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ON THE

ANATOMY

OF THE CANALS

FOOD, BILE, AND URINE

BY ALEXANDER MURRAY M.D.

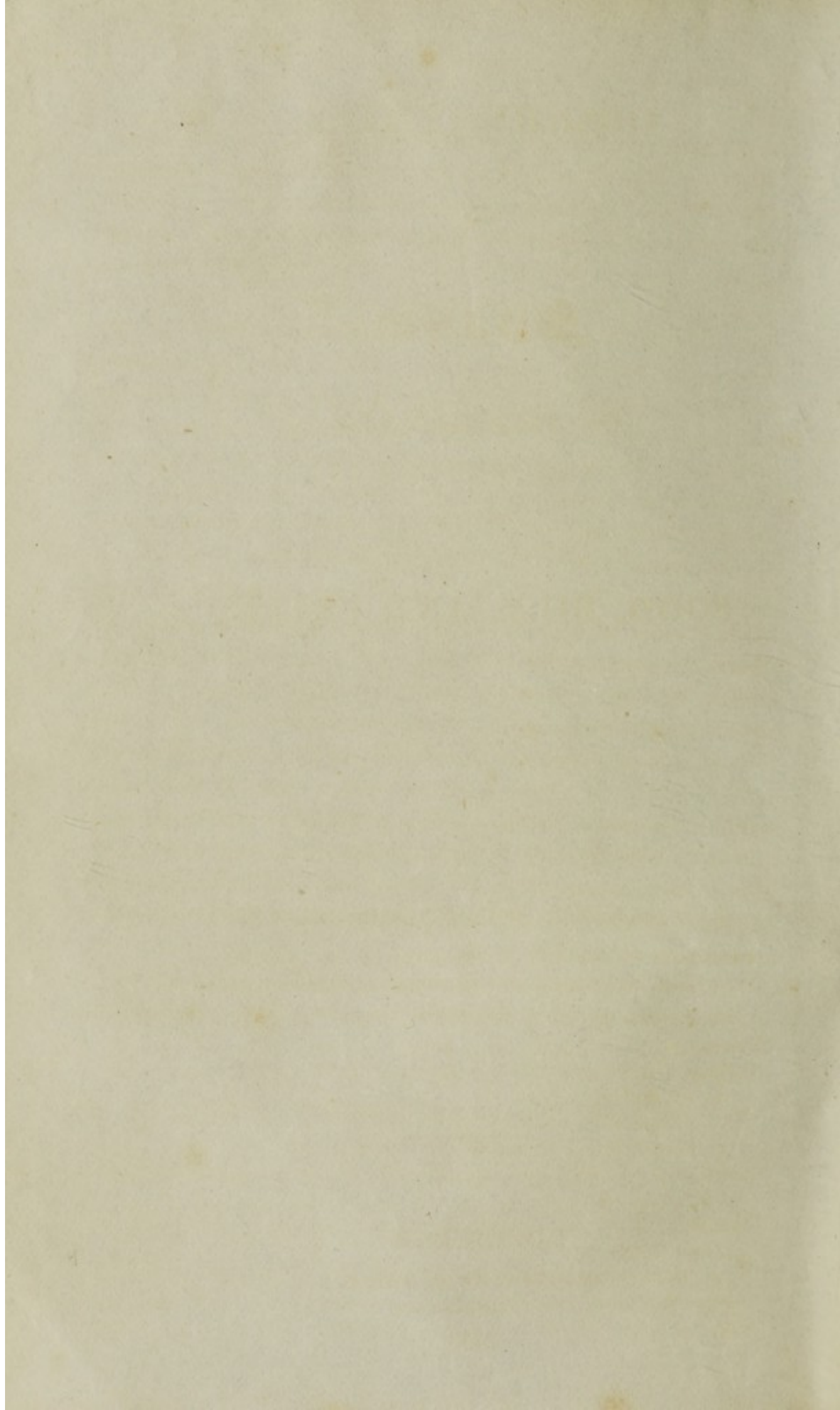
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OBSERVATIONS

ON

Spasm

OF THE CANALS

FOR THE

FOOD, BILE, AND URINE.

BY

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1845

OF THE CANALS



FOOD, BILL

27

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1845

SPASMODIC CONTRACTION, &c.

CHAPTER I.

GENERAL OBSERVATIONS.

THE study of Spasmodic Disorders is peculiarly worthy of attention, on account of their frequency, number, severity, and danger, and also on account of the light they reflect upon the physiology and pathology of the muscular fibre.

In spasmodic disorders the muscles take on an inordinate degree of contraction, for a longer or shorter space of time, and occasionally one part of a muscle is in a state of unnatural contraction, whilst the rest of it exercises its natural functions. These spasms are common to the muscles which are under the dominion of the will, and also to those over which the will exercises no controul *.

* The subjoined is a list of Authors who have written on various Spasmodic Diseases.

Hoffman (Casparus), *Dissertatio de Spasmo seu Convulsione ejusque causis*, in 4to, Altdorpe 1620.

Heister (Laurentius), *Dissectio Mulieris miris spasmis brevi defunctæ*.

V. Ephemerid, *Naturæ Curiosor. centur. v. et vi. p. 166.*

Kaltschmied (Carolus Fredericus), *Dissertatio de Affectibus spasmodicis vagis*, in 4to. Jenæ 1754.

Baumer, *Programma de iis quæ spasmis rigidis particularibus communia sunt*, in 4to. Gissac 1776.

Cullen, G. M. G. xlvi. *Sauv. Nos. Method. cl. 4. O. 11. G. vii.*

Pauvay, *ibid. G. viii. Lin. G. cxxviii. Vogel. G. clxxxiii.*

Vogel, G. clxxxi.

Vogel

To the spasmodic contraction of the latter description of muscles, of which little or no mention has been made by Sauvages, Cullen, or by that very learned and voluminous author Dr Mason Good, it is my intention to limit the attention of the reader, and the prescribed limits of this paper do not permit me to indulge in so wide a range, as to consider the spasmodic affections of all the involuntary muscles, but only those proper to the passages for the food, the bile, and the urine. In discussing this subject, which must be admitted to be of peculiar interest in an anatomical, physiological, and pathological point of view, it is proposed to endeavour to discover the source from which this unnatural contraction of the muscles proceeds, to trace its progress and consequences, taking, at the same time, notice of its effects in occasioning a derangement in the functions of the part more immediately affected, and also in deranging those of the animal economy at large.

Such inquiries are essential to our present purpose, as indicating the means best calculated to remove the cause of the symptoms, and of all the mischief. Before advancing to my more immediate object, it seems necessary to animadvert upon the peculiar distribution and mode of action of the muscles which bring about such a morbid contraction of the muscles proper to the passages for the food, the bile, and the urine, concerning the existence of which anatomists of the highest distinction are not agreed. For instance, the existence

Vogel, G. clxxxii.

Cull. Nosol. G. xlvi.

Sauv., idem, sp. 1.

Sennert., Sauv. et aliis Journ. de Med. Avril 1764, p. 336.

Sauv., ibid. sp. 2.

Planer, Dissertatio de Spasmo seu Convulsione ejusque causis, in 4to. Tubingæ 1790.

Andreas, Dissertatio de Constitutionis ævi nostri spasmodicæ quibusdam momentis, in 4to. Erfordæ 1797.

Marx, De Spasmis. Hal. 1765.

Boehmer, de Spasmodum, &c. 1762, Hal.

Cooke on Nervous Diseases, 2 vols.

Fabricii de Spasmod., &c.

Hamilton on Purgatives.

of the muscular fibres of the gall-bladder and gall-ducts, those of the ureters and urethra, and those forming the sphincter of the bladder, has been denied by authors, whose great name and extensive information have given great weight to their authority.

In attempting to decide upon the opposing facts and discordant opinions upon the subject, an appeal to minute dissection, and to experiments upon living animals, was requisite; from which I trust it will appear in the sequel, upon a review of all circumstances, that every part of the passages for the food, the bile, and the urine, possesses a muscular structure, and is endowed with a muscular power of action. It is no doubt true, that the fibres of the muscular coat are not equally large; but in the passages for the food, in the pharynx, gullet, and stomach, they are quite obvious; whereas the longitudinal fibres of the intestines of many individuals are so small as to escape our most minute investigation; and with regard to the uriniferous canals, it may be added, that muscular fibres are in many persons obvious at the connections of the ureters and urethra with the bladder of urine, but invisible in other portions of the same canals.

No less contrariety of opinion exists as to the varied mode of action, and extent of action, of the muscles proper to the passages for the food, the bile, and the urine, which probably have a reference as much to the disposition* as to the magnitude of the muscular fibre.

Of the theories as to muscular contraction, it is not my intention to expatiate, but merely to state a few circumstances regarding it.

The muscular coats of the alimentary canal possess a great and very perfect degree of muscular power. Those of the stomach and intestines may be contracted to a great degree. The latter contract in so perfect a manner, as to propel air, and even quicksilver, through the tube, contrary to its gravity.

* See my Father's observations on the advantages which are derived from the oblique direction of the muscular fibres, and Sir E. Home's observations on the distribution and mode of action of the muscles of the heart.

According to physiologists, a muscle is capable of contracting itself to a third of its length; but there are several muscles of the human body which contract to a much greater extent:—Thus the sphincter oris may be extended, so as to include all the fingers, and the next moment it may be contracted upon a needle; and, in the same manner, the bladder is capable of containing 6 lb. or 8 lb. of urine, and in a short time, the whole of it, excepting a few drops, is expelled.

In forming an estimate as to the degree of muscular contraction, we must not, as Magendie observes, “confound muscular contraction with the modifications which it suffers in diseases, as convulsions, spasms, tetanus, wounds of the brain, &c.; we must also take care not to confound the contraction of which we are speaking, with the phenomena that the muscles present some time after death.”

By the contraction of the muscular coat of the alimentary canal, and that of the passages for the bile and urine, their contents are pushed onwards, and this contraction is speedily followed by relaxation: thus the coats of these organs are rendered subservient to their particular purpose. But when these passages are spasmodically contracted, there is, at least for a time, no degree of consequent relaxation. A spasmodic contraction occasionally takes place through the whole of the muscular coat of the stomach, or of the gall-bladder, or bladder of urine, but more frequently it is only partial, proper only to certain portions of the muscular coat.

The muscular structure of the alimentary canal has been well described by all the more modern anatomists, but the same remark cannot be extended to that of the biliary and urinary passages.

It has been above stated, that the passages for the bile are also provided with a muscular coat. On this point there exists some diversity of opinion. Sæmmering, one of the most distinguished anatomists of the present day, has observed, “*Fibræ musculares (vesiculæ felleæ) nullæ patent, saltem in nonnullis cadaveribus plane nihil fere cernitur, quod musculi aliquam præ se ferat speciem* *.

* Sæmmering De Corpor. Human Fabrica, tom. 6. p. 191.

The muscular structure of the gall-bladder has been denied, because it is not obvious to our imperfect senses; but if the gall-bladder adapts itself, on all occasions, to its contents, and assists in expelling these, and also contracts, in a living animal, when mechanically irritated (which I have seen take place, for the space of half an hour, by which it somewhat resembled an hour-glass), and if it contracts upon a small gall-stone, as firmly as the bladder of urine, we might, with as much truth, deny the existence of the muscular coat of the bladder of urine, as that of the gall-bladder.

In farther proof of the analogy between the structure of the gall-bladder and that of the bladder of urine, gall-stones within the gall-bladder give rise to a thickening of the muscular fibres of that organ, like stone within the bladder of urine.

The remarkable arrangement of the muscular fibres of the bladder of urine has been very differently described by different writers upon anatomy,—a circumstance which induced me to investigate this department of anatomy with every care, not only in the sound, but also in the thickened bladder.

After having made several laborious and minute dissections of the muscular fibres of the bladder of urine, I described at considerable detail, in my *Elements of Anatomy*, the remarkable disposition of the muscular fibres of that organ, and as that book may not have fallen into the hands of all the readers of this paper, I shall transcribe a considerable portion of it.

The *Muscular Fibres* of the bladder, in the healthy state, are flattened, of a pale colour, of a small size, and disposed in fasciculi, which cross each other in every possible direction, and completely surround the bladder.

When the bladder is distended, and the muscular fasciculi are elongated, these fibres are much separated from each other; so that the internal coat of the bladder is seen between them; but, when the bladder is empty, the muscular fasciculi of that organ approximate each other. These muscular fibres are not of an uniform size. Those which are external are the largest, and are disposed in a longitudinal direction. The smaller cross these.

I conceived it to be a matter of great moment to trace, with care, the direction of the fibres of the bladder, and especially of those fibres which are disposed around the neck of that organ, concerning the course and existence of which, very different accounts have been published by different anatomists.

The muscular fibres of the bladder arise from the prostate gland, and from two small muscles, which proceed from the ligaments of the prostate to the fore-part of the neck of the bladder. These fibres are composed of an inner and an outer stratum, which pass imperceptibly into each other*.

The fibres of the fore-part of the bladder are smaller than those of the sides. The fibres of the sides are flat, particularly those which follow a transverse direction, and form the inner stratum. Most of the fibres of the outer stratum are disposed longitudinally; others, however, run in a serpentine course, describing portions of larger and smaller circles.

The fibres of the upper part of the bladder are paler than those of the lower portion and neck; the superior fibres resembling, in colour, those of the stomach; the inferior, those of the œsophagus.

The muscular fibres of the anterior side of the bladder arise from the prostate gland, and from two small muscles of a triangular shape, extending from the ligaments connecting the

* “ Elle tient le milieu pour la couleur et l'épaisseur entre celles de l'estomac et de l'œsophage. Assez prononcée vers le bas-fond, entre les vésicules séminales et à la région supérieure, elle est par-tout ailleurs extrêmement mince. Elle est composée d'une grande quantité de petits faisceaux blanchâtres, aplatis et affectant diverses directions. Le plus grand nombre cependant est longitudinal, quelques-uns seulement sont transversaux. Ceux qui sont situés sur la ligne médiane paroissent monter de la prostate et du col de la vessie vers l'ouraque; les autres naissent des parties latérales de ce col, et viennent s'entrecroiser à la région supérieure. Quelquefois, ainsi que nous l'avons dit, ils se réunissent en colonnes cylindroïdes, entrecroisées, plus ou moins saillantes.”

“ Le col de la vessie n'est point environné par un muscle particulier, ainsi que le veulent plusieurs anatomistes, qui ont même appelé ce muscle *Sphincter*; les fibres charnues sont seulement plus rapprochées autour de lui qu'ailleurs; et elles y sont appliquées sur une couche d'un tissu blanchâtre, comme fibreux, ferme, élastique, extensible, qui se prolonge en s'amincissant jusqu'à la base du trigone, et qui court à former la saillie de la luette vésicale.”—See *Cloquet*, p. 617.

prostate gland to the under and inner part of the symphysis pubis. These triangular muscles are thin, of a deep red colour, and, on the inside, separated about an inch from each other. They are covered by the ligaments of the prostate, from the outer and under parts of which ligaments they take their origin. Like these ligaments, they are insulated, having on their outside the little depressions of the ilio-vesical fascia; and, on their inside, the membrane of the infundibulum, or digital cavity. They are separated at the fore-part by a large plexus of veins, and by the cribriform fascia, which divides them from the muscles described by Wilson. Their inferior surface faces towards the prostate gland, where there is interposed between the gland and the muscles a plexus of veins, formed by the branches into which the vena dorsalis penis divides, on passing through the cribriform fascia. Each muscle is divided by a few veins, into two portions, the superior and inferior; the superior deriving its origin from the upper part of the prostatic ligament, close to its connection with the symphysis pubis; the inferior, arising from the lower end of the ligament, contiguous to its attachment to the prostate. The superior fibres of this muscle of the right side pass backwards to the fore-part of the neck of the bladder, and, about an inch behind the prostate gland, cross over the corresponding fibres of the left side, spreading out on the lateral and fore-parts of the bladder. The inferior and largest portion of this muscle extends almost directly backwards, in the form of a triangle, the base of which is attached to the neck of the bladder, where it is intimately connected to its fellow. From this base, after being connected to its fellow by a few cross slips of fibres, it radiates in several directions. The most internal fibres run almost parallel to each other, and, with the fibres of the opposite muscle, proceed along the fore-part of the bladder, over other fibres, originating from the prostate. Some of these parallel fibres reach as far as the base of the urachus, into which a few are inserted. The most exterior fibres embrace the neck of the bladder, and mingle with those of the back part, where a few assist in forming the transverse fibres of the inner stratum.

Below, and a little to the outside of, this muscle, some scattered fibres, described by Santorini, appear, which arise from the fore and lateral parts of the prostate, encircling the bladder with numerous fibres, running chiefly anterior to the entrance of the ureters.

Between these muscles of Santorini, and a fasciculus at the back-part of the bladder (afterwards to be described), there are a number of fibres, extending from the posterior and lateral surfaces of the prostate, which, spreading out on the lower part of the bladder, form the very strong fibres that are laid over the bladder at the point where it is perforated by the ureter. Some very minute fibres of this portion are reflected upwards and backwards on the ureter, and seem to compose its longitudinal muscles.

A fasciculus of fibres, the largest and most prominent on the outside of the bladder, arises from the posterior of the prostate, at the point of its attachment to the seminal vesicles. This bundle proceeds backwards and upwards, in a longitudinal direction, increasing a little in breadth as it ascends to the middle of the bladder, where it divides itself into three portions, the two lateral and central.

From the middle of the bladder, the lateral portions commence, diverging forwards and upwards, in a curvilinear form, to the anterior of the bladder, whence they are seen passing downwards, in a circular direction, nearly as far as its neck.

The central portion extends upwards to a point situated about three inches from the urachus. Around this point they describe numerous circles on the summit and posterior part of the bladder, the most anterior fibres of which come in contact with the back of the base of the urachus.

On detaching the highly elastic mucous membrane from the inner stratum, we find, that it firmly adheres to the muscular fibres by bloodvessels, and a cellular tissue, which is short, compact, and remarkably white. The mucous coat dips into the depressions between the muscular fibres. Towards the neck of the bladder the membrane becomes gradually thinner and more transparent, adhering very closely at the trigone.

The muscular fibres of the inside of the bladder follow chiefly a transverse course, and they form distinct fasciculi at the back-part of the bladder, of a considerable breadth, being very much separated from one another; resembling, in this respect, the pectinated muscles of the right auricle of the heart. These larger columns are connected by numerous slips of fibres, so that they appear to intersect each other at different angles. By this intersection of the muscular fibres, various depressions are formed, giving to the inside of the bladder an irregular reticulated appearance. About two inches above and behind the openings of the ureters, the largest fibres run in a transverse direction, and between them are observed very distinct oval-shaped fissures. Towards the lateral and fore-part of the bladder they become smaller and pass more obliquely. Near the attachment of the urachus, the transverse and oblique fibres gradually diminish in size, converging to its base, on which they are lost.

A set of extremely fine fibres, of a yellowish colour, is placed on the trigone, proceeding from different directions, but chiefly from behind, forwards to its sides. They, at its margin, suddenly assume a small size, resembling, in fineness and minuteness of texture, the muscles described by Wilson. A very prominent set of the fibres proceeds, almost transversely, between the openings of the ureters. The rest of these fibres surround the under part of the neck of the bladder in numerous concentric layers, terminating at each side of the fore-part of the neck; from this they pass backwards in a curvilinear form, and are convex towards the centre of the trigone.

On the superior part of the neck of the bladder another set of fibres, redder and larger than those described, is observed, disposed in a circular, but opposite direction, around the upper part of the neck of the bladder, which are covered by the under set of concentric fibres. The exterior fibres diverge considerably towards the sides of the bladder, whereas the interior, after closely embracing the neck of it, are lost in the under concentric fibres, with which they are intimately intermixed.

The muscular fibres of the bladder of urine are also occa-

sionally spasmodically contracted in a general or partial manner.

The degree of spasmodic contraction excited by the presence of a stone in the bladder of urine and gall-bladder, is occasionally so great, that the stone and coats of the contracted organ are in immediate contact, and, in the former, a groove may be observed along which the urine flows. In the same manner, where death has been occasioned by strangulation, I have seen the bladder contracted into a small round or oval-shaped hard ball.

There is no canal in the human body so liable to spastic constriction as the urethra.

The muscular structure of the urethra, has been minutely described by Mr J. Hunter, Mr Wilson *, and Sir E. Home †.

Several arguments in favour of the muscular structure of the urethra may be adduced. When that canal is thrown into a state of inflammation by gonorrhœa, the urine is discharged in a small stream, or comes away by drops. If the penis be put into warm water, the spastic stricture is taken off, and the urine is readily discharged. If the stricture had been occasioned by the spasmodic contraction of the muscles of the perineum, the bougie would only be grasped in its passage through that part of the urethra which is opposite to these muscles, whereas it is grasped by the walls of every part of the urethra. The anatomy of the inferior animals affords a strong argument in favour of the muscular structure of the urethra, for in the horse and bull the muscular fibres of that canal are quite obvious.

Though, from the facts above enumerated, it appears to me that no doubt can be entertained as to the muscular structure of every part of the urethra; yet I have not been able, after the most minute examination, to detect muscular fibres connected with the mucous membrane of the human urethra, excepting in that portion of it commonly called the membranous, in which situation transverse muscular fibres are obvious

* Wilson's Lectures.

† Sir E. Home, Phil. Trans.

to the naked eye of the observer, after having dissected off Mr Wilson's muscle; and even when the urine could not have been expelled, except by an extraordinary effort, as in a very remarkable case which lately fell under my notice, in which the urethra had been completely obliterated, and the urine was discharged through a couple of canals, about the size of the lacrymal ducts, which opened on the surface of the glans penis.

CHAPTER II.

OF THE PARTIAL CONTRACTION OF THE PASSAGES FOR THE FOOD, THE BILE, AND THE URINE.

THE partial is more frequent than the general contraction of the hollow bowels, and is various as to its extent; in some instances so much so, that the stricture does not exceed a few lines in breadth.

Some very interesting circumstances regarding this partial contraction merit particular notice, from which it may probably be inferred, that certain portions of the muscular coat are much more irritable than others. For example, the spasmodic constriction of the gullet most frequently happens at the connection of that tube with the stomach; the cause of which cannot be explained on the principles of anatomy, as the same structure pervades every part of that musculo-membranous canal. The stomach is often contracted in or near to its middle, dividing the cavity into cardiac and pyloric portions, which are again sometimes subdivided into two or three distinct sacs, so that it somewhat resembles that portion of the intestinal tube called *the colon*.

A spasm which had been at first partial, in some instances becomes general over the whole muscular system; and it passes with great rapidity from one part to another. There is great diversity as to the duration of spasm; it is either permanent, remitting, intermitting, or periodical, and sometimes is so very

slight as to create only a kind of tremulous motion of the part affected, but at other times it is very intense.

It may be also remarked, that the intensity of the contraction varies in different parts of the body, as much as its duration. Thus the spasmodic contraction of the stomach is of short duration, but that of the gullet frequently lasts for many weeks.

This contraction of the middle of the stomach has been noticed by many anatomists.

Mr William Cowper has described, (in his explanation of his 34th plate), what he has named "*two bunches* in the lower part of the stomach," and Schneider and Blasius have made mention of cases, in which the stomach has been divided into three sacs. Riolan, Blasius, Morgagni, Larry, Walter, Ludwig, Hufeland, and Vander Kolk, have also described the contraction in the middle of the stomach. This contraction is either temporary or permanent; and, according to Morgagni, is connected with a derangement in the functions of digestion. It is most obvious in those instances where the stomach has attained an unusual size, and is probably only the result of that spasmodic counter action, which takes place at the moment of death, for, after the lapse of 24 hours, it goes off, unless it be the effect of disease; which holds true, also, with respect to the intestinal canal, the gall bladder, and bladder of urine.

The contraction in the middle of the stomach does not invariably go off; for in this, as in other instances, the temporary stricture sometimes lays the foundation of a permanent one.

Stricture sometimes takes place in the lower portion of the smaller intestine, but much more frequently in the lower portion of the larger intestine.

In a few cases the bladder of urine is so contracted as to form several sacs. We frequently meet with different portions of the bladder contracted around small stones; and the constriction is so very great, that the passage between the open cavity of the bladder, and the cyst containing the stone, is remarkably small. I have seen it of so small a size, as only to be capable of containing a hog's bristle.

There is no peculiar portion of the bladder in which these

cysts are found, nor is there any peculiar muscular apparatus which is adapted to bring about a contraction around the stone. Therefore, the muscular fibres of the bladder are of so irritable a nature, and so disposed, that they are capable of contracting around any stimulating substance which is applied to any part of the bladder. Mr Allan informed me, that he had met with an instance, in which there were two stones lodged within the bladder. One of these was readily removed by the forceps, but the other could not be extracted at the time: It therefore occurred, that, as the groping for a considerable time with the forceps in the bladder proves extremely dangerous, it would at the moment be more prudent to desist from further attempts to extract the stone, which was then very firmly grasped by the contracted portion of the bladder, and that the stone probably would come away of itself along with the urine, in consequence of the subsequent relaxation of the contracted part of the bladder. This accordingly happened, and the patient recovered.

A contraction sometimes takes place in *the middle of the bladder*, so that that organ somewhat resembles an hour-glass. I have had occasion to meet with two instances of this description. Both patients were of the same age, six years old, and both were afflicted by stone of the bladder, for which they underwent an operation. The one was cut according to the lateral method; the other by the high operation, by my colleague Dr Ballingall.

Both died after the operation; the one, who had undergone the lateral operation, survived it four days; the other, who underwent the high operation, died in the course of thirty-two hours. In both, the coats of the bladder were much thickened, so that the capacity of the bladder was much diminished, and in both there was no appearance of constriction in the middle of the bladder, after the lapse of a few days; and it may not be improper to add, that I could not detect any appearance of extraordinary thickening towards the middle of the bladder, the seat of the spasmodic constriction in either case.

The contraction of the gravid womb occasionally is so complete in its middle, that only a finger can be passed through

the contracted portion ; so that in order to extract the placenta, it is necessary to overcome the stricture, by passing one finger after another, through the contracted part. At length, the contraction is taken off, but the doing so gives considerable pain to the woman.

The vagina is also liable to a partial and spasmodic contraction, which sometimes takes place at its mouth, or towards its middle, and this is occasioned by the partial contraction of the sphyncter muscle, proper to that canal. The Fallopian tubes are also sometimes spasmodically contracted into a spiral form, by the partial contraction of their muscular coat. A partial contraction of a portion of the intestinal canal, of the biliary ducts, and of the urethra, also sometimes occurs, and it is a remarkable circumstance, that every part of the passages for the bile and the urine is not equally liable to spasmodic constriction.

The ductus communis choledochus, and the ureters, are most frequently constricted at their conjunctions with the duodenum and bladder of urine ; and, in short, the hollow bowels and canals proper to these, have a general muscular coat, but there is no peculiar apparatus for producing a partial contraction.

CHAPTER III.

OF THE CAUSES WHICH INDUCE A SPASMODIC CONTRACTION OF THE MUSCULAR FIBRES.

It would lead to a very long digression, totally foreign to the object of this paper, to enumerate the various causes which have been supposed to give rise to a morbid sensibility, or to what has been called the *nervous temperament*. The chief of these causes have been summed up by Dr Gregory in the following paragraph in his *Conspectus Medicinæ*, vol. i. p. 389. “ *Habitus corporis nimis sentiens, et nimis mobilis, homines spasmis opportunos reddit ; hinc malum foeminis, infantibus, debilibus, luxuriosis, desidibus, sanguine plenis, familiare.*”

The very intimate connection existing between the nervous

and muscular systems, renders it probable, that, in every case of spasmodic contraction, the nervous system is primarily affected. The spasmodic contraction of the passages for the food, the urine, and the bile, is generally excited in consequence of the application of a local stimulus, as by that of an extraneous body, by a calculus, a tumor, by worms, or by partial inflammation.

Spasm is likewise excited not only in the part to which the irritation is more immediately applied, but also in the more remote parts, in consequence of the application of a stimulus. Thus the spasmodic stricture of the urethra has been sometimes occasioned by the irritation of chirurgical operations, or by fracture or dislocation of the extremities.

The effects of local stimuli upon persons of different constitutions are very different. Thus, some have a call to make urine, when but a few ounces of that fluid is collected within the bladder, but others, not until the bladder has been considerably distended, from containing a pound or more of urine. This is to be attributed in part to the different degrees of irritability, and also to the influence of habit. Another proof of the different degrees of sensibility of the bladder, is, that the injection of tepid water into the bladder, has sometimes alleviated the excruciating torture occasioned by stone in this organ, and when the inner mucous membrane, perpetually irritated by the stone, was probably in a state of unnatural excitement, or chronic inflammation; whereas, on the other hand, the introduction of an instrument into the bladder, or even of tepid water, is to others intolerable, and a source of excruciating agony or fainting. It may be also remarked, that the severity of the symptoms of stone in the bladder of urine, is by no means proportioned to the roughness or smoothness of the surface of the stone. I have repeatedly seen those stones, which, from the extreme roughness of their surface, are called mulberry, extracted; and which did not before the operation excite greater uneasiness than a stone with a perfectly smooth surface. It may be added, that there are several well authenticated cases upon record, in which the coats of the pelvis of the kidney, and of the bladder, had so far

lost their natural irritability and sensibility, that stone has been found within these organs after death, when there was not even *the most distant suspicion during the life of the patient, of the existence of* such a cause of irritation *.

When a spasmodic contraction has taken place, it is occasionally considerably aggravated by different causes, and more especially by cold, or by an attack of inflammation, or by indulging to excess in wine or spirits. In the same manner, those afflicted by stone in the bladder of urine, are liable to paroxysms of pain after walking or riding. What has been above stated, applies also to the gullet. The muscular fibres of the gullet, even though not inflamed, sometimes become much more irritable than common, especially in women of a debilitated habit of body. Hysterical women are also subject to spasm of the gullet, to which the great distention of the stomach by wind contributes. Even young women, in whom there is no degree of globus hystericus, are subject to this kind of constriction, when exposed to a stream of air; and also, when the air is highly charged with the electrical fluid, as before, or during, a thunder storm.

In the erect posture, a greater effort is required in order to swallow solids than fluids; when the power of swallowing has been slightly impaired, fluids pass down, but not solids.

Though local stimuli be the most frequent causes of the spastic constriction of the muscular coat of the passages for the food, the bile and the urine, yet a cause diametrically opposite, the want of the usual stimulus, sometimes produces the same effect.

Thus the urethra has been, in the first place, contracted, and ultimately rendered impervious, when all the urine has passed through the canula of a trocar, which had been employed for puncturing the bladder above the ossa pubis; in the same manner as the muscles shrink after an attack of palsy.

* Vide Cooke's Edit. of Morgagni, vol. ii. p. 375.—Boneti, Sepulch. Anat. lib. iii. sect. 24.—Shenk. De Vesic. Urinaria, obs. 269.

By particular poisons, especially that of *hydrophobia*, the muscles acquire a morbid sensibility; and when reduced to that morbid state, their contraction is excited by causes which, in other circumstances, exert no influence over them. Thus, after the bite of a mad dog has been received, the muscles of the pharynx are thrown into immediate and violent contraction by the sight or noise of water, or by the application of a drop of water to the mouth.

CHAPTER IV.

OF THE CONSEQUENCES OF THE TEMPORARY SPASMODIC STRICTURE.

THE temporary spasmodic stricture, when of considerable duration, is frequently followed by a permanent organic stricture. Thus, gall-stones*, urinary and alvine concretions†, occasion a constriction of the passages within which they are imbedded, both above and below them, by which they are firmly fixed in a certain situation.

In the same manner, small calculi, entangled between the muscular fasciculi of the bladder of urine, occasion, from their stimulus, an enlargement of the muscular fasciculi of that organ, so that its inner surface bears no distant resemblance to that of the inner surface of the heart: thus those small concretions become very firmly fixed in their places, and the passage of communication between the small stone and the open cavity of the bladder is so much diminished in size, as only to admit a hog's bristle.

The portion of the canal above the stricture becomes very much expanded; after which inflammation, ulceration, and erosion follow. Thus bile or urine escapes into the abdomen, pelvis, or scrotum, and, from an unnatural communication having

* Vide Plate I. Fig. 2.

† Vide my Morbid Anatomy of the Gullet, Stomach, and Intestines, p. 62. and Plate III.

been established between the neighbouring parts, purulent matter passes from the gullet into the windpipe; or the urine is discharged through a fistulous opening into the intestinum rectum.

Another effect of an impediment to the free egress of the food and urine is the protrusion of the internal mucous membrane between the muscular fasciculi of the constricted intestine or bladder, which forms a considerable pouch communicating with the cavity of the intestine*, or bladder†. I have seen such herniæ of the internal coat of the bladder, considerably larger than the largest sized orange.

CHAPTER V.

OF SPASMODIC CONTRACTION OF PARTICULAR PORTIONS OF THE PASSAGES FOR THE FOOD, THE URINE AND THE BILE.

HAVING premised these remarks regarding spasm in general, I shall subjoin a few observations on spasm of particular portions of the alimentary canal, and of the biliary and uriniferous passages.

Of the Spasmodic Contraction of the Pharynx.

THE spasmodic contraction of the pharynx is much more rare than that of the gullet, if we except the cases of hysteria, in which it is very frequent.

The most violent and permanent degree of contraction of the pharynx, occurs in cases of hydrophobia. To illustrate the subject, I shall describe the case of a woman I visited, who,

* Vide Morbid Anatomy of the Gullet, Stomach, and Intestines, p. 405., and also Plate III.

† Vide Plate II., and Case in the Appendix.

on Thursday, 11th September 1797, was seized with symptoms of hydrophobia, about nine weeks after she had been bitten by a dog. On Saturday the symptoms were aggravated. Her looks had a strange mixture of wildness and timidity. She was perfectly sensible, but found great difficulty on attempting to speak, though, after some efforts, she was able to articulate distinctly, and her words were then uttered with extreme rapidity. On proposing to her to swallow any liquid, she appeared much frightened; and though, on repeated requests, she consented, yet the sight of the fluid never failed to excite strong symptoms of abhorrence, and *convulsions of her face and throat*. After waiting some time, till she could call up sufficient resolution, she carried the cup hastily to her mouth, turning away her eyes, and then gulped down the contents with inconceivable rapidity, *amidst violent convulsions of the muscles of her face, throat, and upper part of her body*. For some time afterwards, she continued much agitated and convulsed, with efforts to retch, much sobbing, and frequent anxious respiration. She talked in the intervals with great unconcern of the wound she had received in her hand, but complained much of the pain of her shoulder, at the same time insinuating, that it was only a rheumatic pain, to which, it seems, she had been formerly subject. Pulse 102, somewhat sharp, but not strong; skin very warm, but moist; tongue white and clammy, and she complained of thirst, but had no headache, or uneasiness about her throat.

About 11 A. M. on Sunday, her looks were extremely wild, at the same time expressive of great horror. When spoken to, she was immediately attacked by convulsive motions about the throat, which precluded any utterance. By degrees she recovered the use of speech, said she had no pain, but extreme thirst; her tongue was white and clammy; pulse, at first, above 100, presently, however, it sunk to somewhat above 80. When drink was offered her, the convulsions in the throat were immediately induced. Her looks and gestures were still more expressive of distress. However, she was persuaded to try to take a little gruel out of a spoon. This, after various efforts,

she snatched at suddenly, and gulped down with seemingly *great pain and distress, and violent agitation of all the muscles of her face and throat.* Such paroxysms were frequently renewed by the mention of any liquid, or any question or object, which caused any sort of surprise. But all the while she was completely sensible; and, in the intervals of the fits, gave a distinct account of her previous situation. On the evening of the same day, a spoonful of a draught composed of camphor, ether, and laudanum was prescribed; and, upon a spoonful being given, the convulsions became more violent than before; her breathing was more interrupted, long intervals being observed betwixt each successive inspiration, and her pulse sinking so low as hardly to be felt. By degrees she recovered; and, being raised again, she herself proposed to take another spoonful; this was accompanied with less commotion than before; but she then requested to be allowed some rest after the severe struggles she had undergone. At this time, it was very apparent that the glare of a candle, or any bright object, immediately caused the convulsions. I asked if she thought she could take a bit of bread, soaked in wine, to which she answered that it would not be amiss. Some little bits she afterwards got over, and the remainder of the draught.

11 P. M.—All the symptoms were more violent. Still, however, she was distinct; seemed very uneasy at first at my approach, as she dreaded another dose; was immediately startled and convulsed, when a candle was brought before her; said she could not bear the sight of it. When offered a bit of bread, with wine, entreated it might not be insisted upon, as she was sure it would not, did we know the painful struggles it occasioned to her. Her pulse was not to be felt; breathing more cut or interrupted; tongue white, and much viscid saliva appeared to have collected about the fauces; a cough, or some motion betwixt that and hiccup, much more frequent, and at times caused such a noise as might, by a lively imagination, be compared to the barking of a dog. An emollient injection was ordered; and, after the operation of it, an anodyne and foetid one. The former

was administered, but immediately returned, without any fœculent matter.

At 9 o'clock A. M. all the symptoms seemed aggravated; she had often short paroxysms of universal convulsions and tremor. Her pulse was not to be felt at the left, and hardly at the right wrist,—about 120. She often tossed about, started up in bed, and threw herself down again; the catching at her breathing incessant; often recovering, however, she presently recollected herself; said she had no pain; and, notwithstanding her seeming agony, could specify no particular distress. She asked for a mouthful of cold water, which she got over, in part, with violent struggles, and immediately cried out she was gone. She was, however, prevailed on to swallow a bolus of op. gr. ij., camph. gr. xv. This occasioned a similar paroxysm to that which had been induced by the water. She died two days afterwards.

Of Spasm of the Gullet.

SPASM of the gullet is partial or general; and the partial constriction is most common at the union of the gullet with the stomach. When the gullet has been partially constricted, the patient feels as if some extraneous body were lodged within it, accompanied with an ascent of air, which is owing to the stricture preventing it from passing off by eructation; and when the spasm is seated in the lower part of the gullet, the food is either retained for some time by the spasm, and then reaches the stomach, or it is rejected as soon as it arrives at the seat of the disease.

The symptoms of spasm of the gullet are very well marked. The patient suddenly, and without an obvious cause, loses the power of swallowing, accompanied by a sense of constriction of the fauces, which have a parched appearance. Whatever the patient attempts to swallow is rejected, when it arrives at the seat of the spasm. If the whole of the gullet be spasmodically affected, the food is immediately rejected as soon as it has passed the pharynx, during which the patient's body is much agitated. In consequence of the continuance of the spasm, great weakness

and emaciation succeed, from the small quantity of nourishment that is swallowed.

The seat of the spasm can only be accurately discovered by passing a probang, which is firmly grasped by the contracted part of the gullet, and cannot be passed into the stomach. Another circumstance respecting spasm of the gullet, which merits particular mention, is, that after the spasm has left the gullet, it sometimes attacks the muscular coat of the stomach.

A spasm of the gullet sometimes comes on very suddenly, while the subject of the attack seems in good health; and its duration is various; for, in some cases, it lasts only a few hours, but sometimes for many days, weeks, or years.

I was acquainted with an elderly gentleman who was twice, in the course of his life, seized with a spasm in his gullet, during dinner; and, upon both occasions, he lost the power of swallowing suddenly, and when he seemed to be in good health.

The first attack of the disorder lasted *only for a few hours*, and was removed by an anodyne clyster, but the second was of three or four days' duration, notwithstanding the repeated use of anodyne clysters, and other antispasmodic remedies. This patient, for ten years afterwards, enjoyed perfect health, and died from inflammation of the lungs.

In some cases upon record, the spasm was very readily removed, but in others it proved obstinate. Oysterdyck mentions a case in which such spasms lasted for twelve days. A case was communicated to me by my colleague Dr Home, in which the spasmodic contraction was of six weeks' duration; and Mr Aird has made mention of a case in which the spasm of the gullet continued through the whole course of a long life. A very singular and very obstinate case of a similar description occurred in our hospital in 1792, under the charge of Dr Rutherford. The patient, a young woman of 20 years of age, had long laboured under epilepsy, which was succeeded by palsy of one of her limbs, and imperfect vision of the one eye. She gradually lost the power of swallowing; and at length, upon attempting it, was seized with convulsive attacks. At first an attempt was made to support life by nutritious clysters, but afterwards it was found

that a whalebone probang might be passed into the stomach; upon which a tube, made of the elastic gum, was passed into the stomach, through which soups and milk were thrown, three times every day, into the stomach, for two years and eight months. The patient gradually recovered the power of swallowing, and enjoyed a tolerable share of health. She died in consequence of inflammation in her lungs. The gullet, upon dissection, was found perfectly sound.

The following important case of spasm of the gullet has been given by Hoffmann. A man, in consequence of excessive grief, was seized with spasm of the pharynx, and difficult deglutition, and felt as if some foreign body had been thrust down his throat. During the accession of the spasmodic contraction, the patient was subject to shivering and sometimes shaking of his extremities, constipation, formation of wind in his intestines, want of sleep, had hard pulse, and limpid urine. This disease lasted three months, with intervals between the paroxysms. When Hoffmann was consulted, he prescribed mucilaginous substances, combined with antispasmodic medicines, and chiefly his own anodyne liquor, to which remedies he added pediluvia, and soothing frictions on the outside of the neck; and, in this manner, he cured his patient in six months.

Of the Symptoms of Spasm in the Stomach.

SPASM sometimes pervades the whole stomach, or is limited to its apertures. Spasm of the stomach is occasioned by various causes. Stricture at the *cardia* is sometimes the effect of air contained within the stomach, as occasionally takes place in hysteria, dyspepsia, &c.

I visited a lady who suffered much from pain in the stomach, and great distention in the intestines, from eating a few slices of cucumber.

Baron Haller has related the case of a person who lost his life from inflation of the stomach, the effect of eating melons. My Father was consulted by a gentleman who suffered the most excruciating torture in his bowels and stomach, from distention,

occasioned by his having eaten a large quantity of nuts. The most acrid purgatives were given in vain : at length a stool was procured by the smoke of tobacco.

The symptoms of inordinate distention of the stomach are, acute pain in the stomach, difficulty in breathing, weak pulse, palpitation, which are sometimes followed by inflammation, or by sudden death. The spasmodic stricture of the pylorus is also often induced by the irritation of acrimonies of different kinds, and even by food of difficult digestion. Acute pain in the stomach is symptomatic of cancer of that organ ; occasionally of incipient menstruation ; of gall-stones in the gall-ducts ; and of stone in the kidney. Cramp in the stomach is also not unfrequent in gouty persons, and from bulimia.

I had occasion to examine the body of a woman, who, when eighteen years of age, suddenly became giddy, and was seized with nausea, vomiting, and fluttering at her heart. She was somewhat relieved by vomiting. Body in general regular, though sometimes she had bilious diarrhoea. Her appetite then became inordinate. Her usual food was oatmeal porridge, and of this she used *to take about six English pints per day, and about a bottle of porter.* She generally rejected a part of her food, but as soon as the vomiting ceased, her desire for food returned so violently, that she was unable to resist it. A spasm of the pharynx often prevented her food from reaching the stomach ; she was then tortured by the most intolerable hunger. She died from apoplexy.

The stomach and intestines were found to be in every respect natural.

Of Spasmodic Contraction of the Intestines.

A spasmodic contraction of the intestinal canal sometimes takes place, and gives rise to colic, which is excited by a variety of causes. Various species of colic have been enumerated by authors:—the *Colica stercorea, flatulenta, Pictonum, spastica, biliosa, accidentalis, phlogistica, scirrhusa, herniosa, dysenterica, calculosa, verminosa, hæmorrhoidalis, arthritica, scorbutica,*

nephritica, and *hepatica*. Much pains have been taken to distinguish these very different kinds of colic, and also the place of the contraction of the intestines. The *Colica stercorea* is said to be distinguished by the sense of weight and fulness in the bowels, and by the constipation which has preceded it. The *Colica flatulenta*, by the intestines being much stretched by air, by their elastic feeling, by the rumbling which the air passing from one part of the intestines to another creates, by the pain in the belly changing its place, by the relief which the discharging of the air upwards or downwards gives, and by the constipation; and this species of colic has sometimes been said to be the cause of the umbilical hernia. The *bilious colic* has been supposed to be distinguished by the acute pain it creates, though the abdomen be not tense, by the bitter taste in the mouth, bilious vomiting, by its exacerbations and remissions, by the pulse being somewhat accelerated, and by its tendency to pass into cholera or inflammation of the intestines. The *symptomatic colic* is distinguished from the *idiopathic*, by the previous history of the case. It has been supposed to be possible, from the symptoms, to discover the seat of the unnatural contraction of the intestines. Thus pain at the navel has been supposed to be characteristic of contraction in the jejunum or ilium; nervous oppression, torpor, inclination to sleep, when the stomach is empty, occasional distention of the abdomen, pain in the right side, which is occasionally very great, and which stretches to the back, and occasionally to the top of the right shoulder, and which changes its place upon the expulsion of air, slight yellowness of the eyes and countenance, with an irregular and soft pulse, the contraction of the duodenum; and pain in the right side, stretching upwards to the region of the liver, that of the caput cœcum coli.

Sauvages has made, what appears to me, a very just observation respecting the diagnosis of the different kinds of colic: “Cum intestinum tenue et crassum diversas sedes occupet, et diversis visceribus abdominis contiguum sit, difficile est ex sensu ægrotantis partem affectam determinare, et errare in hoc assignando quotidianum est;” besides, though the seat of the

constriction could be ascertained, that circumstance does not alter the method of treatment.

A languid, dejected, or maniacal expression of countenance is very characteristic of the colic occasioned by the poison of lead or of copper. There is also giddiness, dimness of sight, loathing of food, pain at the pit of the stomach, occasional nausea, and bilious vomiting, costiveness and severe colic. The patient becomes more costive, as the sickness, bilious vomiting, and pain in the bowels increase.

Upon the vomiting ceasing, the pain abates, and hiccup comes on; but the pain soon returns, and often extends to the region of the navel, to the back and loins, and even to the legs; the muscles of which are in some cases painful on pressure. The pathognomonic symptoms of the painter's colic, are the acute twisting pain about the navel, which is not increased on pressure, the dragging inwards of the parietes of the abdomen, which, when pressed, feel hard or knotty, tenesmus, and obstinate costiveness.

The sphincter muscles of the bladder and anus are in some cases much contracted, and prevent the discharge of the fæces, and also occasion difficulty in passing the urine. The above symptoms are generally of several days duration. Towards the conclusion of the disease, the patient suffers from griping, has a disposition to go to stool, and discharges a quantity of fæces in the form of hard balls, like sheep's dung, mixed with a viscid mucus or blood.

If the patient be exposed to cold, or gets his shoes wetted, or is inattentive to his diet, the colic returns.

When this disorder has been neglected, or improperly treated, it lasts for several months, in some instances, for years, and terminates in a palsy of the upper extremities, in weakness, or loss of voice, in amaurosis, deafness, or epilepsy.

In this chronic form of the disease, the patient has only short intervals of ease. The palsied arm or leg shrinks very much, the muscles lose not only their natural size, but also their natural structure, and have been found converted into a suety substance.

Upon dissection, the intestines are found to be alternately contracted and dilated. The *Colica Pictonum* proves, in some cases, a more acute disorder; the tenesmus and pain in the belly being speedily succeeded by quickness of the pulse, heat in the skin, acute headache, hiccup, retching, bilious vomiting, delirium, and apoplexy, and, in a very few cases, this disease leads to inflammation and gangrene of the intestinal canal.*

Of the Spasmodic Contraction of the Biliary Duct.

A spasmodic contraction of the biliary ducts is frequently induced by biliary concretions being lodged within these. Spasm

* The following is a list of authors upon the different kinds of colic:

Alberti (Michael), *De Colica Hæmorrhoidali*.—*De Colica Hæmorrhoidali in Passionem Iliacam inclinante*.

Troxel (Franc. Mathias), *De Colica Spasmodica Scorbatica*.

Hartleben, *De Ileo Maxime per Spasnum*.

Barthey (P. J.), *Nouvelles Observations sur les Coliques Iliques, qui sont essentiellement nerveuses*. *Memoires de la Societe Medicale d'Emulation*, vol. iii.

Alberti (Henrie), *De Colica Passione*.

Vater (Abraham), *Diss. De Passionibus Colicis et Iliacis prudenter avertendis et curandis*.

Hoffmann (Frid.), *De Intestinorum Doloribus*.

Hernandez, *Trattato del Dolor Colico*.

Dahlhausen (Abrah. Henrie), *Diss. De Doloribus Intestinorum vulgo Colicis dictis*.

Hartmann (Petr. Innman), *De Cardialgia Colicaque funesta ab ingestis orta*.

De Bordeu (Theophile), *Recherches sur le Traitement de la Colique Metallique à l'Hôpital de la Charité de Paris*, 16th et 23d volumes of *Journal de Médecine*, rédigé par MM. Vandermonde et Roux.

Baker (Sir George), *Essay concerning the cause of the Endemial Colic of Devonshire*.

Atwek (Thom.), *The Endemial Colic of Devonshire, caused by a solution of lead in the cyder*.

De Haen (Anton) *De Colica Pictonum*.

Ludwig (Christ. Gottlib.), *De Colica Saturnina*.

Mérat (F. V.), *Traité de la Colique Metallique, vulgairement appelée Colique des Peintres, des Plombiers, de Poitou; avec une Description de la Colique végétale, et un Mémoire sur le tremblement des doreurs sur metaux*.

of the biliary ducts, or of the duodenum, has been stated by authors to be a very frequent cause of jaundice.

But, in my opinion, the frequency of this cause has been very much overrated. I do not entertain the least doubt as to the muscular structure or muscular power of these ducts; yet they seem to possess the contractile muscular power in an inferior degree to the ureters, for stimuli applied externally to the gall-bladder, or to the common biliary duct of a living animal, do not excite such an evident motion or contraction, as takes place in the ureter.

Biliary concretions are very different in point of size, shape, and colour, as to their surface, and also as to their chemical ingredients. Of these several characters of biliary concretions, it is not my intention to enter into detail. I shall content myself merely by stating, that some biliary concretions are of so small a size as readily to pass through the biliary ducts, even where they retain their natural caliber, but others are so large, that, unless the ducts be of an extraordinary size, they must be retained within the biliary ducts. It is very remarkable how speedily the biliary ducts attain an unnatural bulk, after they have been obstructed. My Father made several experiments upon animals, in order to determine this point, and found, that, in the space of a few days, after throwing a ligature around the common biliary duct of a living sow, the ducts became ten times at least larger than in their sound state. Gall-stones are most frequently found at the entrance of the common duct into the duodenum, as at that place that duct is of a smaller diameter than elsewhere.

Gall-stones, however, sometimes stick in other portions of the common duct, and prove the cause of an irregular and inordinate contraction of that canal, as in Fig. 2. of the annexed engraving, Plate I. Gall-stones, while passing through the cystic duct, create pain and sickness of stomach, and also an unnatural slowness of the pulse; but do not prove a source of jaundice, as no more bile can be returned into the blood than that contained within the gall-bladder.

It is possible that, in consequence of the conical form of the

biliary concretion, the bile may find its way into the gall bladder, but that the progress of the bile into the duodenum is interrupted, the gall-stone acting as a valve; thus the gall-bladder is repeatedly filled with bile from the common duct, and afterwards emptied by the absorbing vessels.

It may also happen, that, owing to the irregular shape of a biliary concretion, the same stone may, by accidental pressure, and by the flow of the bile, change its place within the common duct so much, as to interrupt or admit of the flow of bile into the duodenum in an irregular manner; and hence occasion the mistake of supposing that the jaundice is to be imputed to a succession of small stones, or to spasm, according to Lieutaud *. Lumbrici have also proved a cause of jaundice.

Gall-stones, impacted within the common biliary duct, create very acute lancinating pain at the pit of the stomach, which is limited to a small spot, accompanied by nausea, retching and vomiting,—and sometimes by colic, and pain at the top of the shoulder, and costiveness. Soon thereafter, the skin acquires a yellow hue, and also the different secreted fluids; while the fæces have neither their healthy smell nor colour. Notwithstanding the acuteness of the pain, it seldom or never gives rise to quickness of the pulse, or to inflammation.

I have frequently observed the above symptoms preceded by a sense of coldness and shivering.

A patient afflicted by the above symptoms, always sits up in bed, and with the body inclined forwards; he cannot bear to lie down, which aggravates the symptoms. In consequence of the duration of the disease, the body becomes much emaciated, and the yellow hue of the eyes is converted into a greenish black tint.

Of the Symptoms of Spasm in the Bladder of Urine.

Spasm in the bladder may, as above stated, proceed from various causes. The earlier symptoms of the disease are, a dull pain,

* Hist. Anat. Mem. tom. i. p. 211.

accompanied by a sense of constriction in the organ affected ; and this pain extends along the ureters, to the kidneys, loins and thighs. An itching of the glans penis, and frequent erections of the penis, are not unfrequent. The contracted bladder, by pressing upon the rectum, impedes the exit of the fæces, which is followed by pain in the belly, and considerable distention of the bowels. Owing to the continued impediment to the passage of urine, the valvular communication of the ureters is forced, and the urine regurgitates, and distends these canals, which is denoted by acute pain in the region of the kidneys. The patient has at the same time urinous sweats, and even his breath smells of urine. The spasm is sometimes succeeded by inflammation of the bladder, and, on other occasions, by giddiness, and by apoplectick symptoms.

Of the Symptoms of the Hour-glass Contractions of the Bladder.

There are some symptoms which are characteristick of this peculiar state of the bladder. When a catheter is passed, only a few ounces of urine are discharged, because, by that instrument the contents of the lower cavity only are drawn off ; and hence, by an accurate examination, a tumour may be always felt above the ossa pubis.

The late Dr Clark, however, informs us, that being aware of the contraction in the middle of the bladder, he passed a gum elastic catheter through the contracted portion, and thus drew off urine from both cavities of the bladder.

When the patient stands up, the upper chamber is sometimes emptied by the involuntary discharge of urine.

In the case which lately occurred in our hospital, under the charge of Dr Ballingall, the patient, a boy of five years of age, was said to have passed his urine with difficulty, and after having suffered excruciating pain when he was at the breast, and for some years afterwards,—but after his admission into the hospital, he passed his urine in a full stream to the extent of six ounces, and apparently without pain, and has also passed it frequently unobserved during the night.

In that case there was great difficulty in distinguishing the stone within the bladder,—one surgeon could not recognise it, and those who felt the stone (which proved, after having been extracted, to be a very large one *) supposed it to be very small; and it was only by introducing the forefinger of one hand into the rectum, and pushing it forwards, in the manner practised by Mr Allan, that the large size of the stone was discovered, through the parietes of the abdomen lying above the brim of the pelvis.

Of Spasm of the Neck of the Bladder.

A retention of urine is occasioned by a spasmodic contraction of the neck of the bladder, which is frequently combined with inflammation, or with gout. The bladder is a very irritable organ, and has a great degree of sympathy with the neighbouring organs; and hence spasm in the neck of the bladder is induced, not merely by stone, ulcer of the bladder, the tincture of cantharides, and other acrid, diuretic medicines, but also by stricture of the urethra, virulent gonorrhea, bruises on the perineum, inflamed intestines, fistula in ano, piles, and also from the menses being accumulated behind an imperforated hymen.

Of the accompanying Symptoms.—When the neck of the bladder is spasmodically contracted, the perineum is to the touch tense and hard, and painful when pressed, the bladder is much distended, and the patient has very acute pain in the region of the neck of the bladder, and, after a violent effort, the urine comes off by drops.

When inflammation accompanies the spasm, there is fever, accompanied by acute burning pain in the perineum and hypogastric region, which is much increased on pressure. The passing a catheter creates great pain, and is often impossible. The body is much constipated, and there is considerable tenesmus.

* “The stone (says Dr Ballingall) was of an irregular plum shape, weighing, exclusive of many fragments, 13 drachms 1 scruple,—measuring, in its longitudinal diameter, upwards of 2 inches, and in its transverse diameter $1\frac{1}{2}$ inches.

When the inflammation has been of a few days duration, vomiting comes on, which is succeeded by drowsiness, and sometimes by delirium. The inflammation of the bladder sometimes ends in the discharge of purulent matter, and hectic fever.

Of the Spasmodic Contraction of the Urethra.

The longitudinal folds of the urethra are much more conspicuous in some than in other individuals. Mr Wilson's description and figure of these was taken from the urethra of a man who had suffered a violent death; but it does not appear to me, that Mr Wilson has proved these folds to be occasioned by the contraction of any set of peculiar muscular fibres, disposed on the mucous membrane which lines the urethra; and it may be added, that the longitudinal folds of the urethra, which have been supposed by Mr Wilson to be muscular fibres, and which pass along it in an irregular manner, are much less conspicuous after the urethra has been steeped in water, than immediately after death*.

The canal of the urethra being exposed, like other muscles, and also from peculiar function and peculiar situation, and from its sympathy with the bladder of urine, rectum, and prostate gland, to many causes of irritation, is very frequently spasmodically constricted; and the extent of the contraction is very various in different instances. If the contraction be partial, the urethra is affected in the same manner as if a tight ligature had been put around it.

The inordinate contraction of a part of the urethra is sometimes followed by a certain degree of relaxation, or spasm takes place in its more aggravated form, from indulgence to excess in wine

* Since the preceding sheet was printed, I have examined the structure of the urethra of the bear with attention, and remarked, that, in that animal, the folds upon the inner membrane of the urethra are larger, and more nearly of an uniform size, than in the human body. The animal had been poisoned by arsenic; an ounce of the white oxide had been given. Six hours elapsed before the animal died; but I could not in this instance see the muscular fibres beneath the mucous membrane of the urethra.

or spirits, from too frequent intercourse with women, from great bodily fatigue, or from external violence, or from the application of a blister, or from any cause which excites inflammation, as from astringent injections, or from small calculi being arrested in their progress through the urethra. The spasmodic stricture is more frequent in certain parts of the urethra, and especially beyond the bulb.

Of the accompanying Symptoms.—The patient has frequent calls to pass urine even at the commencement of the disease, and the stream is evidently less than in the sound state. In the progress of the disorder, the stream of urine assumes a spiral or forked form ; or in the more severe cases, is discharged in small jets, or dribbles off, which is accompanied by uneasy sensations in the neck of the bladder ; and at length, little or no urine can be passed, even after much straining ; and if any can be passed, it is tinged with blood. Thus the bladder is reduced to a very irritable state.

This aggravated form of the disease is accompanied by shivering fits, succeeded by heat, and flushing of the face, and sweating ; or by symptoms somewhat similar to those of an ague. The symptoms are occasionally more severe, as a degree of spasmodic stricture accompanies the permanent one ; which latter is frequently the sequel of the former.

Of the Means of Cure.

In order to remove the spasmodic contraction of the passages for the food, the bile, and the urine, it is necessary to remove the cause of the irritation, if possible.

When much pain and irritation exist, the detraction of blood, and the use of a tepid bath, should precede the use of opium, and other antispasmodic remedies. Spasm is often combined with inflammation, and more especially when the bladder is spasmodically contracted, by the irritation of a stone lodged within it. If the patient be young and plethoric, the lancet proves highly beneficial ; but if he be far advanced in life, and of a debilitated habit of body, in consequence of having been

long afflicted by stone, or some other disease of the bladder, leeches are to be preferred. If leeches cannot be procured, the application of cupping-glasses to the loins has the effect of facilitating the introduction of the catheter, when its progress has been impeded by a spastic constriction of a part of the urethra. If the spasm be seated in the neck of the bladder, ureter, or urethra, the application of a number of leeches to the perineum is useful, together with the warm water clyster, and the liberal use of warm diluent and demulcent liquors, as linseed tea, or the decoction of althea; thus the acrimony of the urine is mitigated, and the spasm removed.

In the gall-stone jaundice, the patient experiences great relief from bladders, filled by warm water, applied to the pit of the stomach. Of all antispasmodic remedies, *opium is undoubtedly the best, and it is to be given by the mouth, or in the form of clyster, and in large doses.* This remedy is of singular efficacy in spasmodic attacks of the gullet and intestines, in the gall-stone jaundice, and in the case of small stones lodged within the bladder of urine; and its antispasmodic virtue is very much increased, when combined with the warm bath, the temperature of which ought to be about the 96° of Fahr.; and it is necessary that the patient should remain in the bath for nearly an hour, in order that the remedy may have its full effect.

Before introducing an instrument into the urethra, and also before the operation of lithotomy, it seems to me to be always advisable to give a large dose of laudanum, not only to mitigate the excruciating pain of that operation, but also to facilitate the discovering the stone, and its extraction from the bladder; in the same manner as the application of the infusion of the extract of belladonna to the eyebrow or eyelids facilitates the extraction of a cataract.

The stone within the bladder is sometimes grasped, and firmly retained, by the contraction of the muscular fibres, after an incision has been made into that organ; but if a large dose of laudanum has been previously given, the extraction of the stone will be easily accomplished, and the danger of pinching the

bladder by the forceps (which is frequently the cause of inflammation of that organ) is averted.

The use of laudanum, also, removes those sympathetic sensations in distant parts of the body, which are excited by any great irritation in the vicinity of the neck of the bladder of urine.

After the types of this paper were set, I received the following very important communication from Mr Allan, which affords a striking illustration of the preceding observations.

I was present at the operation lately performed on the young boy by Mr Allan, in which the dexterity of the operator was no less conspicuous than his coolness and sound judgment.

“ 57. YORK PLACE,

“ DEAR SIR,

June 20. 1826.

“ You will no doubt recollect of having been present, ten years ago, at an operation of lithotomy, performed by a young surgeon, on which occasion I acted as his principal assistant. The bladder was soon cut into, and a stone of some magnitude readily extracted ; but we were conscious of the presence of another stone, although the operator, after the repeated introduction of the forceps, failed to extract it. The difficulty of extraction arose from the bladder spasmodically contracting upon the stone, and thus preventing the forceps from coming into contact with it. I introduced my finger into the wound, and felt a stone above the pubis, which was firmly held in this situation by the spasmodic contraction of the bladder. I could just reach the stone, and turn it round and round, but my finger was too short to dislodge it. As the operator was not provided with a lever, or with curved forceps, I advised that the patient should not be kept longer upon the table, but that he should be put to bed, and that as the opening was free, when the spasm of the bladder was relaxed, and suppuration established, there was little doubt but that the stone would be easily extracted ; whereas, by persisting in fruitless attempts to extract, the patient would be so much exhausted, that his dan-

ger would be thereby greatly increased. The patient was therefore laid in bed, and when I went to visit him, along with his surgeon, on the evening of the third day, I introduced my finger into the wound, and hooked out, with the utmost ease, a stone about the size of a turkey-bean, which was lying in the inner opening. The patient recovered without one bad symptom, and this operation I have frequently revolved in my mind, and kept the case in view, as a guide in similar circumstances.

“ In a conversation which I lately had with you, respecting the spasmodic action of the bladder, you observed, that you thought this untoward circumstance might be, in a great measure, or altogether prevented, by exhibiting a tobacco clyster, or giving a large dose of opium, a short time before the operation, and you suggested the propriety of this practice. My objections to the tobacco-clyster are, that we can never exactly know the extent of its influence on the system ; a quantity which, in one person, will produce little effect, will, in another, depress the powers of life to a dangerous degree ; and, as far as my experience goes, patients with strangulated hernia, who have received the tobacco-clyster, previous to being subjected to an operation, never recover so well as those to whom it has not been administered. I should therefore give the preference to the opium.

“ On the 31st of last month, a boy, three years and a half old, presented himself with stone in the bladder. From the irritability of system incident to this period of life, from the rectum being prolapsed immediately on the sound being introduced into the bladder, and from the obstruction which I experienced in passing the instrument through its neck, when this viscus was empty, I was prepared for some difficulty in the extraction, and therefore judged this to be a proper case for the trial of the opium. I ordered the patient to be placed upon a milk and vegetable diet, to be immersed in the warm-bath at bed-time, for several nights in succession, to have five minims of laudanum each night, and his bowels to be kept freely open by laxatives. The rectum was washed out with tepid water, on the

morning of the operation, and two hours before cutting, he had a draught, containing fifteen minims of laudanum.

“ On the 6th of June, I performed the lateral operation with the knife ; and, on passing my finger into the bladder, readily felt a stone, but I had no sooner introduced the forceps than it disappeared. This repeatedly occurred ; and it is worthy of remark, that if I withdrew my finger for a minute, on again introducing it I readily felt the stone ; but when I moved my finger freely within the cavity of the bladder, it was as effectual in exciting spasmodic action, as when the forceps was introduced. I changed the posture of the patient, and injected some tepid water, but with no advantage. I now ceased to introduce any metallic instrument, and after the bladder had remained for a little while quiescent, again introduced my finger slowly into the wound, when I felt the stone above the pubis held in the contracted folds of the bladder. On attempting to hook the stone, it fell down to the lower and anterior part of the bladder. I then put my finger upon it, passed along the finger a small lever, which I had got made for the occasion two days before the operation, and, with the assistance of another finger in the rectum, easily turned out a rough stone, the size of a French olive.

“ It is just a fortnight to-day since the operation : for the last few days all the urine has been passed by the urethra, and the wound is completely cicatrized. During last night the boy made water only twice, he is now running about, and is in every respect well.

“ *Quære.*—When the incisions are free, and the delivery of the stone prevented by the spasmodic contraction of the bladder, as this will not relax till the patient is exhausted, and brought into danger, is it not the preferable practice to put the patient to bed, instead of employing force, or persisting in fruitless attempts at extraction ? “ *S’il est de l’honneur du chirurgien (says Le Dran), d’oter la pierre, son honneur est encore plus attaché a la guerison du malade. Que pourroit on penser, d’un lithotomiste, qui ne manqueroit jamais d’oter la pierre,*

mais dont tous les malades periroident par l'inflammation, dans les premiers jours de l'operation ?

" I am, dear sir, yours most faithfully,

" ROBERT ALLAN."

" *To Alexander Monro, M. D. Professor of Anatomy
and Surgery in the University of Edinburgh,
&c. &c. &c.*"

The *tinctura muriatis ferri*, as a means of removing spasm of the urethra, was introduced into notice by Mr Cline. He prescribed ten drops every ten minutes in a glass of water, until the urine comes away in a stream. When administered in the mode above mentioned, it powerfully affects the stomach, and from sympathy the other parts producing syncope, or a very near approach to it. This remedy has no effect, excepting in pure spasm.

Camphor is of peculiar efficacy in spasmodic disorders, when administered in large doses, according to Hoffmann and Pinel.

The former laborious physician has related the case of a hypochondriac, who, when in a very despondent state, on account of the death of his wife, was attacked by spasmodic constriction of the larynx, and top of the gullet. He could neither speak nor swallow, and breathed with difficulty. The spasmodic constriction of the gullet continued with great obstinacy; and if, by any chance, a portion of food slipped over the pharynx, it was immediately stopped, and prevented from entering the stomach. The patient was advised to take a mixture, containing 30 grains of camphor, with some olive oil, at intervals; but, by some chance, he *took it all at one dose*, by which he was completely cured.

Pinel prescribed camphorated liniment, consisting of a drachm of camphor, to an ounce of olive oil, as a remedy for a woman of 60 years of age, whose gullet was spasmodically contracted, which had been of six months duration. The patient *took the whole of the liniment at once, and was thereby cured.*

Blisters, and other external applications, are useful in the spasmodic contraction of the urethra, and of the stomach; but their effect is far inferior to the remedies which have been already mentioned; and it may be added, that, though blisters sometimes produce strangury, they remove the spasmodic contraction of the urethra.

Electricity, judiciously employed, is a remedy, which I have seen of singular efficacy in some spasmodic affections of the gullet.

Spasm of the urethra is often removed by the introduction of a *bougie*; but, if that instrument does not pass readily, it should not be forced forwards, but allowed to lie for five or ten minutes within the urethra, after which it is to be gradually pressed onwards; and, if it be introduced into the bladder, it should be allowed to remain there, till the patient has a desire to pass his urine; and when he is under that forcible contraction of the bladder, the *bougie* is to be withdrawn, and the stream of urine will follow it.

It is proper also to notice the great danger of inflammation of the bladder, and even of suppuration of that organ, when the surgeon has delayed too long to draw off the urine. In the earlier part of the disease, the introduction of a *bougie* is sufficient. The urine will flow as soon as the instrument is withdrawn; if that does not suffice, the elastic gum catheter is to be employed; and, as the late Mr Hey of Leeds has well observed, it should be introduced with the greatest gentleness. "When any obstruction occurs, the design of the surgeon should be to evade rather than overcome it. Unsuccessful attempts may render a case extremely difficult, which was not so before *."

I wish to impress upon the mind of my reader, that a moderate force, improperly directed, is capable of injuring the urethra in such a manner, as to render the operation almost (and without a just knowledge of the injury) if not altogether impracticable. He has concluded, by the following very judicious observations on the early introduction of the catheter. "Delay is not only fruitless in general, but also renders the operation more dange-

* Hey's Surgery.

rous, as well as more difficult, and usually protracts the completion of the cure. Besides, the great danger of inflammation which the bladder suffers, when the extraction of the urine has been long delayed, brings on a suppuration in the part. I have seen many instances of this. The retention, indeed, has been cured, but a discharge of purulent matter has succeeded, and the patient has died tabid."

When the bladder has been divided near to its middle into two sacs, by the spasmodic contraction of a portion of its muscular coat, and when a stone has been lodged within one of these, which proves a cause of very acute pain, and other violent symptoms, (as in the case I lately saw in the hospital, under the charge of my colleague Dr Ballingall), it becomes necessary to have recourse to an operation; and I beg to refer my reader for further information on this head to Dr Ballingall's observations on the case above alluded to, which have been published in the second volume of the Medico-Chirurgical Transactions of this place.

ALVINE CONCRETIONS are occasionally retained for some time within the rectum by a spasmodic contraction of that bowel, and while in that situation, they create great pain when the patient is sitting, or when he goes to stool.

In the more fortunate cases, after the concretion has remained for some time in such a situation, it is discharged by stool; but in other cases recourse must be had to the injection of warm olive-oil, and to the forceps,—as in the following case, which was communicated to my Father, by letter, by Mr R. Marshall, surgeon at Peebles.

"DEAR SIR,—I herewith send to you two concretions or stones passed, I may rather say extracted, from the rectum. The patient, a lad of 17 years of age, says he has been in bad health for six years. He sent for me to the country lately, in a great hurry, to take away some hardened excrements, which he could not pass. He thought he must die instantly. After throwing up some warm oil, I extracted by the forceps one of the stones, and the other came away soon after without assistance. I am, Dear Sir, &c. ROBT. MARSHALL."

SMALL URINARY CALCULI sometimes stick within the urethra of the male, and prove a source of great uneasiness.

By the application of warm flannel to the penis, or by immersing the penis for some time in water, and then injecting warm oil, the small stone or stones are sometimes discharged.

Stones in the urethra excite sharp pricking pain, and are obvious to the touch, or upon introducing a sound into the urethra. Different kinds of forceps have been contrived by Hales, Sanctorius and others, for extracting small stones from the urethra ; but these are far inferior to the instrument for dilating the urethra by Weiss. Upon the dilatation of the urethra, the subsequent ingenious observations occur in Leroy's *exposé* of the different methods of removing urinary stones.

“ Il est très-difficile de maintenir ce dilatateur dans un état de distension, ainsi que Ducamp lui-même l'avait observé. D'ailleurs, on peut, contre ce moyen, diriger un reproche semblable à celui que ce médecin faisait aux sondes et aux bougies cylindriques ; même ce reproche serait plus grave ; car, si les bougies et les sondes cylindriques distendent non-seulement le rétrécissement, mais encore la partie saine du canal, le dilatateur distend plus encore cette portion saine que la coarctation elle-même. Voulant, au mois de septembre dernier, me servir du dilatateur pour un rétrécissement situé à deux pouces et demi, je ne pouvais parvenir à maintenir le boyau de chat dans un état de dilatation, bien que j'y eusse poussé de l'air, puis de l'eau, ainsi que le conseille Ducamp. Je m'avisai d'un moyen qui me réussit dans cette circonstance et dans une autre semblable, l'un et l'autre rétrécissement existant près de l'entrée du canal. Je pris un bout de sonde de femme en argent, long de trois pouces, qui se trouva sous ma main. Après avoir égalisé, avec la lime et poli son extrémité fracturée, j'introduisis dans sa cavité le bout du boyau de chat que j'avois porté avec le stylet dans le point rétréci. Je fis une injection d'air ; je nouai solidement l'ouverture du boyau ; glissant alors sur lui la canule, je refoulai le fluide élastique et, augmentai la distension, agissant sur cette poche comme le serre-nœud de Desault sur le fil qui embrasse la base d'un polype, et graduant à volonté la distension du rétrécissement, de même qu'avec le serre-nœud on

augmente la constriction du pédicule de la tumeur. Cette modification, quoique très-peu importante, m'a paru avoir quelque avantage : elle simplifie l'appareil destiné à l'emploi du dilateur ; elle rend son action plus certaine, plus circonscrite, et, de plus, elle permet d'augmenter graduellement la dilatation avec la même quantité d'air ou de liquide."

From what has been stated above, as to the spasmodic constriction of the muscular coat of the passages for the food, the bile, and the urine, it follows,

First, That though a muscular structure be not equally obvious in the different portions of the passages for the food, the bile, and the urine, yet they all possess the peculiar characteristic feature of the muscular fibre, a contractile power, upon the application of a stimulus, and are also under the influence of antispasmodic remedies ; and, therefore, they are to be considered as parts of a muscular structure, and endowed with a muscular contractile power, even though muscular fibres be not distinguishable by our imperfect senses.

Second, That there is no peculiar arrangement of muscular fibres of the stomach, gall-bladder, or bladder of urine, or in the canals connected with them, which is adapted to produce a partial contraction in any particular part of these passages.

Third, That the contraction is various as to its extent, degree, and duration ; and, when of long duration, it is sometimes succeeded by a permanent organic stricture.

Fourth, That the partial degree of contraction in the hollow bowels, gives rise to different symptoms, according to the part affected, proving, in some instances, fatal in a short space of time, as in the stomach and intestines, ureters, and neck of the bladder ; but that, in other organs, life may be continued, though the spasm be in the middle of the womb, or middle of the body of the bladder, and though that spasmodic contraction be of considerable duration.

Lastly, That the inordinate degree of contraction which sometimes takes place in the canals for the food, the bile, and the urine, may, in its earlier stages, frequently be removed by antispasmodic remedies.

In the preceding paper, a general delineation of the facts and arguments in favour of the muscular structure, and muscular contractile power of the canals for the food, the bile, and the urine, has been given. Though each of the arguments, singly considered, cannot be said to be absolutely conclusive, yet, when taken collectively, they form a very strong, and, in my mind, perfect body of evidence.

With this light before us, we can readily account for the gradual and continued progress of the food, the bile, and the urine, through their proper canals; and also for those peculiarities and irregularities which occasionally occur, as to the passage of the food, the bile, and the urine; and the keeping in view the influence of this muscular power, is, as it were, the *master-key* that unlocks every intricacy, and resolves every difficulty.

In short, upon a minute inspection and comparison of the canals for the food, the bile, and the urine, these are found to be alike in structure, and to act by certain common laws; and it may be added, in the appropriate language of Steno, “*Elegantissima enim mechanices artificia, in illis (musculis) obvia, verbis nonnisi obscure exprimuntur: carnum autem ductu, tendinum colore, insertionum proportione, et trochlearum distributione oculis exposita omnem superant admirationem.*”

Explanation of the Engraving, Plate I.

Fig. I. Of the annexed Plate gives an excellent view of the spasmodic contraction of the pharynx, larynx, and gullet, which sometimes, though not always, takes place in consequence of hydrophobia; and, it may be observed, that this spasmodic contraction did not go off after the death of the patient. It may be observed, that the tonsils seem, in the engraving, to be unusually prominent, which I presume is to be imputed to the spasmodic contraction of the muscles around them. In the engraving the spasmodic contraction of the constrictor isthmii faucium is well represented.

The inner membrane of the larynx and gullet was of a brilliant red colour. It may not be out of place to add, that I met with another instance of hydrophobia, in which the morbid appearance in the pharynx and larynx were exactly similar to those above described.

- 1, 1. Point out the Velum Pendulum Palati, which is very unequal on its surface, on account of the spasmodic constriction of the constrictor isthmii faucium, as pointed out by No. 2.

The Uvula is seen hanging down from the velum pendulum palati; the surface of it is also corrugated by the contraction of the azygos uvulæ muscle.

- 3, 3. Point out the Tonsils, which in this case were remarkably prominent.
- 4, 5., Point out portions of the Pharynx turned back. The pharynx was opened from behind to shew the larynx, the membrane proper to which was thrown into a number of folds. The larynx was opened, so that the state of the mucous membrane which lines it may be seen; it was found to be of a deep crimson colour.
6. Points out a portion of the Gullet.

Fig. II. This figure was copied from a preparation, in which the cystic, hepatic, and common ducts, were very much enlarged, in consequence of gall-stones being lodged within them. The enlargement is much greater at some than in other parts of those ducts.

1, 1. A string which suspends the gall-bladder, marked by No. 2, 2.

3. Marks a remarkable dilatation of the Cystic Duct.

4. Points out the Hepatic Duct, which was much enlarged.

6, 6. Point out two Gall-Stones, which are lodged in the common duct.

7, 8. Point out two small probes, which were passed through the common duct in its oblique course, between the coats of the duodenum.

This portion of the common duct, which is naturally of smaller diameter than any other portion of the common duct, has been excessively enlarged, in consequence of gall-stones having been lodged within it ; and it merits particular mention, that gall-stones impacted within the common duct frequently prove a cause of death.

9, 9. Two portions of string, by which the part of the duodenum which had been opened is suspended.

PLATE II.

THE bladder from which this figure was taken, is remarkable in several particulars.

1st, On account of its great size, it generally happens, when cysts are connected with the bladder, that that organ is much diminished in its capacity, and that its coats are thickened to a much greater degree than in this specimen.

2d, In this preparation, there are a number of cysts connected with the bladder; the largest, marked *k*, is formed by a protrusion of the mucous membrane between the muscular fasciculi of the bladder; whereas those of smaller size are formed chiefly by the thickened muscular fasciculi; and two of them contained those six very singularly shaped concretions which are represented at the side of the bladder.

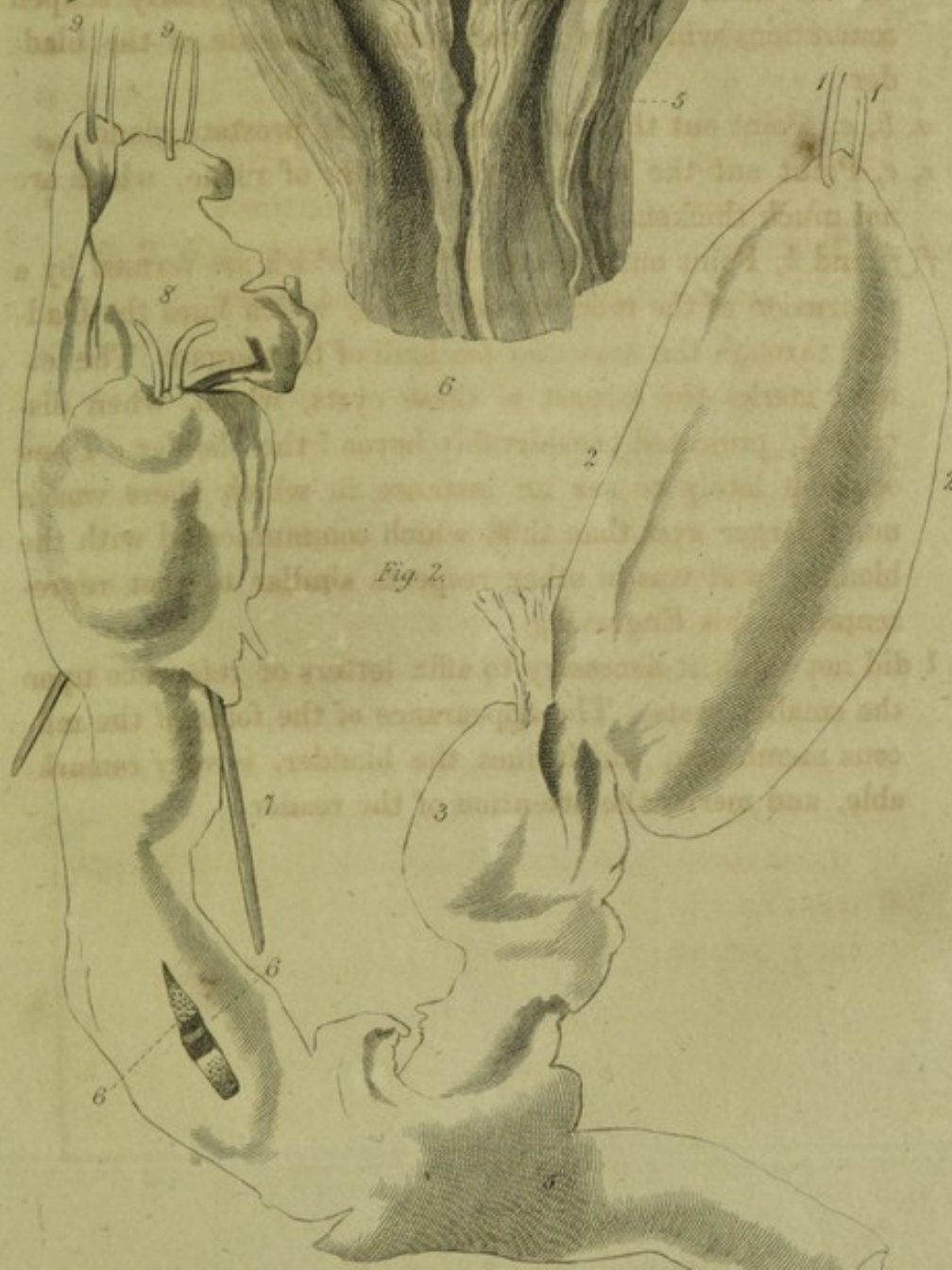
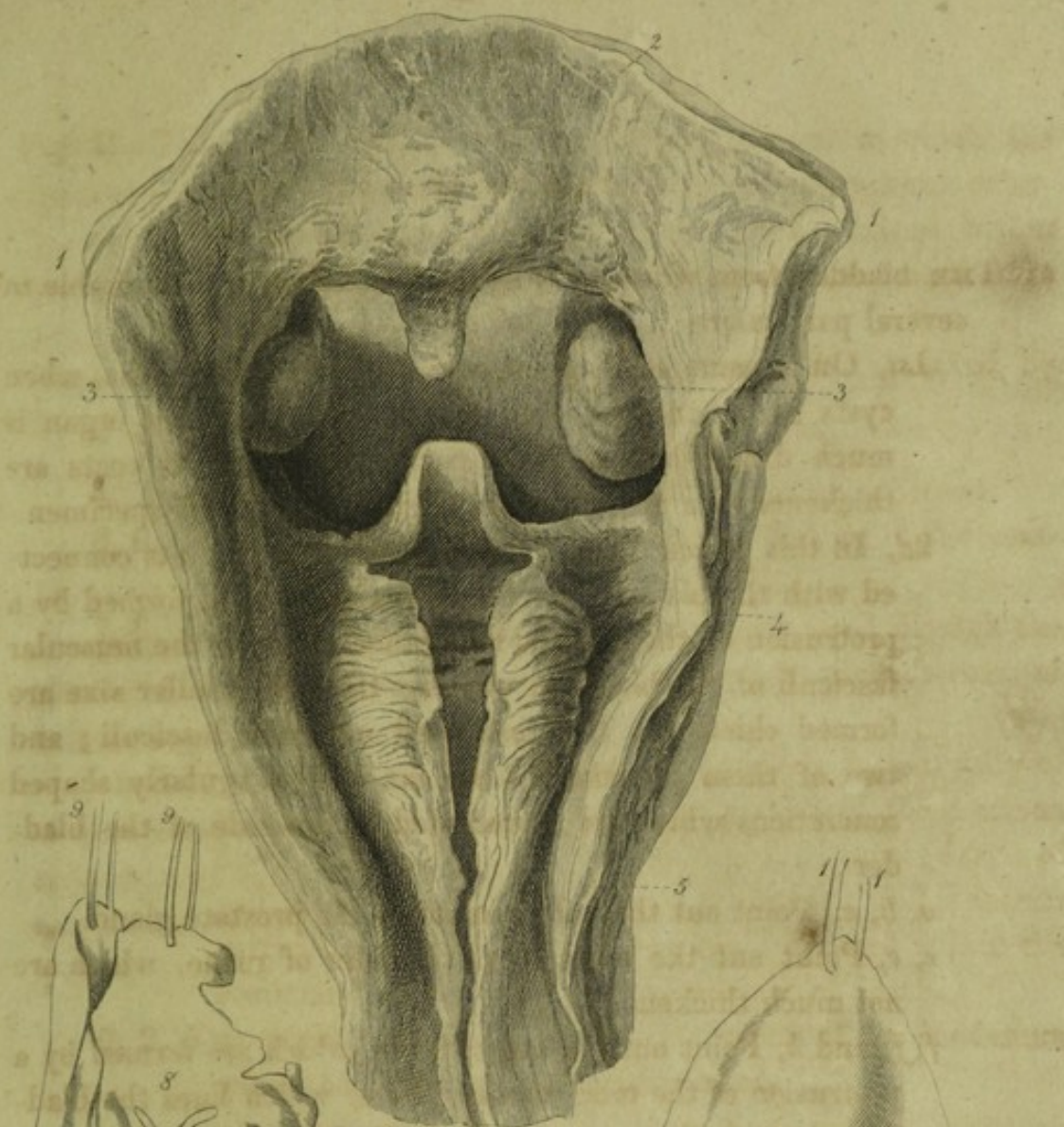
a, b, c, Point out the enlargement of the prostate gland.

e, e, Point out the coats of the bladder of urine, which are not much thickened.

f, f, and *k*, Point out the larger cysts, which are formed by a protrusion of the mucous membrane, which lines the bladder, through the muscular fasciculi of that organ. The letter *k* marks the largest of these cysts, which, when distended, projected considerably beyond the bladder. I had occasion lately to see an instance in which there was a much larger cyst than this, which communicated with the bladder, and was in other respects similar to that represented in this Engraving.

I did not think it necessary to affix letters of reference upon the smaller cysts. The appearance of the folds of the mucous membrane, which lines the bladder, is very remarkable, and merits the attention of the reader.

Fig. 1.







Thos. Donaldson del. et Sculp.



