œsophagus. Again, we find permanent stricture where the œsophagus joins the stomach, the cardiac orifice; where the stomach joins the duodenum, or pylorus; where the sigmoid flexure of the colon joins the rectum; and at the lower part of the rectum, where the dilated portion of the gut joins its more contracted termination. And likewise, in the lachrymal apparatus, we find that constrictions mostly obtain where the lachrymal sac joins the ductus ad nasum, although I have also observed obstructions at the junction of the lachrymal ducts with the sac. And so it is in stricture of the urethra: they mostly occur at that spot where the narrower membranous portion passes into the more dilated fossa of the bulb. I would, however, offer a few observations upon the formation of permanent strictures, and likewise attempt to explain the cause of retention of urine in some of these cases.

We find, notwithstanding the prevailing opinion to the contrary, that these strictures are formed in two ways: first, by the deposit of a false membrane upon the free surface of the urethra; and, secondly, by the thickening of the mucous membrane itself, the effusion of lymph into the subjacent cellular tissue and other structures, producing consolidation and thickening of the several parts, which pressing upon the mucous membrane, push it inwards, and thus constrict the canal, diminishing its calibre.

This latter is the usually described cause of permanent stricture; but from a very careful examination of many urethras, I am convinced that these affections depend upon adventitious membranes much more frequently than is commonly supposed, especially in those preceded by acute inflammation; and this not merely in that form recognised as "bridle stricture," but in those of considerable extent and duration.

To gain as much information as possible upon this point, I have examined all the urethras I could get. I have examined the urethras of those who have died of other diseases, in whom the existence of stricture had not been suspected; I have also, through the kindness of my friends, been enabled to examine preparations taken from those who had at one time suffered from this malady, and who were supposed to have been cured; I have also been enabled to examine those taken from patients who have died whilst labouring under the complaint. And the result of these examinations is the conviction that permanent stricture from false membrane within the canal upon its free surface, is a common and frequent occurrence; and I am confirmed in this view by my friend Dr. Beith, who has rendered me great assistance, and who, from his position at Greenwich Hospital, has had ample opportunities of studying these diseases, to which he has devoted much attention. Some surgeons have based their disbelief of this fact upon the supposed want of organization of these membranes. I will not take up your time in discussing this point; I would only remark that we can scarcely deem a part disorganized, or rather, void of organization, which, though placed as it were "extra corpore," is capable of maintaining its connexion with vital parts, of resisting forces constantly acting upon it, and of maintaining its vitality for several years against the inroads of

decomposition and putrescence. It is true we may not be able to trace blood-vessels directly into them, but neither can we trace blood-vessels into the cornea of the eye, nor the cartilages of the joints, yet we do not dream of denying the organization of either.

A patient had stricture of several years' duration, and from drink brought on complete retention of urine, which could not be overcome. Nothing would enter his bladder. Accordingly, as a *dernier ressort*, the surgeon under whose care he was, punctured his bladder. This gave him instant relief; the stricture yielded, as it is commonly expressed, the urine in the course of time beginning to flow through the natural channel, and everything went on well for a few days. Erysipelas, however, came on; he sunk into a typhoid state, and died. I did not see the patient during life; but the gentleman under whose care he was, most kindly and skilfully removed the parts entire and sent them to me, and I examined them with Mr. Hogg.

The cause of death was evidently the escape of urine into the cellular tissue around the puncture, as this was in a sloughing condition; but the original mischief consisted in a deposit of false membrane, constituting a stricture of about an inch and a quarter in length, situated at the junction of the bulbous with the membranous portion of the urethra. This invaded the canal so much, that it must doubtless have presented a great and distressing obstacle to the passage of urine under ordinary circumstances, let alone the increased turgescence and excitement produced by drink. The membrane was straw-coloured, and for the most part adhered so firmly to the mucous membrane, that it was only by careful dissection we could separate the one from the other; indeed, so identified were the two, that had we remained content

with a mere cursory or superficial examination, we might have imagined the morbid appearances to have depended upon thickening and puckering of the mucous membrane itself, rather than upon what actually obtained. It was only by the microscope that we could determine what was really the condition of parts.

The existence of this false membrane was proved by some points of great interest. Among others, that although this newly-deposited structure appeared to be invested by mucous membrane when examined by the naked eye, the investment, though smooth and shining, did not possess the actual organization of mucous membrane, but when viewed through the microscope, presented more the character of condensed cellular tissue.* It did not possess either villi or papillæ upon its free surface. It was not invested by epithelial scales; and what was extremely interesting, as incontrovertibly proving the non-identity of this membrane with the proper mucous canal, we found that, by carefully dissecting it away, we came down upon the layer of epithelial scales, separating it, as it were, from the proper mucous membrane of the urethra. We could not detect any appreciable change in the structure, either of the proper mucous membrane of the urethra or of the parts surrounding it; and hence we could not arrive at any other conclusion than that, in this instance at least, the prevailing notion that permanent organic stricture (other than the bridle constriction) was always produced by mischief without the canal, was erroneous; and other cases which we have had the opportunity of examining have not only strengthened this opinion, but have led me to conclude that it is not merely a possible but a frequent

* See Plate 1, Fig. 2, p. 20.

cause of this malady. There was another point also of the greatest interest, and one which, so far as I can trace, has never been noticed before. We have seen that this false membrane was for the most part adherent. It was so for about an inch of its anterior extent, where we have observed it so closely attached as almost to be identical with the subjacent tissue; but towards the bladder this new structure sent off two processes, which extended to the prostate, and became lost on the mucous investment of the outer part of the sinus prostaticus. These two processes were the limbi of a semi-lunar valve, constituting the vesical extremity of the false deposit, which was here separated from the subjacent mucous membrane to the extent of some half an inch, constituting a regular valve, having its free lunated edge towards the bladder, whilst elsewhere it was continuous with that portion attached to the urethra. On carrying a probe from the bladder along the urethra, it passed under this valve, and entered a blind pouch, of considerable size when viewed in relation to the parts; whilst the appearance of the valve was very similar to that of one of the semi-lunar valves at the commencement of the aorta or pulmonary artery.

In another case there was a stricture of the bulb, caused by adventitious membrane, presenting towards the bladder a semi-lunated edge, where the false membrane formed a species of valve, covering a cæcal passage half an inch long, looking backwards, or towards the bladder. This had induced considerable mischief in the bladder and kidneys; the latter contained numerous cysts, and their pelves were excessively dilated, the whole substance, with the capsules, being hardened and thickened. The former was much enlarged and hyper-trophied, and contained within its parietes several deep cysts containing pus.

These cysts neither communicated with the interior nor exterior of the organ. No matter could be detected in the urine, although this fluid was albuminous. The prostate gland also was larger than usual.

These cases explain points connected with extreme retention of urine, which have never been properly accounted for, and the reasons for which, as advanced from time to time by writers upon the subject, although maintained for want of better, were neither satisfactory nor conclusive; they always appeared to me to require further elucidation; and this, I believe, is afforded by what we are now considering. Let us again briefly revert to the first case. The patient had complete retention of urine; nothing would pass. His symptoms were so urgent as to demand operation. His bladder was tapped, with instant relief, and accompanied apparently with relaxation of the stricture, as an instrument could subsequently be passed without much difficulty, and the patient was enabled to micturate, although in a small stream. Now, this yielding of the stricture is thus explained by Sir B. Brodie, who, in alluding to what takes place when the urethra gives way, observes:—"There is no more straining, and the spasm of the stricture, no longer excited by the pressure behind, becomes relaxed, so as to allow some of the urine to flow by the natural channel." This implies that the retention of urine has depended upon muscular contraction, that it is the undue action of the muscles of the part which prevents the escape even of a drop of urine, this contraction persisting for days, even to the death of the patient, notwithstanding his violent and uncontrollable efforts. But where the stricture has resulted from acute inflammation and the deposit of a false membrane,—which, I believe, is much more frequent than is usually

admitted,—this complete retention and subsequent phenomena may be explained by what was found in the cases just related. I allude to the 'valve with its free margin directed towards the bladder. It is not an isolated fact; I have met with it in three cases within the last two or three months: one in the case just related, where the retention was so complete as to require operation, the other two in which the patients died of some other disease. In these cases, retention of urine may be considered as purely mechanical. The false membrane presenting its valve, the urine insinuates itself between the valve and the mucous membrane, raises it up, and so closes the canal; and the greater the stress or pressure from behind, the more is the valve raised up, and the more complete is the occlusion of the canal. When by any means this pressure is removed, the valve drops down, and the canal again becomes pervious, and so allows the urine to flow; and so it will continue to do, as long as no forced or unnatural impulse is given to the urine. The degree of retention in such cases must doubtless depend upon the size of this valve: where the latter is small, it may merely produce impediment; and this was probably the case in the preparation before you, wherein the valve is small compared with that in which complete retention took place; but we can readily understand that in the course of time, if left to itself, it would have attained ample size to have produced the most baneful results. Equally inconclusive is the usual explanation, when applied to the same train of phenomena occurring in what have hitherto been deemed the common and ordinary form of permanent stricture. It may reasonably be doubted, in cases of long standing, wherein the state of the surrounding parts is such as to constitute a cartilaginous, or even indurated stricture, whether the

muscles surrounding the actual seat of disease would have sufficient power to produce decided closure of the canal. Where the mucous membrane is thickened, the sub-mucous cellular tissue and even the spongy tissue so loaded with lymph as to be converted into the indurated mass in which we find it, the organic muscular fibres could not and would not act: they might at other parts of the canal, but they would not at the seat of disease. Retention therefore must be due to the contraction of the voluntary muscles surrounding the whole mass; and if so, it is, I believe, the only instance wherein voluntary muscular fibre is capable of exerting this continuous and uninterrupted contraction for so long a period. We have, however, another explanation—we may ascribe the retention of urine in these, as in the other cases, to mechanical rather than to vital contraction. The bladder acting with more than usual violence upon its contents, the force thus exerted upon the urine is reflected from the urine upon the neck of the bladder, and so on to the urethra; hence, as the latter becomes over-excited and distended, the strictured portion is drawn upon, and still more contracted, and hence complete occlusion takes place; and this the more readily that the greater the efforts or force exerted upon the fluid, the greater the amount of contraction. These cases mostly occur when, from some cause or other, a more than ordinary quantity of urine has been allowed to accumulate in the bladder before any effort has been made to expel it; so that from the very onset such efforts have been forced and unnatural. Hence we can readily understand that when the urethra has given way, or an operation has been performed, the contraction of the bladder upon the urine is more natural, the reflected action upon the neck of the bladder is diminished, and

there is less distention of the urethra behind the stricture, the traction upon which is consequently diminished, and it therefore permits the urine to flow. Very little explanation will suffice to make this point clear to you. In cases of this description, the stricture is a mass of induration of greater or less extent, seated at a given point upon an elastic and extensible canal, which in its normal condition is loosely attached to the structures beneath, but, under existing circumstances, becoming implicated in, and consequently firmly attached to this mass of induration; so that the stricture is no longer an isolated independent body, but part of this tube, being more or less a fixed point, having the loose extensible tube in front as well as between it and the bladder, but lined, recollect, by the same membrane, which, whilst loosely attached at other parts, is here intimately blended with, and adherent to, the altered structures beneath. This mass is not merely deposited around the urethra, but as the coagulable lymph becomes effused in the subjacent structures it gradually compresses the membrane of the urethra and pushes it inwards towards the interior of the canal, forming convex projections in that direction, of greater or less extent, with consequent and relative obliteration of the canal. If the urethra in front of the stricture were as solid and fixed as the stricture itself, it is probable that we should not have these cases of complete and unsubduable retention of urine: but, in the existing order of things, as the urethra between the bladder and stricture becomes distended with urine with greater force than ordinary, and the urine enters this part by an orifice of much greater extent than that of the exit afforded by the stricture; and, moreover, as fresh urine is unceasingly pressed forward by the violent efforts at expulsion exerted by the bladder, &c.,

behind; as a matter of course, the urethra behind the stricture must become more or less dilated, and in its dilatation draw upon the urethra in front. Now, if the urethra in front of the stricture were as solid and fixed as the stricture itself, the force exerted by the dilatation of the urethra between it and the bladder, by acting equally in all directions from within outwards, upon the cylindrical tube, would tend to expand the vesical opening of the stricture, and thus favour the passage of urine. And, probably, if the surface of the stricture were uniform and flat, instead of convex, the retention would not be so complete. But as it is, the convexity serves as a fulcrum or pulley to convey the force exerted by the distention of the urethra behind, to the most remote point of consolidation or adhesion in front, producing a kind of double action upon the part. For the sound urethra in front offering no resistance, whilst the vesical orifice of the stricture is dilated by the traction exerted upon it, the same traction draws the anterior portion of the stricture together, approximates the most prominent convexities or projections, and, the greater the force, distention, or pressure behind, the closer and firmer will be this approximation in front. When by any means this pressure is relieved, whether by subduing the vesical efforts by opium, iron, or by operation, or by the urethra giving way, this forced contraction subsides, the parts assume their wonted position, the canal is restored, and hence the urine is allowed to flow. This, I believe, is the correct explanation of those phenomena occurring in permanent strictures of the form under consideration. We can scarcely understand how parts disorganized to the extent that these are, can be endowed with such vital contractility as to justify our ascribing such complete retention of urine to irritation

or spasm; we may also feel sceptical as to the capability of the delicate muscular fibre of the urethra to resist the powers opposed to it; but when we look upon the case as one of a given force acting upon and resisting itself, our surprise and doubt at once subside.

Another cause of retention of urine, although probably not so urgent an one as the two preceding, is the accumulation of viscid mucus, which, plugging up the neck of the bladder and constricted portion of the urethra, completely prevents the escape of the fluid. Although I had frequently seen this mucus produce inconvenience, I had no idea that it could present such a complete obstacle until a few weeks since. A preparation was sent to me, taken from a man who had for some years suffered from a stricture. I was anxious to ascertain whether the impediment to micturition had arisen from spasm or actual organic obstruction—whether, in fact, the causes which prevailed during life persisted in death. Accordingly, I suspended the bladder in a frame; so that the penis hung down; and, making a hole at the fundus of the bladder, poured water in, at first slowly, as the urine would enter from the ureters, until the bladder was well distended, but not a drop escaped per urethram. I was then anxious to ascertain whether the obstacle was capable of resisting greater force. Accordingly I applied the bladder to the tap of a cistern, introducing the nozzle of the tap into the hole in the bladder, and tying it firmly round; I then gradually increased the amount of pressure by turning the tap: still no water escaped. I now thought it would be interesting to ascertain the precise spot of obstruction, and accordingly I cut off the penis, portion by portion of an inch in length: still no water escaped, although I had reached the front of the prostate gland; here, however, I observed

some thick viscid mucus protruding through the urethra : I withdrew it by forceps, and the water then gushed out in a full stream. In the second case of permanent stricture to which I lately alluded, we found that the bladder had undergone certain changes resulting from the obstruction of the urethral canal. These changes were abscess in the coats of the viscus, with thickening of the latter. Did time permit, I would enter more in detail upon the results of permanent strictures of the urethra ; but as only a few minutes remain, I must confine what I have to say to some short remarks upon thickening of the bladder, and that form called a columnar bladder. It is commonly stated that the organ, being obliged to act more powerfully in consequence of the impediment which it has to overcome, becomes diminished in size, its walls at the same time being thickened from hypertrophy of its muscular coat, which is so much developed as to present itself in the form of strong bands or columns under the mucous membrane, forming well-marked projections. This, I believe, is incorrect. I have examined several thickened bladders microscopically, and I have found that the thickening of the coats, as well as the columnar appearance of the inner surface, is due, not so much to the muscular as to the cellular coat of the viscus ; that in point of fact these columns or projections are not muscular, but composed for the most part of elastic cellular tissue. The contraction of the bladder only obtains as a general rule at a comparatively early stage of the complaint ; for we find, when the obstruction has existed for any length of time, that the bladder, though thickened, is dilated instead of contracted ; and from what Mr. Hogg and I have observed, I am led to the conclusion that there is only a certain degree of hypertrophy of muscular fibre consistent with

the persistence of that fibre as muscular tissue; that beyond this point it appears to lose its original character, and to pass into a state of fatty degeneration.* I will not attempt to enter upon the question as to whether this conversion of tissue into fat-globules is a conservative or destructive process—whether it is to prolong life, or to assimilate the body whilst living to those changes which it undergoes in its abode of death. Is it a process of nutrition, or is it a process of decay? Observation and reasoning would point to the latter. I would, however, venture to express the hope that the matter may engage the attention of those well versed in animal chemistry, that they may enlighten us thereon, and show whether the fat-globules of fatty degeneration are identical in chemical composition with those of the fat of nutrition, or whether they merely possess their physical appearances.

When the condition of the bladder is such as here stated, its capability of contraction must be materially lessened, and hence we may infer that the greater the degree of hypertrophy or thickening, the weaker will be its power. And here, likewise, we have a reason why cases of enlargement of the prostate gland as well as of severe forms of stricture are so often attended with incontinence of urine, which, under such circumstances, is not due merely to over-distention of the bladder, but as frequently results from non-action of the bladder itself, and which, from its incapability of contraction, leaves the neck of the viscus open, and so the water dribbles away; at the same time it is extremely doubtful in these cases of thickened or columnar bladder, even if the enlarged prostate could by any possibility be

* See p. 20, Fig. 3, Plate I, drawn from a preparation under the microscope, taken from a section of a columnar bladder.

removed, whether the bladder would have the capability of completely emptying itself, as from the degree of degeneration to which its muscular coat is reduced, it must, in a great measure, be deprived of its power of acting. This consequently points out to us the importance of the daily introduction of a catheter in such cases, that the organ should be thoroughly emptied at least once every twenty-four hours.

THE END.

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