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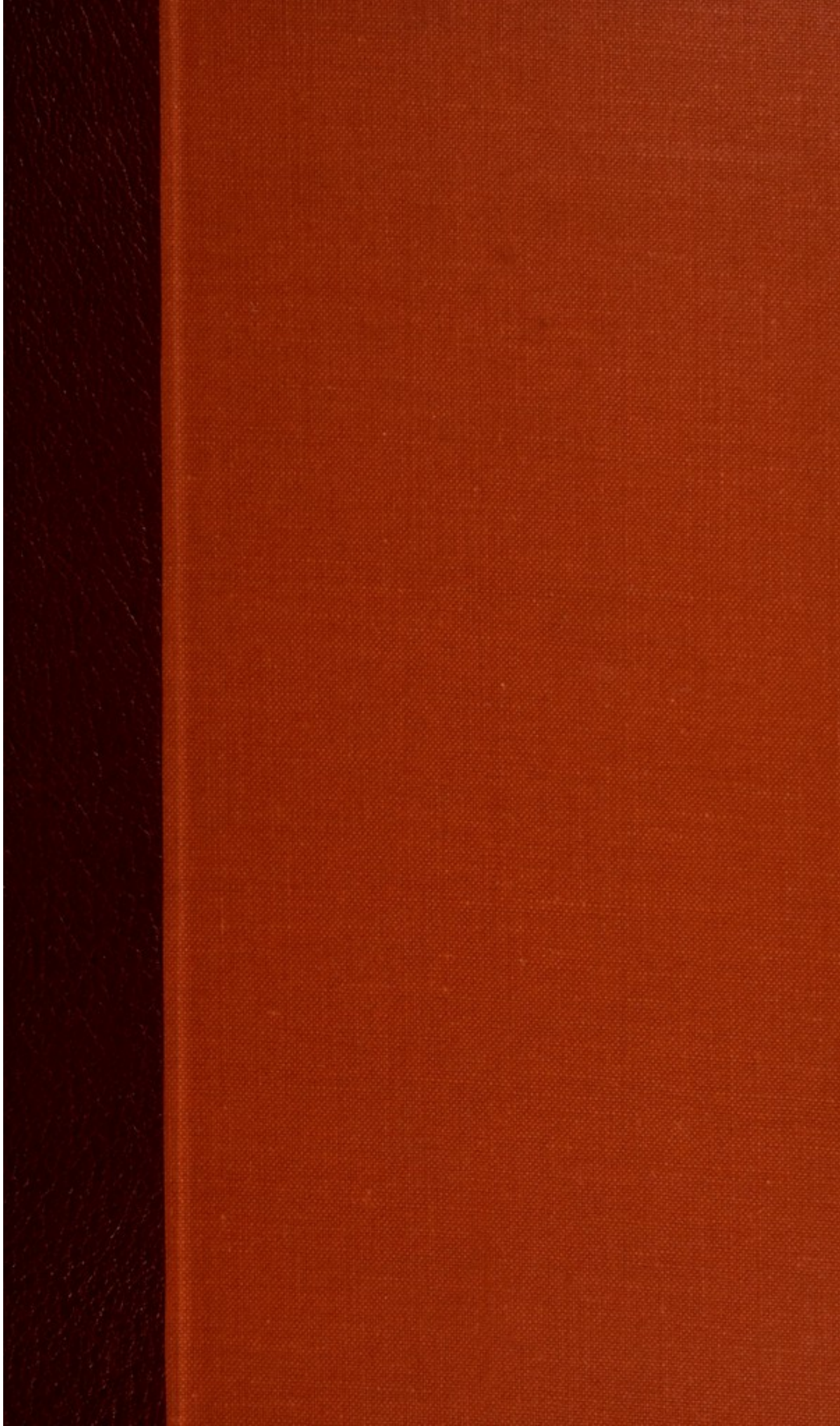
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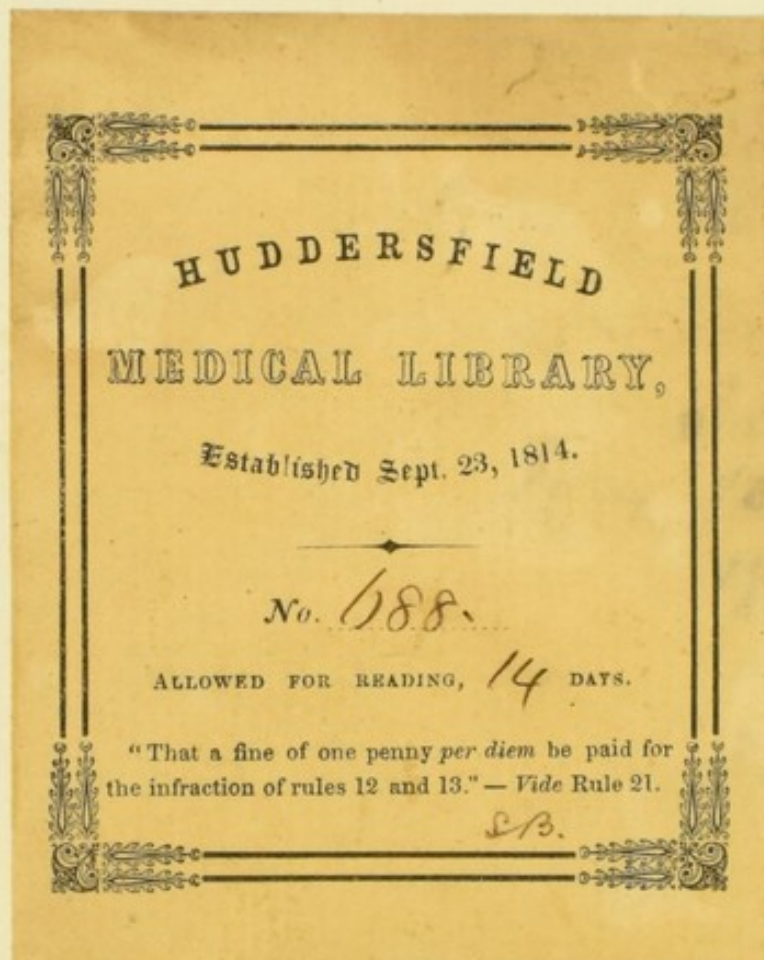
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ON DISEASES
OF THE
BLADDER AND PROSTATE GLAND.

THE

BLADDER AND PROSTATE GLAND

ON DISEASES

BLADDER AND PROSTATE GLAND

BY

LONDON: J. & A. H. SMITH, 1854.

ON
DISEASES
OF THE
BLADDER & PROSTATE GLAND.

With Plates.

BY WILLIAM COULSON.

SECOND EDITION, GREATLY ENLARGED.

LONDON:
LONGMAN, ORME, BROWN, GREEN, AND LONGMANS.

MDCCCXLI.



DISEASES

BLADDER & PROSTATE GLAND

LONDON:
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321845



PREFACE

TO THE SECOND EDITION.

THE diseases of the urinary system have occupied considerable attention both in this country and in France during the last fifty years. The result has no doubt been a considerable advance in our knowledge of the nature and treatment of these affections, especially in regard to stone, its chemical composition, and the operations for its destruction or removal. Whether these diseases be more or less frequent than in former times, we have no means of ascertaining; but the authorised returns of the causes of death, which, for the first time, have assumed a shape on which reliance may be placed, show that the mortality from urinary complaints is very considerable.

It appears by the abstracts formed by Mr. Farr, and appended to the Registrar-General's first

report, that out of 148,701 deaths, which have been certified within the six months ending 31st of December, 1837, eight hundred and sixteen are to be attributed immediately to these diseases. The cases are thus classified in the abstracts:—

		DISEASE.	MALES.	FEMALES.	TOTAL.
OF THE URINARY ORGANS.	{	Nephritis - -	37	23	60
		Ischuria - -	49	4	53
		Diabetes - -	68	27	95
		Granular Disease	2	1	3
		Cystitis - -	61	9	70
		Stone - -	161	19	180
		Stricture - -	43	3	46
		Disease* - -	262	47	309
			<hr/>	<hr/>	<hr/>
			683	133	816

But the mortality, great as it may appear, affords an insufficient indication of the frequency of urinary diseases, so many of which embitter life without directly tending to its termination.

My chief object in the former edition was, to establish clearly the distinction between the inflammatory diseases which attack the several coats of the bladder. It appeared to me important

* The head "disease" appears to include all cases of death arising from diseases of the urinary organs, not more accurately described in the returns.

that these affections should not be confounded under the general character of inflammation of the bladder, as not only are they distinguished from one another by their symptoms and progress, but as each of them requires an essentially different plan of treatment.

Since the publication of my former edition, I have availed myself of the increased opportunities which have occurred to me, to follow up my investigations of the subject, and they have not in any way altered the practical conclusions which I formerly attempted to draw. I have endeavoured to render my present edition a more complete work as to the diseases of the bladder; and I have added three chapters on the affections of the prostate gland, which are so closely connected and so often confounded with those of the bladder.

*Frederic-Place, Old Jewry ;
February, 1840.*

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DISEASES OF THE BLADDER AND PROSTATE GLAND.

CHAPTER I.

ON URINE.

OF the excretory organs none are more important than the kidneys ; none, having their functions diminished, depraved, or suspended, give rise to more alarming symptoms ; none, having their structure disorganised, are attended by greater pain, or have that event followed by greater danger. In diseases of the bladder and prostate gland, the secretion of urine is often so much deranged, as to render a knowledge of the changes which it undergoes, indispensable to the successful management of these affections. I have, therefore, deemed it necessary to prefix here an account of the alterations to which this fluid is liable, and of the practical indications afforded by its various appearances, taking care more especially to point out the causes by which these changes are produced.

The urine is of a very varied and compound

character; it is apt to be altered by a multitude of accidental circumstances; and its composition consequently changes with the influences to which it may be subjected. Berzelius, whose analysis of urine is deemed the most complete, describes the following substances as entering into its composition, viz. :—

Water,	.	.	.	.	.	.	933.00
Urea,	.	.	.	.	.	.	30.10
Free lactic acid,	.	.	.	.	.	}	17.14
Lactate of ammonia,	.	.	.	.	.
Osmazome,	.	.	.	.	.
Extractive, soluble in water only,	.	.	.	.	.
Lithic acid,	.	.	.	.	.	.	1.00
Vesical mucus,	.	.	.	.	.	.	0.32
Sulphate of potash,	.	.	.	.	.	.	3.71
Sulphate of soda,	.	.	.	.	.	.	3.16
Phosphate of soda,	.	.	.	.	.	.	2.24
Biphosphate of ammonia,	.	.	.	.	.	.	1.65
Chloride of sodium,	.	.	.	.	.	.	4.45
Muriate of ammonia,	.	.	.	.	.	.	1.50
Phosphates of lime and magnesia,	.	.	.	.	.	.	1.00
Silica,	.	.	.	.	.	.	0.03
							1000.00

Since the above analysis was made, M. Martin Solon has detected the presence of the lactate of potass and the chloride of potassium; Proust, that of sulphur; and carbonic acid gas shows itself when urine is subjected to a boiling heat. But besides these, which constantly exist in human urine, this fluid may contain a great number of other substances: sugar, bile, albumen, fibrin, fat, milk, blood, pus, have all been found in urine; *

* Vid. Haller's Physiology.

and the fact is interesting, insomuch as it shows how little the kidneys share the power of altering the character of the heterogeneous matters they separate from the system.

From the abundance and variety of the matters, extracted from the body through the channel of the kidneys, the urinary system may properly be regarded as the emunctory of the entire animal economy, in which we meet with every principle and constituent that analysis has discovered, forming the solids and fluids of the body, and these in more or less proportion, according to certain modifying circumstances, afterwards to be spoken of. Indeed, no animal fluid contains so many substances dissolved in it as the urine.

So important, and indeed essential, are the kidneys to the functions of life, that we find organs either similar or analogous to them in all animals, down to the lowest grade of animated beings. Birds, amphibia, and fishes, have kidneys which are formed of one substance only, resembling the cortical of mammiferæ, without either nipples or calices; * and Brugnatelli, † Meckel, ‡ and Blainville, § have discovered an excretion analogous to urine in insects and mollusca.

Every excretory organ performs some special

* V. Ferrein, in *Mém. de l'Acad. des Sc. de Paris*, 1749. Galvani, *Comment. Bonon.* tom. v.

† *Giornale de Fisica*, 1815.

‡ *Archiv. fur die Phys.* tom. iv.

§ *Journ. de Physique*, loc. cit.

office : for example, the lungs clear the system of its excess of carbon, and the kidneys purify it of azote and saline particles. The principal element of the urine of mammiferæ, is a peculiar animal matter, *urea*.* It is this substance which appears to be so noxious to the body, and which, if not carried off by the kidneys, proves so fertile a source of disease. Hence we find that in many of the most important diseases connected with the urinary function, there is usually, if not a total absence, yet a very great diminution, of the quantity of urea ordinarily existing in urine.

To this purifying process in animals, there is an analogous function even in vegetables ; for the experiments of Schuebler and Zeller † have ascertained, that vegetables which have absorbed different organic and inorganic noxious matters by their roots, get rid of them by their leaves.

In perfect health, the quantity of urine passed in twenty-four hours, varies even when no difference is made in the mode of living or exercise. Rye considered forty ounces an average quantity in the twenty-four hours ; whilst Dr. Prout reduces it to thirty-two. In judging of this circumstance, it is necessary to recollect, that the quantity of urine voided, usually exceeds somewhat the quantity of liquid drank. The number of times a healthy

* V. Tiedemann's Phys. ch. viii. s. 368.

† Schweigger's Jahrbücher de Chemie und Physik, art. v. p. 54. 1827.

person micturates, is also uncertain, varying usually from six to fourteen times ; and occasionally a person in good health may be found, who passes urine only twice in twenty-four hours.

The properties of urine are much stronger in the adult male, than in children or females ; and its nature and character are much affected by other circumstances, besides those of age and sex ; for example, the nature and quantity of the food and drink we take. Thus urine has been divided into two distinct kinds—that of the drink, and that of coction, or the urine of the blood. Paracelsus was the first to establish this distinction. He notices the first being passed shortly after a meal—of its being clear, nearly colourless, with little odour and taste—characters ascribable to its containing much less of the principles of urine, than the urine of coction*. Nysten has investigated the differences between the urine secreted subsequently to the digestion of food—“*urina chyli*,”—and the limpid, tasteless urine secreted after fluids have been taken, the “*urina potûs* :” the latter he finds to contain thirteen times less urea than the former, four times less of the sulphates, muriates, and phosphates of soda and ammonia, and sixteen times less uric acid.

The urine of the blood is distinguished by

* Celsus notices this fact. “Healthy urine,” observes this author, “should be pale in the morning, and afterwards rufous.” Lib. i. cap. 2.

possessing all the properties of urine in an eminent degree, from having had time to be perfectly elaborated; for, after the functions performed in the intestines, have separated the grosser and useless parts of the food from the nutritive (which is the literal meaning of the word *digested*, when applied physiologically), it still remains for the kidneys to strain off that part of the elaboration which is impure, resulting from the sanguification of the chyle. Hence we see, that this latter is the urine proper to be selected by the practitioner for his observations. For this purpose, it ought neither to be too fresh nor too stale; it should be kept six or seven hours, before it be examined; the quantity ought not to be less than four or five ounces; and the vessel into which it is put, should be clean and transparent, about six inches in length and two in breadth.

Another material circumstance affecting the character of the urine, is the influence of the seasons as to temperature. The kidneys are excited to greater activity in winter than in summer; nor is the reason for this difficult to be explained. All the emunctories of the body act, as occasion may require, as mutual suppeditories. Now, in cold weather, the perspiration is more or less suppressed; and were it not that the kidneys evacuate the fluid which otherwise would transpire, we should be liable to plethoras, or repletions, of the most dangerous nature. Hence it comes, that

when the perspiration is abundant, the urine is scanty and high-coloured, containing a strong impregnation of saline ingredients; and *vice versa*, when the perspiration is checked by any cause, the urine is copious, limpid, and but slightly imbued with its proper salts.

Exercise, likewise, influences the urine, first, by augmenting and keeping up perspiration; and next, by increasing the appetite, and consequently the consumption of food: the urine, from both causes, takes on the character of the urine of the blood.

Emotions of the mind are also among those influences, that manifestly impress a character on the urine; among which may be enumerated, fear, chagrin, sadness—in short, all those passions and sentiments, that suddenly or violently affect the mind. Any sudden shock given to the mind, especially produces a great increase of the secretion of urine, and that while the emotion endures. The urine, in all these cases, is without odour or flavour, and consists almost entirely of water.

The last and most important influence of all on the nature and character of the urine, is that of disease.

The art of predicting the crises in diseases by inspection of the urine, as well as their exact nature, is, in many cases, only to be acquired by long and careful observation. The physicians of antiquity made this a most important part of their study; indeed, Hippocrates seldom narrates the case of a

patient without particularly noting the condition of the urine. Galen was not less observant of the various appearances of the urine in disease ; and the first chapters of Alexander Trallianus are occupied with nothing else.

In modern times, this essential branch of practical knowledge, founded on an attentive examination of the condition of the urine, has been almost entirely neglected ; and the fact ought scarcely to excite surprise. The fraudulent, who are ever ready to take advantage of the credulity of the public, and, by playing upon their weaknesses, to turn them to their own profit, took up the subject of urine as a fruitful and lucrative source of imposition—they pretended to be able to distinguish a patient's disease by the bare inspection of his urine, and that too without requiring to see him. These were the Uromantes, or Urine-casters of a by-gone century, who, by their empirical conduct, soon brought into disrepute one of the aids in the detection of diseases, that had heretofore proved of so much use and value, when properly studied and applied. Uromancy thus came to be abandoned by regular practitioners, and its employment fictitiously assumed by illiterate charlatans. It is only of late years, that the obloquy attached to the practice of observing the condition of this excrementitious fluid, has been removed ; and ever since chemistry has founded the observation of the morbid changes of the urine on scientific principles, this important

branch of medical knowledge has regained its proper position in the estimation of every discerning practitioner. A knowledge of the urine in health, and of the variations to which it is subject in disease, is one of the bases upon which we may safely rely for much valuable information. In fact, the different appearances of this fluid may be considered as indicating, not merely different modifications of the action of the organs separating it, but also as affording correct information of changes that have taken place in other parts of the organic system, whether in virtue of the influence of some noxious cause, operating upon the whole body, or in consequence of the sympathy and reactions, that different parts exercise upon each other.

The uncertainty attendant on the signs deducible from the examination of the urine, depends much on the manner in which they have been observed ; and our knowledge of this animal excretion is most imperfect, if it extend no farther than an acquaintance with its condition in a morbid state : it is not less necessary to know its characters in a state of health, in order to form a just idea of the alterations going on in the animal functions, to which the urinary organs may be acting as the principal emunctory.

Hallé was the first to commence a work expressly on this subject : he was persuaded that the urine of persons in perfect health, underwent a multitude of changes, according to the continually varying circumstances in which they were, from time to

time, placed. Nevertheless, there are phenomena common and constant under all circumstances. He further averred, that there existed in the urine of a person in health, relations with the matters of transpiration and of nutrition, of the most intimate nature, the attentive study of which was capable of throwing great light on the nature and formation of each reciprocally.

Gäirtner of Tübingen took up this important subject after Hallé. Gäirtner observes, that the recent urine of a healthy man, is a transparent, straw-coloured fluid, which, as long as it is warm, exhales the animal odour common to all the humours newly separated from the body—an odour that shortly dissipates, and is immediately replaced by the urinous odour, properly so called. After exposure to the air for a few days, urine acquires an ammoniacal odour and an alkaline reaction, and a white slimy pellicle forms on the surface, in which, as well as on the inner surface of the vessel, small white crystals of the phosphate of ammonia and magnesia show themselves.

The specific gravity of human urine varies between 1.005 and 1.030 : in some diseases, particularly in diabetes, it is sometimes as high as 1.050.

We may now notice the characters of the urine deducible from its colour. The colour of the urine of the blood in health, varies in different individuals, from the pale straw colour, to the orange, approaching the red. As a general fact, it is to be remarked, that the colour is so much the

deeper, inasmuch as the constitution of the individual is more robust, the circulation more active, and the food more of an animal nature.

The urine of persons in health is usually of a pale amber colour, becoming slightly turbid towards the centre, seven or eight hours after having been passed, and shortly depositing a sediment, that rises up in the form of a cone from the centre of the fluid. This deposition, which at first is in small quantity, increases until putrefaction renders the whole of the urine turbid.

It is essential to distinguish whether the colour be owing to the food that may have been taken, or to any medicine that has been administered. Urine, for example, becomes limpid if much drink has been swallowed; red, after much exercise, or a paroxysm of passion, long watching, heating diet, long fasting, the use of water-cresses, beet, sorrel, and madder: it is tinged blackish by chalybeates; yellow, by saffron, turmeric, and rhubarb; in short, no secretion is more variable in its physical attributes than urine.

The state of the body greatly modifies the quality of the urine. We know, for instance, how limpid, colourless, and watery it becomes after any spasmodic paroxysm, and in the cold stage of agues; turbid, yellowish, and mucous, at the termination of pituitous or catarrhal affections; golden-yellow, and turbid, in jaundice; turbid, accompanied with deposition of mucus, in catarrhal affections of the bladder.

Pale, limpid urine, in a state of health, is regarded as the consequence of indigestion, and hence we find it a very usual symptom of dyspeptic head-ach; or it may proceed from constipation*, or suppressed perspiration. This limpidness of the urine is a dangerous sign in continued and intermittent fevers, and especially in affections of the brain.† In old people, the urine is usually pale, and dull and cloudy.

Colourless, limpid urine, which is like spring water, as well as inodorous and insipid, is called nervous urine.

The urine is clear, transparent, and insipid, in spasmodic affections, in hysteria, hypochondriasis, and epilepsy. It is equally transparent and clear, but usually very abundant, in diabetes.

The following are some of the opinions to be found in the ancient writers respecting the morbid indications taken from the colour of the urine, very many of which have been confirmed by the experience of more modern observers:—

Deep red urine, in fever, with clammy mouth, and total loss of relish, indicates derangement of the alimentary canal; but if the tongue be dry and hot, with a feeling of burning in the bowels, it announces inflammation.

The urine is of the colour of brick-dust, and

* Hippocrates notices this fact. In the 83d aphorism (sect. iv.) he says, "Abundant urine during the night, denotes that the bowels are not sufficiently open."

† This is another remark to be found in Hippocrates (v. Aph. 72, sect. iv.), which Celsus (lib. ii. cap. 4.) repeats.

turbid, in almost all intermittent fevers, in certain dropsies, in rheumatism, gouty affections, scurvy, atrophy, and some kinds of stone. The urine is of an orange yellow colour, or saffron yellow, in bilious diseases; but the yellowness is of a much deeper hue in symptomatic jaundice, than in critical febrile, or simple critical jaundice.

Deep yellow urine, approaching black, denotes a diseased state of the liver. Black urine, which deposits a sediment of the same colour, is a fatal symptom in acute diseases.

Many substances, when taken internally, possess the property of colouring the urine of a particular hue. A red colour is imparted to it, for example, by madder, logwood, raspberries, mulberries, &c.; it is dyed blue by indigo; rhubarb and angustura bark tinge it yellow; and the astringent principle of galls, and other substances containing tannin, is evident in the urine, by its becoming of a bluish or greenish tint, on any of the salts of iron being added to it.

The odour of urine is likewise often a valuable indication of the morbid condition and nature, both of the particular organs concerned in its secretion and evacuation, and of the general health.

The odour of healthy urine is somewhat aromatic, without acidity, ammoniacal smell, or fetid taint; and resembles, in a great degree, the odour of the perspiration of a healthy man.

The urine of persons affected with stone in the bladder, often acquires a highly offensive odour.

The urine of diabetic patients has usually a sweet, wheyey smell: indeed, their whole persons exhale a similar odour.

Certain substances, when eaten, or even when respired, it has been long noticed, impart a peculiar odour to the urine. Hippocrates, for instance, mentions that garlic and other strong smelling substances impart their particular odour to the urine.* Oil of turpentine enters the circulation by respiration, and is conveyed to the kidneys in the same way; the odorous principles of asparagus, cauliflowers, fennel, juniper-berries, valerian, castor, balsam of Peru, copaiba, cubebs, and many other substances, likewise pass through the blood into the urine.

In persons of delicate constitution, and those of a weak digestion, we can often recognise, by the odour of their urine, the nature and character of the food they have eaten. The celebrated French chemist Fourcroy observes, that the urine of hysterical females, and of hypochondriacal men, passed immediately after a meal, has smelled of bread, bouillon, and other articles of food; circumstances attributable to the odorous molecules which had entered the blood, being afterwards excreted by the kidneys.

Another important character of urine, is that presented by the sediment it deposits: indeed, the appearance on which we can most rely, is that obtained from the precipitate.

* De Morbis, Lib. iv. sect. v.

Theophilus,* an author celebrated among those ancient writers who investigated the morbid characters of the urine, divided the deposit into *nubes*, *encœorema*, and *hypostasis*, according as it occupied the upper, middle, or lower part of the fluid.

When the cloud occupies the upper third of the mass of the liquid, it indicates that the mixture of the constituent principles of the urine has not been complete. When the cloud remained suspended, the older writers apprehended spasms, delirium, or metastasis.

The oily or fatty pellicle (*cremor urinæ*) that forms on urine, is a very thin and delicate membrane, which is sometimes seen floating on the urine of consumptive and dropsical persons, of those threatened with marasmus, or at the termination of acute fevers. Oily urine, according to Hippocrates, indicates an abscess, or nephritis†; it is sometimes seen in scurvy, calculus, and diabetes.

The discoveries of modern chemistry have taught us, that this pellicle is not in reality of an oily nature, as was formerly believed, but that it consists of a thin layer of a triple salt—the ammoniaco-magnesian phosphate.

The natural sediment of urine varies remarkably in different individuals, according to the constitution,

* Theophilus is thought to have lived somewhere between the fourth and eighth centuries.

† Vide Aphor. 35, sect. vii.

age, sex, habit of body in respect to spareness or plumpness, the kind of labour or exercise of the individual, &c. For example, there is much more sediment in the urine of fat people who pass an indolent life, than in those individuals who are lean and work hard, or who take much exercise—or, in fine, after a long fast or excessive perspiration. The sediments from urine often partake of the nature of the predominant constitution. Thus, in the sanguine temperament, it is red ; in the bilious, it is yellow, citrine or saffron-coloured, or reddish or greenish ; in the inflammations of mucous membranes, it is whitish, turbid, thick, or milky ; lastly, in the melancholic or atrabilious, it is leek-green, or blackish brown, or black.

There is good reason for believing, from the most recent investigations of chemistry, that the black sediment of urine is nothing but a portion of that animal oil which is formed by the partial decomposition of the urea it contains. It is an animal matter, *sui generis*, composed of hydrogen, carbon, nitrogen, and oxygen, which in its natural state gives colour to the urine, and which in the case of the black sediment, is surcharged with carbon. The animal oils are, when quite pure, always colourless, and owe their tint, from citrine to black, entirely to the progressive intensity of the carbon present. In the black urine of putrid fevers, the urea entirely disappears, and serves to form this colouring animal oil, surcharged with carbon : such urine has lost its ordinary acidity, it is sensibly

alkaline and fetid, and quickly precipitates this oily matter, owing to its being specifically heavier than the liquid in which it is dissolved. We are hence justified in concluding that the black sediment of urine is derived from the superabundance of the carbon we have spoken of, and not, as is very generally supposed, from the presence of blood in it ; for were it owing to this latter cause, we could readily detect it by boiling, when an albuminous pellicle would form on the surface.

The red lateritious sediment* before the seventh day of a fever is likewise a good sign ; but if it do not show itself till after this period, it indicates long-continued illness, and in convalescence there is cause to apprehend a relapse.

A deep red sediment in pestilential fevers is considered a fatal sign, especially if the colour be derived from blood.

A mucous, viscid sediment, is often traceable to either stone in the bladder, or chronic inflammation and ulceration of its inner surface.

Pus in the sediment is often the result of ulceration in some part of the urinary organs.

The sediment in rickety people contains a large proportion of phosphate of lime.†

* Rosacic urine, which at one time was believed to derive its character from the presence of a peculiar acid, and named, from its rose colour, *rosacic*, is now known to be only uric acid, united with a peculiar colouring matter of an azotic nature. This kind of urine prevails in acute rheumatism, intermittent and inflammatory fevers, &c. It is of a bright colour, and on standing, deposits a red sediment.

† Dr. Weatherhead, in his Treatise on Rickets, has shown that in

The sediment attendant on a state of pregnancy resembles flakes of wool or cotton. Towards the sixth or seventh month, this flocculent matter, which occupies the centre of the urine in the form of a light cloud, often consists of molecules of chyle that have not been completely animalised.

The late Mr. Murray Forbes* observes, with much probability of truth, that “secretion by the kidneys has been considered as filtration; but it is an *elective filtration*, by which fluids in mutual diffusion are separated from each other, and some permitted to pass, while others are retained. If the kidneys have not the power possessed by glands in general, of communicating new properties to fluids, by effecting a new modification of elements, they exert an admirable faculty of division, by which fluids that are blended can be withdrawn from each other, that greatly surpasses other filtration.” It is in this way that he explains the ready and rapid transition of many substances from the stomach to the bladder; and he goes on to remark, in illustration, that “particular colours and odours of the urine, from very small quantities of certain matters that have been taken into the stomach, are not communicated in an equal degree to all the fluids within the blood-vessels. The matters on which they depend remain chiefly conjoined with

this disease the osseous system undergoes a real decomposition, the kidneys being the emunctory by which the earthy matter of the bones is discharged.

* Treatise on Gravel, 1793.

the superabundant water, and along with it are abstracted by the kidneys. The colouring matter of ten grains of rhubarb, that gives a strong yellow to the urine in an hour or two after it has been swallowed, cannot be supposed to be extended in an equal degree over twenty-five or thirty pounds of fluids. If that were the case, the tinge would be of longer duration, and could not be wanting in the urine that is discharged for a considerable time: it could not vanish almost as quickly as it appeared."—P. 34.

Not merely does he apply these observations to explain the transition of colours and odours, but also to that of many acid and saline matters with which the urine is imbued. The kidneys and the skin appear to have the faculty of separating the superabundant water, with whatever may impregnate it, from the other constituents of the blood. This ingenious explanation likewise accords in principle with the practice occasionally had recourse to, of administering nutriment *per enemata*, with which the ordinary process of digestion can have nothing to do: the nutritious particles are in this case retained and assimilated in the circulation, while the excrementitious and watery are evacuated either by the skin or kidneys.

A very characteristic difference between the excrementitious fluids and the secretions is, that the latter consist of simple organic constituent parts of definite form, or globules, as may be seen in the saliva, the pancreatic juice, the milk, &c.,

whereas none are to be found in the urine, the bile, the tears, &c.* This, it must be observed, is a very curious fact, and may eventually lead to the means of determining in what organic function consists.

Urine, while warm, holds in solution much more uric acid than an equal quantity of boiling water will dissolve; and this has induced Dr. Prout to think that the uric acid in the urine is in the state of urate of ammonia. The uric acid which is precipitated during the cooling of the urine is, however, in the free state. Duvernoy† contends that the uric acid is held in solution in warm urine by means of the colouring matter. The precipitate of uric acid is at first in the form of a grey powder, but assumes by degrees a rose red colour, and crystallises as it dries. The red or brick-dust tint of uric acid, is due to a colouring matter which is combined with it :‡ in intermittent fevers, this red colour is unusually deep.|| Berzelius regards it as still very doubtful, whether or not the red colour of the precipitate in the urine in fevers is dependent on the presence of purpurate of ammonia.

Duvernoy detected no essential difference between the deep-coloured red urine and the urine of the crisis of fever, which deposits a sediment.

* Tiedemann's *Physiol.* cap. viii. s. 337.

† Untersuchungen über den Menschl. Urin. Stuttg. 1835.

‡ Müller's *Physiol.* by Baly, p. 585.

|| Sydenham makes this observation, and Hoffman repeats and confirms it. The former says, "the urine in agues is of a red colour, and deposits a sediment like brick-dust."

Both have a stronger acid reaction and a redder colour, and contain a larger quantity of uric acid than natural. The critical urine merely had a larger proportion of uric acid, and deposited it more readily.

In the remaining view of this subject, I shall avail myself of the elaborate researches of Prout and Brodie, greatly abridging their statements.

Water* forms the basis of blood and urine, as well as of all animal fluids: nevertheless, it appears probable, that water exists in two distinct conditions;—first, as an integrant constituent of the globular portion; and secondly, as diffused generally throughout the mass. It is from the latter source that the urine is taken. There is sometimes an increase of the watery portion, whilst the other principles remain the same, or become diminished, as in hysteria and various nervous affections: but sometimes the increased flow of urine involves an increased proportion of a natural ingredient, as of urea; or of unnatural ingredients, as of albumen or sugar. On the other hand, the proportion of water is not unfrequently diminished below the natural standard, as in various forms of urinary suppression; and sometimes when the cause of this suppression is mechanical, the urine is simply diminished in quantity, while its composition remains the same: at other times, the suppression is connected with deranged action of the kidneys,

* Inquiry into the Nature and Treatment of Diabetes, Gravel, Calculus, &c., 2d edit., by Wm. Prout, M.D. page 4, et passim.

and while the proportion of water is diminished, those of the other ingredients are relatively much increased, as in various forms of gravel and calculus. In some varieties of dropsy and other diseases, not only the serum of the blood, but the fibrin and red particles pass through the kidneys unchanged. The albuminous matters, however, which are found in the urine, are usually more analogous to those of the chyle than of the blood; and in that case, the urine is commonly of a pale colour, and more or less opaque. Albuminous urine, on being exposed to a temperature of about 150° , becomes opaque, and deposits the principle in a coagulated state. The precipitate varies considerably in appearance in different instances, being sometimes firm, and similar to that formed by the serum of the blood, from which it may then be supposed to be derived; while, at other times, it is delicate, fragile, and somewhat resembling curd, when it may be supposed to be of chylous origin.

It is essential to distinguish the urine which owes its albuminous character to the admixture of blood or pus, from the urine which derives this peculiarity from the function of the kidneys. Hæmaturic urine may be recognised by its colour, which it loses by coagulation with heat or nitric acid. Purulent urine, on the other hand, may be known by its milky appearance, and by the white coagulum produced by heat and acids. As for true albuminous urine, it does not usually differ in

its physical appearances from that of health ; but it becomes turbid or wholly coagulates by heat, particularly if a small quantity of nitric acid be previously added to it.

An excess of urea in the urine seems to be characteristic of a peculiar form of disease. Urea is a principle proper to the urine of man and quadrupeds, and perhaps of all animals. It was first detected by Rouelle, and afterwards more fully examined by Fourcroy and Vauquelin : it has been named *nephrene* by Dr. Thomson of Glasgow. In its solid and pure state, as obtained by Berzelius, urea crystallizes in the form of long prismatic needles, which are white, transparent, having somewhat the lustre of mother-of-pearl, inodorous, with a taste approaching that of nitre, and none at all of the fluid which furnishes it. Urea contains much azote in its composition : Voehler regards it as a cyanate of ammonia. It has been said that urea is met with in the blood of animals from which the kidneys have been extracted. Now, if this be the fact, it would appear that the kidneys simply separate the urea from the blood, and do not form it.

The mucus derived from the mucous membrane of these organs, is always met with in minute quantity in healthy urine ; but it is particularly important, in a pathological point of view, when inordinately increased, or changed in its properties. Mucus, generally speaking, is insoluble in water ; though it possesses the property of absorbing a large proportion of that fluid, and of thus becoming

transparent, and assuming a glairy appearance. It is also insoluble in acetic acid, and it is not coagulated by boiling. These properties sufficiently distinguish mucus from all albuminous matters. In diseased states of the bladder, enormous quantities of mucus are sometimes secreted, the properties of which differ considerably from those of the healthy secretion.

Pus is sometimes met with in great abundance in urine. When nearly pure and unaccompanied by mucus, or when it contains blood, it may be supposed in general to be derived from an abscess. Most frequently, however, it is accompanied by mucus. When the mucus is in excess, or has preceded the pus, we may almost always conclude that some portion of the mucous membrane lining the urinary organs is the common source of both.

The source of blood in the urine may be various, and is often very obscure. When derived from the kidney,* it is in general equally diffused through the urine; and when derived from the bladder, it generally comes away in greater or less quantity at the termination only of the urinary discharge. In the former case also, coagulated fibrin† of vermi-

* Spontaneous hæmaturia, Hippocrates tells us, proceeds from the rupture of a vessel in the kidney. Aphor. 78, sect. iv.

† The presence of flakes of fibrin in the urine has been mentioned both by Hippocrates and Celsus; for so I construe the 33d Aphorism of the 7th section of the former of these ancient writers, and "the thin white flakes" spoken of by the latter in lib. ii. cap. iv.

Celsus likewise makes this judicious observation, that if pus be mixed with bloody urine, it denotes an ulcer in the kidney or bladder.

form shapes, moulded in the ureter, and subsequently washed out by the urine, is frequently met with; and when these appear, the diagnosis is commonly equivocal. When, moreover, there is a sense of heat and weight accompanied by more or less of pain in the region of the kidneys, and when urinary calculi have been known to descend from the kidney, and there are symptoms of the presence of others, while those of disease or calculus in the bladder are wanting, the hæmorrhage may be fairly supposed to come from the kidney* or ureter. When, on the contrary, there are evident symptoms of stone, or other disease of the bladder or of the prostate gland, and when the kidney is not affected, the bladder may be safely considered as the source of the hæmorrhage. When the blood comes away guttatim without the urine, it may be supposed to come from some part of the urethra. In this case, however, the blood occasionally flows backwards into the bladder, and thus produces some uncertainty as to its origin. A very troublesome, and sometimes very dangerous consequence of great hæmorrhage into the bladder, is the formation in that organ of a coagulum, which, by causing retention and other distressing symptoms, often produces alarming consequences, especially in old people in whom the prostate is

* Oribasius describes the symptoms preceding hæmorrhage from the kidney, the sense of weight, &c., with much precision, which are relieved, he observes, by the flow of blood. (V. Lib. Synop. ix. cap. xxix.)

diseased. Another consequence of the presence of blood in the bladder, is the formation of a nucleus, round which calculous matter sometimes concretes, and lays the foundation of urinary calculus. Hæmorrhage from the bladder is also occasionally a distressing and formidable symptom, in diseases of a typhoid character, in scurvy, &c.

The treatment of hæmaturia will, of course, depend on its seat and cause. Hæmorrhage in the kidney, occurring in a young subject, and attended by inflammatory symptoms, strong pulse, &c., sometimes requires abstraction of blood, generally or locally, and the usual antiphlogistic treatment. Celsus's directions in such cases are admirable (Lib. iv. cap. x.). He advises rest, a lax state of the bowels, fomentations, reclining on a soft couch, attention to diet,—that nothing salt, acrid or acid be taken, but mild diuretics, and diluents in abundance. On the other hand, when accompanied by symptoms of debility, as in typhus fever or scurvy (in the latter of which the urine is commonly alkallescent), tonic and astringent remedies, such as the mineral acids, &c., are proper. In ordinary cases, when there are no striking symptoms either of excitement or debility, and when the cause is of a mechanical nature, small doses of balsamic remedies, particularly copaiba, have been strongly recommended by some practitioners, while others have extolled highly the effect of the *tinctura ferri muriatis*. In all cases, rest in the horizontal position should be attended to as much as possible,

agreeably to the sage advice of the ancient writer just quoted; and the patient should carefully abstain from all exciting causes, otherwise no remedy can be expected to produce much good.

From the earliest writers an intimate connexion has been remarked between diseases of the joints, disorders of digestion, and the state of the urine. Of all diseases, it is gout especially in which the proportion of uric acid in the urine is greatest. Though this acid was unknown by name to Hippocrates* and Celsus,† both had observed the fact of its abounding in the urine, in affections of the joints; and Sydenham‡ notices the liability of gouty people to stone in the kidney—indeed he himself was a martyr to both. The abundance of uric acid in gouty habits is shown not only by the copious sediment of it in the urine, but by its depositions in the bursæ situated about the articulations. These latter concretions are not composed of uric acid simply, but of a combination of this acid with soda and lime—tofi are urates of soda and lime. Muller§ on this subject observes, that “it is not improbable that the perspiration likewise of patients labouring under gouty and calculous diseases contains uric acid.” All the foregoing circumstances render it very probable, that the

* In the 74th Aphorism of sect. iv. Hippocrates says that “an abundant flow of thick white urine relieves the danger of depositions about the joints;” and he repeats the observation in his “*Liber Prædictorum*.”

† Vide lib. ii. cap. vii.

‡ Epid. Diseases, from 1675 to 1680.

§ Physiology, by Baly.

source of the uric acid lies much deeper than the point of its excretion, and that its production is intimately connected with the nature of the food, and with the process of sanguification, since its proportion in the urine diminishes when the food consists of vegetable substances only.

In many instances, an excess of uric acid is voided, without any particular symptoms to indicate its formation, and the patient is made aware of the circumstance only by seeing the deposit in the urine; but, at other times, he complains of uneasy sensations in the loins, of pain in the groins, and in the course of the urethra; and sometimes a small quantity of blood is discharged from the urethra, in consequence of its being abraded by the angles of the crystals. Where the urethra is liable to spasmodic affection, the contact of the red sand induces spasm in it, occasioning a diminution of the stream, and even difficulty of voiding the urine.

It is of great consequence, Sir B. Brodie* observes, to stop the formation of red sand, both because it is in itself a considerable evil, and because, if neglected, it may lead to the formation of a larger concretion in the bladder. We may accomplish this object by conveying alkaline remedies by the stomach through the kidneys; as potash, soda, lime-water, ammonia, magnesia. If the lithic acid is deposited in small quantity, and

* Lectures on the Urinary Organs, 2d edition, p. 170, et seq.

the bowels are too much relaxed, lime-water may be useful. In weak persons, who require cordial and stimulating remedies, we may exhibit ammonia. Dr. Prout recommends the carbonate of potash in preference to the carbonate of soda, because the soda, under certain circumstances, enters into combination with the lithic acid, forming an insoluble salt as bad as the lithic salt itself, whereas the lithate of potash is perfectly soluble; and if this combination takes place, it will pass dissolved in the urine. On the whole, magnesia is preferable to the rest. Being in itself insoluble, it cannot enter the circulation except it has first become combined with acid in the stomach or intestine; and hence it does not pass out of the system so soon as the alkalies. We may give of pure magnesia from ten grains to two scruples daily, and of the others in proportion.

The carbonates of potash, soda and ammonia agree better with the stomach, and are therefore preferable to the pure alkalies. The carbonic acid does not interfere with their medicinal effects. There is a remarkable difference in the effects produced on these disorders by the salts which contain a mineral, and those which contain a vegetable acid. The sulphates, muriates, nitrates, are of no avail; but the tartrate, citrate, and malate of potash produce the same effect as the pure alkalies, or as the alkalies combined with the carbonic acid, and the fact is to be explained thus:—The mineral acids do not find their way into the urine, but the

vegetable ones do, if free : the singularity, however, is, that the latter in this combined condition are decomposed either by the digestive organs or the kidneys, while the alkali with which they were chemically united passes through the kidneys, and thus renders the urine alkaline. On this principle we can account for fruits, as apples, cherries, strawberries, &c. when eaten, proving of service in gravel and calculous concretions composed of uric acid. On the contrary, sorrel, which contains free oxalic acid, is apt to generate calculi of the most painful kind ; and hence we find that the inhabitants of those countries where sorrel is much eaten at table, are more liable than others to the mulberry calculus : the oxalic acid seizes on the lime of the phosphate usually met with in the urine, and forms an insoluble compound, which requires only a nucleus and cement to give rise to a calculus. Sir Gilbert Blane has recommended a very efficient method of exhibiting the carbonate of potash in these cases, by giving it in a saline draught, with an excess of alkali.

Different doses of the alkaline remedies will be required in different instances. If we give too little of the alkali, the result is not obtained, and the lithic acid is still deposited, although in smaller quantity. If we give too much, we not only prevent the formation of the red sand, but render the urine alkaline, and a white sand (the triple phosphate of ammonia and magnesia) is deposited in its place. If magnesia be taken in a larger quan-

tity than is necessary to neutralise the acid generated in the stomach, the patient is liable to the formation of magnesian calculi in the intestines.

In some instances, the urine deposits distinct white particles, minute crystals of a triple salt, the phosphate of ammonia and magnesia. Here the urine is of an alkaline quality. The urine, it is well known, ordinarily contains phosphate of magnesia, which, being highly soluble, is held in solution. But in some cases the urea becomes decomposed in the kidneys, and ammonia is evolved, which combines with the phosphate of magnesia, so as to make a triple salt, which is insoluble, and is therefore precipitated in the form of a white sand. This is sometimes so great, that the quantity of phosphate of magnesia which healthy urine contains will by no means account for it.

Healthy urine is always acid, and its reddening litmus paper, shows that the acid is free: it becomes ammoniacal only by a prolonged exposure to the atmosphere; for it remains perfectly unchanged if kept in a vessel filled with it and well stopped. Its ammoniacal transformation is owing to the spontaneous decomposition of the urea. It appears that this conversion may even take place in the kidneys under the influence of disease, especially in putrid and other adynamic fevers: then the urine is alkaline as it passes from the bladder, and proportionally contains less urea. Until I had more deliberately examined the matter, I was inclined to coincide with the opinion of some

writers, that this was owing to a too long retention of the urine in the bladder: but as urine that has not come in contact with the atmosphere does not spontaneously decompose, we are, I think, warranted in concluding that urine, voided ammoniacal, has been altered by a functional perversion of the kidneys, and not of the bladder. There is, therefore, no philosophical foundation for the supposition that the urine becomes alkaline in the bladder.

The state of the system which leads to the production of alkaline urine and of white sand, is very different from that which is attended with a too acid condition of the urine and the formation of red sand. The latter occurs in individuals who are over-fed or over-stimulated, and whose powers are not expended by exercise; where there is what Dr. John Brown would have called a sthenic diathesis. But the alkaline urine indicates an asthenic state of the system; it is the result of debility. In a person who is exhausted by too severe mental or bodily exertions, or who has long been worn by mental anxiety, the urine becomes alkaline.

In many instances, a course of mercury renders the urine alkaline. In some individuals, even a single dose of calomel will produce that effect. Mercury is what is commonly called a lowering medicine, and this seems to explain the principle on which it operates. In a person who is constitutionally weak, the further degree of exhaustion which is the consequence of the exhibition of an

active purgative will be sufficient to make the urine alkaline. The too abundant exhibition of alkaline remedies will, as indeed might be expected, lead to the same result.

Injuries of the spine, affecting the spinal cord, will also be followed by the secretion of alkaline urine. It is remarkable that this effect is equally produced whatever part of the spine be injured—whether the loins, the back, or the neck, and whether the bladder be or be not paralytic. It continues even after the patient has recovered of all the other symptoms. The same thing occurs where there is disease of the spinal cord, independent of mechanical injury.

In the commencement of paraplegia, the urine is sometimes unusually acid, and it is only as the paraplegic symptoms advance that it becomes alkaline. This confirms a remark of Dr. Prout, that alkaline urine is frequently preceded by a too abundant formation of lithic acid. In females who labour under aggravated hysterical affections, the urine is frequently alkaline, and deposits the triple phosphate in abundance; the same persons are also liable to have the red or lithic sand in the urine; and not unfrequently the two kinds of sand alternate with each other. It is astonishing what a quantity sometimes of lithic acid, and sometimes of the triple phosphate, pass off with the urine in some of these cases.

Those persons who habitually secrete alkaline urine, are generally pale and sallow; incapable of

much bodily or mental exertion ; complaining of lassitude and weariness ; and when this state of things has existed for some time, their bowels become irregular, being sometimes too much relaxed, and exhibiting other marks of debility.

There are, however, cases to which the preceding description does not apply.

Besides the triple phosphate of ammonia and magnesia, another salt, into the composition of which the phosphoric acid also enters, is frequently to be detected in the urine, namely, the phosphate of lime. A small quantity of this seems to be occasionally generated by a diseased kidney, but by far the greater proportion of it is derived from another source.

I conclude this section with a brief notice of the analytic means by which we chemically ascertain the presence of those substances in urine, that are most intimately connected with its morbid conditions.

As an ordinary and easily available mode of ascertaining the nature of urinary sediments, none, perhaps, is better than that mentioned by Mr. Rees. "When," he says, "we observe a deposit, concerning which we are in doubt, the sedimentary matter can be extemporaneously examined, by shaking it up in the urine, and then applying heat to a portion of the turbid fluid ; if the sediment dissolves, we may at once conclude that it consists of the alkaline lithates, and, for the most part, of the lithate of ammonia ; if, on the contrary, the

action of heat fails to render the urine clear, we may be pretty sure that we operate on phosphates, or organic matter in the form of pus or mucus. These may easily be distinguished, since the phosphates are at once dissolved on the addition of muriatic acid, whereas the latter substances resist the solvent.*

Litmus paper is the best immediate test for detecting acidity in urine. When the urine is acid, the blue colour of the paper is changed to a red. Turmeric paper, or what is still better, reddened litmus paper, is the best test for ascertaining whether urine be alkaline or not. Alkaline urine turns the yellow colour of the turmeric paper brown, and changes the red colour of the stained litmus paper to a blue; this latter is a much more delicate test than the former.

Whenever it is necessary, however, to make an accurate analysis, it behoves us to employ more precise means than the foregoing, which merely determine the general and predominant characters of urine. The following is the process by which we obtain *urea* from the urine :—

Mix equal parts of urine reduced to the consistence of syrup, and pure nitric acid; surround the mixture with ice, when crystals of the nitrate of the urea fall down; wash the crystals with a little cold water, and dry them on blotting-paper; thus cleansed, dissolve them, and digest the liquid on

* On the Analysis of the Blood and Urine, p. 145.

animal charcoal; decompose the nitrate of urea by carbonate of potash, and evaporate the filtered liquor, by a gentle heat, to dryness; treat the residue with pure alcohol, which dissolves only the urea, and this, when concentrated, yields the urea crystallized. Should any colouring matter adhere, again treat the urea with alcohol and animal charcoal, and re-crystallize.

The mode which Dr. Prout commonly uses to detect an excess of urea, is to put a little urine into a watch-glass, and carefully add to it nearly an equal quantity of pure nitric acid, in such a manner that the acid may easily subside, from its greater specific gravity, to the lower part of the glass, and allow the urine to float about it. If spontaneous crystallization takes place, an excess of urea is indicated; and the degree of excess can be inferred, nearly enough for practical purposes, by the greater or less time which elapses before the crystallization takes place, and which may vary from a few minutes to two or three hours. Such urine is commonly, but not always, of a pale colour.

Lithic or uric acid.—This acid, when pure, is perfectly colourless, and is easily detected in urine by the addition of a little hydrochloric acid. After standing for three or four hours, a red crystalline precipitate will be found, which is lithic acid, tinged with the colouring matter of the urine. If it be wished to obtain the acid quite pure, let the crystals be dissolved in liquor potassæ, that is,

form a lithate of potash; if you now again add a little hydrochloric acid, you decompose the salt you had formed, by making a muriate of potash, when the lithic acid is again precipitated, free from colouring matter.

The salts of urine.—Unless it be the muriate of ammonia, all the other salts found in urine resist the action of heat. It therefore becomes necessary, before subjecting the urine to the process, to extract the muriate of ammonia, which is done in the following way:—Let the urine to be experimented upon stand for several days, when a deposition of various salts will spontaneously take place. This crystalline sediment is to be dried on blotting-paper, and those crystals of a cubical shape are to be carefully separated from the rest. On examination, they will be found to consist of the muriate of ammonia by the ordinary tests, such as wholly volatilizing the crystals by heat; by decomposing the muriate with potash by heat, when fumes of ammonia fly off, &c.

The alkaline and earthy salts.—These are obtained by evaporating urine to dryness, and subjecting the residue to a strong heat. The alkaline are easily separated from the earthy salts, by simply treating with water.

Vesical mucus.—If collected in a filter, mucus, when moist, is always more or less transparent, and when dried it has a shining appearance. Nitric acid dissolves it, and if to this ferro-cyanate of potash be added, a precipitate is produced.

Mucus does not dissolve in sulphuric acid. Liquor potassæ dissolves it, and ammoniacal fumes are produced, most probably, as Mr. Rees observes, from containing some urate of ammonia.

Vesical mucus is sometimes passed in such quantity, as to show itself plainly in the form of a glairy tenacious matter adhering to the bottom of the vessel. If pus be conjoined with mucus in the urine, it is not difficult to distinguish between the two, the former being quite opaque, whereas the latter is more or less transparent; pus will also be found lying on the surface of the mucus, and is of a yellowish hue.

Albumen.—Albuminous urine contains much less urea than healthy urine, and in these cases it is that urea is found in the blood. This kind of urine is not characterized by any particular physical appearance; it often is of a natural colour, sometimes a little pale, at other times it is obviously tinged with blood. For the most part, albuminous urine is transparent at the instant it is voided, but on cooling it gets turbid; its odour is ordinarily less urinous, even when it has stood a day, than the urine of health.

The tests for detecting albumen are various. Nitric acid is one of the best; for if a few drops be added to the urine containing albumen, an abundant precipitate is formed, which we cannot re-dissolve by an excess of the acid, but which is readily dissolved by the addition of a sufficient quantity of an alkali.

Heat, from its property of quickly coagulating albumen, is an excellent test for recognising this principle, as it has the advantage of not changing the other elements of urine; but to give this result, it is necessary that the albumen be present in considerable quantity; and another requisite is, that if the urine be alkaline, it must be rendered acid before subjecting it to the experiment of heat. Nitric acid and heat are the two best tests. The bichloride of mercury, alcohol, tannic acid, and infusion of galls, have been employed for the same purpose, but they cannot be depended on. The objections to the bichloride are, that it precipitates mucus as well as albumen, and that it decomposes the salts of the urine; and both alcohol and the infusion of galls precipitate the clouds soluble by heat, as well as the albumen. A whitish precipitate is produced in albuminous urine by the addition of a solution of alum.

In conclusion, I may observe, that albumen, in a modified state, often exists in healthy urine. This albumen, Dr. Bostock tells us, varies in its correspondence with re-agents, sometimes coagulating by muriatic acid and not by heat; at other times by the bichloride of mercury, or it shows itself on the addition of ferro-prussiate of potass.

CHAPTER II.

IRRITABILITY OF THE BLADDER.

THIS term is usually employed to denote any affection of the bladder attended with frequent desire to void the urine. I wish, however, to express by it, a frequent, and often irresistible, desire to micturate, not arising from inflammation, nor any of the organic affections, of the bladder or prostate gland, and sometimes, but not always, attended with pain. The frequent desire to micturate, is the chief symptom of this complaint.

Thus, a person previously enjoying good health, feels, suddenly, a desire to void urine every half-hour, or oftener; and the desire is so strong, that, unless he yield to it at once, the urine passes in spite of all attempts to prevent it; or, if he succeed in checking the desire, uneasiness, pain, or even paralysis of the bladder, is apt to occur. In this disease, the act of micturating is sometimes, but not always, attended with pain in the glans, or under the frænum, and with violent efforts or straining.

The urine, except in hysterical subjects, is voided in small quantities; and although such quantities are frequently passed, their aggregate does not much exceed that of a person in health.

Hysterical persons sometimes suffer from irrita-

ble bladder, and experience great pain in passing urine. In these patients, the quantity of urine is often considerable, and possesses the aqueous character, or contains less than the usual proportion of solid matter, the nature or relative quantity of its constituents remaining the same. This peculiarity in the quantity and quality of the urine in the hysterical, as well as the often concomitant irritability of the urinary system generally, is capable of explanation perhaps, to a certain degree, from the fact that the viscera apt to be deranged in hysteria, all derive nerves from the same source, namely, the abdominal ganglionic system.

Opportunities for examining, after death, the bladders of persons who labour under idiopathic irritation of that viscus, are exceedingly rare. I examined the body of a gentleman, of very nervous temperament, who had long laboured under this affection, and who was carried off by disease of the lungs, but I could not detect the least alteration in the appearance or structure of the bladder, or any of the urinary organs.

After long-continued irritation, the bladder diminishes in size; and, instead of containing a pint or more, it is incapable of holding above two or three ounces. Notwithstanding this contracted state, if there be no stricture or disease of the prostate, the parietes of the bladder are often thinner than natural. It would, therefore, seem that long-continued irritation produces actual absorption of part of the substance of the bladder.

Where a case of irritability of the bladder comes under the notice of the surgeon, the first and great object of inquiry is, the cause on which the irritation depends.

Irritation of the bladder often depends on obvious causes; as pressure of the womb in pregnancy, hæmorrhoids, and foreign bodies in the bladder. In almost all cases of stricture, the bladder is liable to irritation; but, if there be no alteration in the structure of the organ, the irritation subsides when the stricture is removed. After the operation for stone also, the bladder often remains irritable.

Sometimes the slightest derangement in the digestive organs, by disturbing the functions of the kidney, causes irritability of the bladder. Adults, and children more particularly, are, from eating fruit, very liable to this affection in the summer season: in these cases, the urine contains an excess of acid, either lithic acid, or lithate of ammonia, and we are further to recollect that the malic, citric, and other vegetable acids, are conveyed to, and excreted by, the urinary organs, unchanged by any process of digestion or sanguification.

Sometimes irritation is produced by taking alkaline remedies for too long a time; and, in this case, the urine is alkaline. I was consulted for irritability of the bladder, by a gentleman, whose urine was alkaline, but whose appearance and state of constitution did not at all lead me to expect that state of urine. On inquiry, I found that, for a long time, he had been taking the sesquicarbonate

of soda in large doses. I ordered him to discontinue its use, and he soon recovered. The altered state of the urine being the immediate cause of this irritability, the condition of that secretion should especially engage our attention.

Many gouty and rheumatic persons are subject to this complaint. It often occurs, that a patient, having irritability of the bladder, applies to his medical man, who, on inquiry, finds that he is occasionally subject to pains in the limbs and loins, to some scaly eruption on the skin, and sickness of a morning, as well as that the urine is usually passed in small quantities, is very acid, and contains a large quantity of the lithate of ammonia.

The following case illustrates this common form of the disease:—On the 11th of February, 1837, a gentleman, forty-two years of age, and subject to rheumatism, applied to me, on account of a very frequent desire to pass urine, from which he had suffered for several years. He was affected with a scaly eruption, of a leprous nature, on several parts of the body, particularly about the elbows and knees; and he often felt severe pains in the hips and loins. The urine was very acid and scanty. I ordered him the following mixture:—℞ Infus. Diosmæ ℥xv.; Tinct. Hyoscyam. ℥iij.; Potass. Bicarb. ℥iss.; Extract. fluid. Sarsap. ℥iv.; Cap. coch. ij vel iij ampl. ter in die. I gave also the following pill at bed-time: ℞. Pil. Hydrarg. gr iij; Pulv. Rhei gr ij. On the 3rd of March, the irritability of the bladder was much lessened, and the

eruption improved. I then gave the decoction of the pareira brava in the day, with a grain of the acetous extract of colchicum at bed-time. His complaint was much relieved, but not cured.

Remarkable irritability of the bladder and urethra, with increased secretion from the mucous membrane of these parts, prevails with some persons shortly before a fit of gout; and these symptoms almost always take place when the urethra is affected with stricture.

During the most frequent symptoms of the paroxysm, says Sir C. Scudamore,* “the urine is usually passed with considerable irritation, both as to frequency and sense of heat. The pink or lateritious sediment appears, more or less, in every portion of the urine, during the inflammatory symptoms. When these have entirely subsided, and the state of the liver (on the condition of which the symptom in question principally depends) is still remaining unhealthy, the sediment of the urine often assumes a whitish colour, and is compared by the patient to the appearance of magnesia. This and the pink sediment frequently alternate, one or the other appearing as inflammatory or nervous action most prevails. Sometimes, however, it occurs that a patient who has for years been labouring under irritability of the bladder will have this symptom relieved or suspended during a paroxysm of the gout.”

Scybala in the intestines may give rise to this

* On Gout, Gravel, and Rheumatism, p. 18.

complaint. I have already assigned a reason why there should be not only a sympathy betwixt the bladder and the other viscera of the pelvis, by which the diseases of one may be mistaken for those of the other; but certain parts of the primæ viæ through their whole extent, sometimes the stomach, sometimes the ileum, often the colon, and still oftener the rectum, being the seat of irritation, produce sensations in the bladder, the perineum, or urethra, which fill the mind of the sufferer with serious apprehensions, and lay him open to the mistakes of ignorance.

Irritability of the bladder is sometimes the result of a mere nervous state of the organ, of the same spasmodic nature as that which in other individuals, and other parts, occasions a constant winking of the eyes, or twitches of the muscles. The frequent voiding of the urine, being once begun, is kept up by habit; the bladder becomes less capacious; and it is not until after some time, nor without some effort on the part of the patient, that it is restored to its natural condition and capacity.

Various mental affections, as grief and anxiety, cause this complaint; and it is often connected with a peculiar state of the nervous system. An elderly man, for example, says Brodie,* “ complains of frequent attacks of giddiness. In walking, his head turns round, so that he is in danger of falling; and this symptom probably arises from an altered structure of the arteries of the brain, causing an

* Op. cit. p. 75.

imperfect state of cerebral circulation. Not unfrequently this is attended with an irritable state of the bladder; and although the urine is of a healthy quality, and the bladder itself is free from disease, the patient is tormented by a constant micturition, voiding his urine without pain, but at short intervals, and in small quantities at a time." It ought never to be absent from the surgeon's consideration, when a patient complains of frequent micturition, pain in the bladder, and pain in the perineum, that these symptoms very frequently depend, neither on stone, nor stricture, nor inflammation, nor any mischief in these parts, but on remote irritation.

I have known irritation supervene on paralysis of the bladder. Nine years ago, a gentleman, during an attack of typhus fever, was seized with inability to pass urine, requiring it to be drawn off twice a day. As he gained strength the power of micturating returned, and the desire to pass it then became so frequent as to compel him to do so every half-hour. He consulted me for this symptom in November, 1835. There was no disease in the urinary organs, and his general health was good, with the exception of occasional rheumatic attacks. The urine was very acid and scanty. I ordered him a grain of the acetous extract of colchicum at night, and ten grains of bicarbonate of potash, seven of sesquicarbonate of soda, and four of nitrate of potash, twice or three times a day, soon after meals; and by these means the urine became more

abundant and less acid; but the frequency of passing it continued. I tried the infusion of diosma, the decoction of the pareira brava, and various preparations of steel, for the relief of this symptom, but without success.

In children, a not uncommon cause of irritability of the bladder, is a contracted state of the prepuce. A striking case of this kind lately came under my notice. Master Charles B., æt. seven years, was sent to me by Mr. Huxtable of St. John Street. The child had, for the last eight months, complained of a frequent desire to make water, attended with difficulty in passing it, and pains round the lower part of the abdomen. On examining the prepuce, I found it so contracted as scarcely to admit the point of a probe. I immediately removed the end of the prepuce by circumcision. From that time the symptoms subsided, and the child is now quite well. In these cases, the division or removal of the extremity of the prepuce will be sufficient for the cure of the complaint, without the aid of medicine.

Irritability of the bladder may, in many cases, be mistaken for some of the inflammatory affections of this organ. The distinction however, is easy, and of great practical importance. If the disease have recently occurred, it may be distinguished from acute inflammation of the bladder, by the absence of pain and of those severe constitutional symptoms which characterize the latter disease. If it have been of very long standing, it may be

distinguished from chronic inflammation of the bladder, by the general health suffering but little ; whereas, in chronic inflammation, the constitutional powers sooner or later give way. In the following case the complaint was of very long duration, and the health was but little affected.

On the 4th of December, 1835, a gentleman, sixty-five years of age, of good constitution and regular habits, consulted me on account of a very frequent desire to pass urine, unaccompanied with stricture, disease of the prostate, or any other affection that I could detect. Thirty years ago, he had applied to Mr. Jesse Foot for the same complaint ; and the *lotura vesicæ* was then tried on him without affording any relief. This symptom has continued ever since ; being aggravated in cold weather, and on any excess in living or derangement in the health. In other respects, he is quite well.

The cause of irritability is sometimes supposed to be confined to the bladder, when in fact that organ is not at all affected, and the kidneys are the source of the complaint : these cases are attended with great obscurity.

Morgagni* relates a case in which the bladder was thus the seat of sympathetic pain ; the disease being in the kidneys. The patient, he says, complained of very little pain in the region of the kidney ; while he was tormented with pain in the

* On the Seats and Causes of Disease, Letter 42.

bladder, so excruciating, that five or six physicians who attended him, entertained no doubt of the seat of the disease being in that organ. On dissection, however, no morbid appearance was discovered in the bladder; and there were large and ramifying calculi in the kidney.

In certain renal affections in particular habits, says Dr. Prout,* even where the urine is not very unnatural, the pain is confined chiefly to the neck of the bladder; but when the urine is actually diseased, and more especially when it is alkaline, we may be certain that the kidney is functionally, and if the patient be of scrofulous habit, and the case of long standing, very probably organically, affected.†

In idiopathic irritability of the bladder, which has not been of long continuance, the treatment is usually plain; the state of the general health and the condition of the urine being our guides. In gouty and rheumatic subjects, in whom the urine is generally acid and scanty, and red sand is often passed, the alkalies should be administered; and a good form for their exhibition is a combination of potash, soda, and nitre.‡ The carbonate of

* Inquiry into the Nature and Treatment of Diabetes, Calculus, &c., 2d edition, p. 315.

† Some interesting cases of irritation of the bladder caused by disease of the kidney, are related by Mr. Henry James Johnson in the *Medico-Chirurgical Review*, vol. xxix. p. 193.

‡ R. Bicarb. Potass. ʒj; Sesquicarb. Sodæ, ʒvj; Potass. Nitrat. ʒij. As much of this powder as can be put on a sixpence, to be taken twice or three times a day, in water, soon after a meal.

potash is to be preferred to the carbonate of soda, because, under certain circumstances, soda enters into combination with the lithic acid, forming an insoluble salt, as bad as that acid itself; whereas the lithate of potash is perfectly soluble, and if this combination should take place, it passes off dissolved in the urine. In addition to the alkalies, the acetous extract of colchicum, in doses* of one or two grains, should be given at bed-time; and if the digestive powers be weak, as is often the case, some tonic, as infusion of cascarilla, or columba, or hop, a short time before meals, will be found serviceable. Great relief will sometimes be obtained from cupping on the perinæum, and from the warm bath, with the internal use of the liquor potassæ and tincture of hyoscyamus, and occasional doses of the blue pill and saline aperient. When we can trace the irritable state of the bladder to mischief in the kidney, setons and issues in the lumbar region must be employed in addition to the means immediately directed against the sympathetic disease.

In these, and indeed in all cases, the strictest attention should be paid to diet. Vegetables and fruit should be avoided, as well as wine, spirits, and all fermented liquors.

In some constitutions, notwithstanding the acid state of the urine, and the deposition of a large quantity of the lithate of ammonia, the alkalies

* R Extract. Aceti Colchici, gr. j vel ij; Pulv. Glycyrrhizæ, q. s.
A pill to be taken at bed-time.

disagree, producing restlessness, giddiness, and uneasiness about the region of the stomach. I recently saw a gentleman who had great irritability of the bladder, and whose urine was very acid, and deposited great quantities of the lithate of ammonia, but who could not bear even small doses of alkaline remedies.*

If the patient be of nervous temperament, and the urine be alkaline, a different plan of treatment will be necessary. The dilute mineral acids,† combined with the decoction of *pareira brava*, should be administered, and every thing having a tendency to lower the system, as attention to business, study, or anxiety, should be studiously avoided.

In other cases, where the urine is neutral, the extract of the *Uva Ursi*,‡ combined with that of Hop or *Hyoscyamus*, may be taken, and opiate suppositories,|| or injections, with some drops of the *Liquor Opii Sedat.* according to the severity of the symptoms, may be administered. The decoc-

* In such cases, the following mixture may be given:—*R* Spirit. Ammon. Aromat. ʒ ij; Spirit. Æther. Nit. ʒ ij; Tinct. Hyoscyam. ʒ ij; Mist. Camph. ʒ v. A fourth part to be taken three times a day.

† *R* Acid. Nitric. dil. ʒ i; Acid. Muriat. dil. ʒ ss; Aquæ distillat. ʒ viij. Two table-spoonsful to be taken three times a day.

‡ *R* Extract. *Uvæ Ursi* gr. v. Extract. *Humuli vel Hyoscyam.* gr. iii. Two pills to be taken three times a day. The acetous extract of *Colchicum*, or the muriate of *Morphium*, may be added to this formula; the former, if there be rheumatic pains in the limbs; the latter, if there be much irritability of the bladder.

|| *R* Pil. Saponis cum Opio gr. vij. To be introduced within the rectum at bed-time.

tion of *Uva Ursi*,* and the infusion of wild-carrot seeds,† will occasionally give great relief. In my experience, however, no medicine has been so often successful in irritability of the bladder, as the *Diosma* in the form of infusion.‡ I could cite several cases, where it has succeeded after other medicines had failed. A young gentleman, æt. 21, applied to me, in May, 1834, on account of an affection of the bladder; and said that, for the last eleven or twelve years, he had experienced great difficulty in retaining his water for any length of time, being obliged to leave all company in which he might be, once or oftener in the hour. The moment the desire to micturate came on, the water, unless the desire was immediately complied with, passed away involuntarily. This irritability of the bladder was always very much aggravated after taking malt liquors, wine, spirits, and on exposure to cold, and, during the last twelve months, it had considerably increased. He was very susceptible of cold, complained of pains down the inside of the thighs, but had no pain in the region of the

* R Folior. *Uvæ Ursi* ʒi, *Aquæ ferventis* ʒxx; coque ad ʒxvi. A third part of a pint to be taken three times a day.

† R *Seminum Dauci Contusorum* ʒi, *Aquæ ferventis* ʒxvij; *Macerate per horas iv*; dein cola. A third part of a pint to be taken three times a day.

‡ This is to be prepared according to the formula in the London Pharmacopœia. If there be scaly eruptions, and the urine be very acid, the following form will be of service: R *Infus. Diosmæ* ʒvij; *Potass. Bicarbon.* ʒi; *Tinct. Hyoscyam.* ʒiiss; *Extract. Fluid. Sarsap.* ʒiv. Two table-spoonsful to be taken three times a day. If the urine be not very acid, the alkali must be omitted.

loins on pressure, nor any over the bladder, and his general health had not suffered. The urine was light-coloured, and neutral in its character. After trying the various preparations of steel, the decoction of *pareira brava* and henbane in different forms, without success, I ordered the infusion of *diosma*, which he took for some time with great benefit.

From time immemorial, the Buchu leaves have been held in great esteem by the natives of the Cape of Good Hope, as a remedy for a number of diseases, particularly irritative or chronic inflammatory affections of membranous parts, as the urethra, bladder, prostate gland, rectum, and also for rheumatism, indigestion, and gravel. Of late years, these leaves have been very successfully prescribed in the same complaints, both in Holland and in this country. There are several species of this shrub, but that termed "*Diosma crenata*," is most esteemed for its medicinal virtues. It affords, on distillation, an essential oil, resembling a mixture of oil of rue, juniper, and camphor: the extractive matter is slightly bitter and mucilaginous. The natives of the Cape, and the Dutch, who have learned from them the use of the plant, are partial to the spirit of buchu, made by distilling the leaves in the dregs of wine, which they term buchu brandy; and they regard it as a sovereign remedy for all chronic diseases, and even for acute ones, of the stomach and bladder, especially colic spasms in the stomach and intestines.

Mr. Jesse Foot, as is well known, was a great

advocate for injecting the bladder in cases of irritation of that organ ; but the plan, since his time, has never been extensively tried. Mr. Wadd, indeed, mentions two cases in which great relief was experienced from the *lotura vesicæ*, and expresses his surprise that it is not more resorted to by practitioners.

The bladder may be injected with simple tepid water, or with some bland mucilaginous decoction, as of quince seeds, linseed, &c., and the injection may be repeated once or twice a day, the quantity thrown up being gradually increased, and the time of retaining it lengthened.

I have myself tried the injection of the bladder in cases of simple irritability, and I have been disappointed in the results which I expected from its use. It is certainly a valuable remedy in an affection of the bladder to be noticed hereafter ; but I do not consider it of much use in the complaint now under consideration.

In the irritability of the bladder which is met with in young females at the time when menstruation should take place, or when some irregularity in that function has occurred, the preparations of iron are of great service. The ammoniated or the muriated tincture of iron, given in some light bitter infusion, is found serviceable ; and if the bowels be costive during the use of the remedy, the compound decoction of aloes should be daily administered. The bowels should be kept well open, for the symptoms of the disease are invariably

aggravated when the bowels become costive. If there be much hysteria, the tincture of valerian, combined with the vinum aloes, may be also tried with benefit. The cold shower-bath will likewise be found very serviceable in such cases.

In children, incontinence of urine usually depends on an excitable state of the bladder, or an altered condition of urine. In either instance, the bladder cannot contain more than a trifling quantity of urine, before the call to void it is felt, and this is so sudden and irresistible, that it must be obeyed, or the contents are at once expelled. In some cases it occurs during sleep, and the urine often passes off voluntarily under the influence of a dream.

CHAPTER III.

PARALYSIS OF THE BLADDER.

THIS is the opposite state of the bladder to that which has just been considered, although one is sometimes consecutive of the other.

Partial paralysis of the bladder, in which a quantity of urine flows from it, which is insufficient perfectly to empty it, may exist for some time without exciting attention.

When more complete paralysis supervenes, and the patient has not lost all sensibility, he complains of great uneasiness and oppression or weight in the region of the bladder, and he finds himself incapable of voiding urine, notwithstanding all his efforts to do so.

The principal uneasiness appears to arise from the pressure of the urine against the tender parts at the neck of the bladder, and the pain is referred there and to the glans penis: as the distension increases, these symptoms go off, and the patient does not even experience an inclination to void urine. This arises from the bladder having lost its sensibility, so that pressure is no longer felt, although the bladder is now pressing backwards upon the rectum, and forwards against the abdominal muscles. The local symptoms have in a great measure subsided; others come on, showing

the constitution to be much disturbed ; there is a quick pulse, great thirst, general irritation, anxiety of mind, the tongue is covered with a brown fur, and the patient becomes delirious, with intervals of stupor. Under these symptoms the patient sometimes dies, and is not uncommonly believed to have been carried off by typhus fever, totally unconnected with the disease of the neck of the bladder.

This affection falls most frequently under the notice of the surgeon as the effect of injuries or diseases of the spine ; and these cases are attended with important changes in the whole urinary system, as well as in the condition of the urine itself.

In some cases, the urine first secreted, though free from mucus, and of an acid quality, has an offensive and disgusting odour. In other cases, the urine is highly acid, has an opaque yellow appearance, and deposits a yellow amorphous sediment. But the most common change produced in the urine by injury of the spinal cord, is the following :—it is voided turbid, and of ammoniacal odour ; when allowed to remain at rest and to cool, it deposits much adhesive mucus ; and, when tested with reddened litmus or turmeric paper, it is found to be highly alkaline : after some time, a quantity of phosphate of lime may be detected in the mucus, and it is tinged with blood : at a later period, a considerable quantity of sanguineous coagulum is blended with the mucus and urine.

An opinion has been entertained that, in these cases, the ammoniacal condition of the urine is owing to imperfect nervous power influencing the kidneys, and that, consequently, even at its source, there is a change in the secretion of urine.

I have already given my reasons for concurring with this opinion; and believe, that, unless atmospheric air be permitted to come in contact with the urine, no spontaneous alkalescent change ever takes place.

However, as this point is one of great importance, it requires further observation before it can be finally determined. If the opinion to which I have alluded be correct, little relief can be afforded, excepting in so far as the paralysis itself may be relieved. If, on the contrary, the evolution of ammonia, and the inflammation of the bladder, be the effect of the retention, the prospect is more cheering.

Lallemand remarks,* that we must ascribe to diminution of sensibility, the distension of the bladder and the inflammation of its mucous membrane, observed in disease of the brain and its membranes, when such disease is accompanied with stupor, drowsiness, &c. In that case, the patient makes no effort to expel the urine from the bladder, because he does not feel the impression made by it: it consequently accumulates and distends the parietes of that organ as long as they admit of it, until their resistance being greater than that of

* Letter II. p. 236.

the neck of the bladder, the urine dribbles away as slowly as it is conveyed by the ureters, that is, drop by drop.

This complaint often attacks elderly persons, particularly those who are gouty and rheumatic. It is the result of general diminution of nervous and muscular power ; the bladder being less sensible to the stimulus of the urine, and being incapable of obeying the will with the same facility as before.

Paralysis of the bladder is peculiarly, as Soemmering observes, a disease of old age—the excitability of the organic formation, particularly that of the muscular fibres, gradually decreases ; the susceptibility of the nerves becomes limited, and the cellular membrane loses its tone. Hence, an attack of paralysis is often long announced by weakness in the loins, tottering in the step, and bending of the knees in walking. From this it may almost always be inferred, that a considerable alteration in the functions of the spinal marrow, and of the nerves proceeding from it and from the sacrum to the bladder, has taken place.

The bladder is rendered incapable of obeying the will with the same facility as before : no longer so susceptible of the customary excitement of the urine, it yields to the urine, and becomes distended, sometimes to an enormous size, even so much as to burst, when the patient almost immediately expires. Haller saw a bladder in a great drinker, which was able to contain twenty pounds'

weight of water. Frank found the bladder so distended as to give the appearance of dropsy; twelve pounds of urine passed at one time through the catheter, although he did not remove the whole of it.

Baillie remarks that this expansion of the bladder may arise from an accidental circumstance, where the urine accumulates whilst the muscular coat still retains its peculiar power; or the muscular coat of the bladder may likewise be paralysed, and hence be incapable of expelling the urine. The difference between these two circumstances can always be ascertained by an examination of the case during life.

In advanced age, the muscular power of the bladder is liable to be impaired in a greater proportion than that of some other muscular parts. Two evils, apparently of opposite kind, yet both referrible to impaired action of some of the fibres of the bladder, occur as sources of great inconvenience and distress. One is retention of urine, from debility of those muscular fibres by which it is usually expelled, and the other is the incontinence of the bladder, arising from paralysis of its sphincter; or, as those who deny the existence of any sphincter would say, from loss of tone in the urethra.

The first indication of failure in the muscular power of the bladder, is the inability to empty itself wholly, some urine always remaining behind, after every attempt at expulsion. If, from any

accidental circumstance, the urine has been suffered to accumulate in too great a quantity, its expulsion becomes still more difficult, and may even be found to be impossible, without the introduction of the catheter.

After the bladder has thus been stretched to an excessive degree, its tone is much impaired, and is with difficulty recovered; and even if the power of retention to a certain extent be obtained, this power may be accompanied by incontinence when the quantity is exceeded; the urine continuing to come away involuntarily, while there is still a considerable quantity retained in the bladder.*

Children are likewise subject to both partial and complete paralysis of the bladder. In some cases, the urine continues to pass involuntarily by day as well as by night; and then the patient suffers more or less from this complaint during the remainder of his life. When this occurs only in sleep, children should be waked up in the night, twice or oftener, for the purpose of passing urine; and they should not be permitted to take late meals, or much liquid for some time prior to retiring to rest. Indeed, they should not at any time be allowed to take much liquid. As lying on the back in bed tends to keep up this complaint, it should be guarded against. Cold bathing, preparations of iron, and other tonics, are of great use. This complaint usually improves as children get older, and often disappears after puberty, owing to the

* Cyclopædia of Practical Medicine. Article—Age, by Dr. Roget.

increased energy which the genito-urinary organs then experience. If it continue after puberty, the tincture of cantharides is often very serviceable, together with the occasional application of blisters across the sacrum or loins.

M. Lallemand* strongly recommends the use of baths, medicated with aromatic plants; and mentions several cases which were cured by using them. After eight or ten baths the beneficial effects are usually observed, and fifteen or eighteen generally suffice for the cure. Sometimes the complaint returns after a few months; if so, the baths must be again resorted to.

I have known this state to occur after an attack of scarlet fever. A boy, now fifteen years of age, was quite well till eight years ago, when he was attacked with scarlatina; and ever since that period he has been afflicted with incontinence of urine during the night.

Incontinence of urine is frequently connected with a weak and scrofulous state of constitution; and often, in these cases, all remedies are unavailing. I lately saw a child, six or seven years old, with a large head, pale countenance, bad teeth, prominent sternum, large abdomen, and emaciated extremities, who, from its earliest infancy, had suffered from incontinence. All kinds of remedies had been tried without success. In this case, as in many others, there was great irritability of the bladder during the day, and, unless the desire to

* Archives Générales de Médecine, Mars 1827.

pass urine was attended to, it flowed off involuntarily. The urine was very acid.

In incontinence of urine, it is of the utmost importance to preserve the patient from the consequences of a perpetual dribbling of the urine. For this purpose, a receptacle should be worn during the day to contain the urine as it is passed. The contrivances in ordinary use, composed of gum-elastic, are objectionable, on account of the strong urinous smell which they soon acquire, notwithstanding every attention to cleanliness. An oval glass bottle or vessel composed of copper or platina, and covered with a piece of thin macintosh, is better adapted for persons labouring under this complaint. These contrivances are made for females as well as males. During the night patients should have a piece of macintosh cloth placed under them.

In some persons, particularly in stout females, the urine will flow involuntarily on lifting a weight, or coughing, or any violent exercise. In such cases, there is no pain, no blood in the urine, no desire to make water often, but merely an involuntary flow on exertion—the action of the diaphragm and abdominal muscles overcoming that of the sphincter of the bladder. In females, incontinence often occurs after distention of the urethra for the extraction of calculi or foreign bodies, and occasionally after difficult labours. Dr. Cory relates a rather interesting case of the latter, which speedily yielded to the one-sixteenth part of a grain of

strychnia, given three times a day.* In these cases, it is probable that the sphincter vesicæ has been injured.

In the end of gestation, incontinence of urine is not uncommon, being produced by the pressure of the uterus on the bladder, by which the urine is expelled involuntarily, whenever the woman coughs or moves quickly : at least, she cannot retain much of it, being obliged to void it frequently, though without strangury. For this complaint there is no cure ; and many regard it favourably, as an omen that the child's head is resting on the os uteri. When the uterus is very pendulous, some advantage may, in this respect, be obtained, by supporting the belly with a proper bandage, attached to the shoulders.

Incontinence of urine, resulting from a mere weakness of the neck of the bladder, is common in those who have had very large families, ten or twelve children, for example. In these cases, more especially if the child is large, or the pelvis small, when the labour has been severe, the bladder is apt to get so infirm about the neck, that it loses much of its retractive power, and, perhaps, from the moment of delivery, the woman is incapable of retaining the water : or if, any time, she chance to cough, laugh, rise suddenly, or in any other manner contract smartly the abdominal muscles, the water comes gushing away. For years this disease may continue in greater or less severity, but it

* Med. Gazette for March 16th, 1839.

frequently cures itself, in good measure, and the first few weeks after delivery, say at the end of the fortnight, the patient is better; at the end of the month the retentive powers are still more increased; and in the course of a few more weeks, she becomes able to hold the water very well, though still liable to gushes, when sudden efforts are made. Hence, where inconvenience is the result of an enfeebled cervix vesicæ, time must be looked upon as one of the principal remedial means; in some cases, advantage may be obtained from plunging the hips into cold water two or three times daily. The improvement of the general health is by no means to be neglected, for the more you improve the general health, the more you will increase those healing powers of the parts on which all cures are more immediately dependent.*

Paralysis of the bladder is also frequently brought on by neglecting to expel the urine when it has accumulated. A person, not being conveniently situated for emptying the bladder, may neglect the first call, and allow the bladder to become distended; the elongated fibres lose more and more their sensibility; the desire perhaps goes off; a large quantity of water accumulates; the retention, which at first was only partial, becomes complete; the bladder rises up to the umbilicus, or even higher; and when he attempts to empty it, he finds that he is unable to do so, and that he cannot void any water at all. In this case, the detrusor

* Vid. Blundell's Lectures, Lancet, 1828, p. 673.

muscle has lost its power, and the urine cannot be discharged by the patient, though no obstruction exists. We are further to recollect, that the other power that so mainly assists in the evacuation of the bladder, I mean the action of the abdominal muscles, is counteracted in its effects by the abnormal position of the bladder. Though all the muscles of the abdomen assist by their contraction in the expulsion of the urine, still this is more particularly accomplished by the compression made immediately over the bladder by the lowest or hypogastric sections of the recti muscles. Now, when the bladder, through distension, rises as high as the umbilicus, any contraction of these sections, instead of pressing the urine downwards against the sphincter vesicæ and overcoming its resistance, pushes the urine in an opposite direction, from the axis of action being changed. Patients, therefore, ought never to resist the first desire to make water.

When the bladder is distended to a certain degree, the urine will sometimes flow off involuntarily; and it has happened, at this stage, that the paralysis has been overlooked, especially in corpulent persons, and incontinence has been supposed to exist, whilst in reality, the bladder was full and could hold no more. In the case, therefore, of a person who complains of not being able to hold his water, and especially in that of an old person, in whom the water is flowing off involuntarily, the surgeon ought not to give any opinion till after he has laid the hand upon the abdomen, and felt whether the

bladder be distended or not ; for very serious consequences may be produced by a mistake in this respect.

In illustration of this important point, Mr. Lawrence states the following case:—" It happened to me, a good while ago, to be sent for, to see a gentleman labouring under an affection of the bladder ; and the medical attendant, who had lately seen him, mentioned that the case was one of great irritability of the bladder, which would hold no water at all—the urine passing off as fast as it came into it. He said he had been doing all he could to get the bladder's natural power of retention restored ; he had directed the patient to take diluent liquids ; in short, he had done all he could to prevent it ; but still the water ran off. It appeared to be a singular case. I put my hand under the clothes upon the abdomen ; and I felt the fundus of the bladder forced up a good way above the umbilicus. I said that I had brought a catheter with me, and that I might as well introduce it, to see if there was anything in the bladder. I introduced it ; and about five pints of urine immediately flowed off. The fact was, the bladder had been, in this way, allowed to distend for about five days before I saw the patient ; and the consequence was, that he never afterwards recovered the natural power of emptying that viscus ; but he acquired, after a certain time, the art of introducing the catheter, which he still employs : he can introduce it, and let off the water whenever he finds a

desire to do so ; but since that time he never has been able to empty the bladder by the natural powers."

If, by the use of the catheter, the bladder should happily recover its natural power, the patient must be strongly impressed with the importance of never again allowing the urine to accumulate in such a quantity, but of immediately passing it as often as he feels the smallest inclination, or, if unable to expel it, of making timely use of the catheter. The patient ought also to be informed of the necessity, on every occasion, of voiding the urine even to the last drop.

Although the complaint is often met with in old persons, it not unfrequently occurs in others who are under thirty-five or forty years of age, and whose constitutions have been impaired by venereal excesses, long courses of mercury, anxiety, fatigue, and excessive attention to business. Before the attack, the patient complains of pain in the head, or some part of the back, weakness in the loins, and inability to walk firmly, flatulence, or a sense of fulness in the epigastric region, and he feels and looks as if threatened with some impending mischief. If these symptoms be not relieved, paralysis of the lower extremities follows ; and the bladder partakes of the affection. I recently attended, with Mr. Ireland, of Artillery Place, a case of this kind, which, in eight weeks, terminated fatally. From the commencement of the illness, the use of the catheter twice, or occasionally three

times a day, was required. At first, the urine was of a deep red colour, very acid, and without mucus; but towards the close of the illness, mucus was secreted in abundance, and the urine became alkaline.

I have known, however, paralysis of the bladder to occur where the previous habits were regular, and the state of health was in other respects good. I, last year, with Mr. Dunn, of Norfolk-street, attended a gentleman, about thirty years of age, extremely nervous, who had been labouring under considerable mental excitement. We were sent for to this gentleman, suddenly, on account of retention of urine. The urine was drawn off by the catheter; and this was repeated twice a day for ten days; at the end of which the power of the bladder returned, and he was able to make water himself. The retention arose entirely from a paralysed state of the bladder, owing to diminution of nervous power: there was no stricture, nor gonorrhœa, nor local impediment to the passage of the urine.

The bladder is an organ easily deprived of its power of contraction; for, in typhus fever, some cases of compound fracture, and severe injuries of the lower extremities, we often find that the bladder becomes paralytic, and that the water must be drawn off.

Mr. Hunter* observes, that when the bladder, from whatever cause, has been distended so consi-

* Palmer's Edition of Hunter's Works, vol. i. p. 287.

derably as to have its contractile power destroyed, there is a considerable extravasation of blood from the inner surface of that viscus, so that the water which is evacuated is often extremely bloody; and he alludes to cases where the patient has died with this obstruction upon him, and in which the inner membrane of the bladder has been almost black, from being loaded with extravasated blood; but this symptom of bloody urine goes off as the bladder again acquires its power of contraction.

In the case of a lady on whom I operated for hæmorrhoids, the bladder became paralysed, and she required the use of the catheter for some days before it recovered its usual power.

Paralysis of the bladder has occasionally occurred from the use of opiate suppositories, or injections; so that it has been necessary to draw the water off, and much alarm has been occasioned by it.

I may allude to a few of the causes which may deprive the bladder of the power of expelling the urine, although it cannot, under such circumstances, be said to be in a state of paralysis.

The rectum may be distended by flatus, blood, morbid growths, or a foreign body; and, in these states, the neck of the bladder and the urethra may be compressed.

I, last year, attended with Mr. Brown, of St. Mary Axe, a case of diseased Hip Joint, in which matter had made its escape from the affected joint into the pelvis, so as to press on the neck of the bladder, and had caused paralysis of that organ.

On examination, after death, we discovered, that the matter had escaped through the acetabulum to the posterior part of the bladder, and had made a lodgement close to its neck.

Children, whilst labouring under whooping-cough, and at the time of dentition, are liable to retention of urine. Joseph Wm. Brett, æt. two years and a half, whilst labouring under whooping-cough, was seized with inability to pass urine. Two days before, the mother had, on three occasions, observed some blood in the child's urine, and some red sand deposited in the urinal. A small catheter was introduced, and a pint of urine drawn off. After twenty-four hours, this operation was again repeated, and the functions of the bladder gradually returned.

There are two periods in pregnancy* when women are especially exposed to retention of urine, about the fourth month, and at the time of confinement. To have the more exact an idea of this state, it must be recollected, that, in the first month, the womb continues, as before conception, in the depth of the pelvis; that it does not ascend above the cavity until the fifth month, and sometimes even later; that till that time, its size and weight having progressively increased, it even descends towards the vagina, and, in the manner of a wedge, presses posteriorly the rectum, and anteriorly the neck of the bladder, and the urethra against the

* *Traité des Maladies des Voies Urinaires*, par J. P. Desault, p. 160.

symphysis of the pubes, to such a degree, as to stop the opening of that canal.

The displacements of viscera, which most frequently give rise to retention of urine, are retroversion of the womb, and prolapsus of that organ, or of the vagina or rectum. If we examine the connection of the bladder both with the womb and vagina in the female, and with the rectum in the male, it is evident that these parts cannot be displaced without drawing with them the bladder; and that, in such displacement, whatever may be its contractile force, it cannot entirely expel the urine it may contain.

In the prolapsus and retroversion of the womb, and prolapsus of the vagina and rectum, the posterior part of the bladder, instead of being carried upwards and forwards, must be drawn downward and backward, and the curve of the urethra must be entirely changed. Instead of presenting a concavity beneath the pubes, as in retroversion, the bladder presents there a convexity, a derangement which must not be lost sight of in the introduction of the catheter.

A case is recorded by Mr. Coley* of retention of urine caused by imperforation of the hymen. A young lady, aged sixteen, had been ill three days and nights, with retention of urine; and her medical attendant had been under the necessity of relieving her by the introduction of the catheter,

* Lancet, 1833, p. 395.

twice daily, during that period. The cause of the ischury was found to consist of an imperforate hymen, which, by totally preventing the discharge of the menstrual fluid, had produced a mechanical obstruction in the urethra. The external orifice of the meatus urinarius was situated in a cul-de-sac, and the hymen was tense and slightly protruded. The patient being laid on her back, a double-edged scalpel was passed through the hymen, which was very thick and tough, beginning at the upper part just below the meatus. Nearly four pints of tar-like fluid gushed out; after which the incision was continued down to the perineum. An aperture was thus made capable of admitting two fingers, into which a plug of lint was introduced; at the end of two months she was cured. In performing the operation of dividing the morbid vaginal membrane, great circumspection is requisite, as death has been the consequence in several instances. De Haen, in the sixth part of his *Ratio Medendi*, mentions a misfortune of this kind, occasioned by the operator having carried his incision, by mistake, into the bladder; and Denman lost a patient with peritonitis produced by the operation. Parsons* mentions the case of a young woman, of seventeen, with imperforate hymen, who had retention of urine from the lodgment of the menstrual fluid in the vagina. When allowed to proceed without relief, the disease has terminated in death. An instance of this kind is recorded by

* Parsons on the Bladder, p. 8.

Dr. Schmiedt,* in which the stagnant urine, accumulated in the vagina, eroded the passage and made an opening into the rectum, which proved fatal; the patient being only eight years old.

The morbid appearances presented after death are, dilatation of the bladder, attenuation of its coats, and a pale white appearance of the mucous membrane; these, at least, are the appearances found when the kidneys and the mucous membrane of the bladder have not been seriously involved in mischief, as after injuries of the spine. In the latter case, there is great vascularity of the mucous membrane lining the bladder, ureters, and the pelvis, and infundibula of the kidneys; the mucous surface of the bladder is thickened, of a slate colour, and presents, here and there, dark red spots; and sometimes it is covered with phosphate of lime, deposited from the mucus, or a white powder is found in the mucus itself, and the bladder contains some foetid urine.

In the treatment of this disease, the first and immediate step required, is to draw off the accumulated urine by means of a catheter; and the operation should be repeated at least three or four times in the twenty-four hours† (at intervals suffi-

* *Miscellanea curiosa Medico-Physica Academiae Naturae Curiosum, sive Ephemeridum Medico-Physicarum Germanicarum. Annus tertius, p. 198.*

† The usual recommendation is to draw off the urine *twice* in the twenty-four hours, but this practice is much too seldom. Few people evacuate the bladder, in health, less than four or five times within the same period; and it is especially incumbent on us to relieve the bladder, at least, as often as nature herself does.

ciently short to prevent over distension), until the bladder has recovered its contractile power. In some cases, however, less disturbance will arise from allowing the catheter to remain in the bladder than is produced by the repeated introduction of the instrument.

As full a sized catheter had better be used as the urethra will admit; and, if blood is present, it must not alone be full-sized, but longer by four or five inches than those usually employed: in old people a large instrument is also necessary, as it develops the calibre of the urethra, the parietes of which, at this time of life, are soft and flaccid: in retention of urine in old people, the bladder frequently ascends above the pubes, and elongates the urethra, which, consequently demands a catheter somewhat longer than those in ordinary use.

The curvature of the catheter must be proportioned to that of the urethra, or, at least, in relation to the period of life; the curve increases from infancy to old age, being greater in the adult than in the infant; whilst the urethra is most curved in those who are far advanced in life, which is caused by the increase in depth of the symphysis pubis. In ordinary cases of retention, I prefer a full-sized silver catheter, mounted on a rough ebony handle, or a gum-elastic catheter, made of such materials as will enable it to retain its shape. The catheter being well oiled and slightly warmed, the patient stands with his back against the wall or a table, or

he may lie in the horizontal position, which is preferable to the former, with the legs and thighs flexed and slightly separated; while the surgeon stands on the left side and introduces the instrument, with the concavity of it towards the abdomen and pubes; it is then propelled gently onwards, through the urethra, till the point has arrived beneath the symphysis of the pubes. The surgeon then depresses the handle of the catheter between the thighs of the patient, and imparts to it a slight degree of pressure, or impulsion, to make it enter the bladder, otherwise the beak, in place of passing under the symphysis pubis, will strike against the sub-pubic ligament. This pressure should be very slight, if possible the weight of the instrument ought to be sufficient for this purpose, which can be regulated by not holding it too firmly.

When it is necessary to pass the female catheter, it is of consequence to be able to do it readily, which is by no means difficult. The woman ought to be placed on her back, with her thighs separated, and the knees drawn a little up. A basin is next to be placed betwixt the thighs, or a bladder may be tied firmly to the extremity of the catheter to receive the urine. The instrument is then to be conveyed under the thigh, and the labia and nymphæ being separated with the finger, it is to be run gently down the fossa under the clitoris, that leads to the orifice of the urethra, which is easily distinguished, as an irregular depression

just above the entrance to the vagina, and higher or lower from its orifice, according as the vagina is in its natural state or retracted. The point of the instrument is to be moved lightly down the fossa after the finger, and it will readily slip into the urethra. It is finally to be carried on in the direction of the axis of the outlet of the pelvis, and the urine drawn off.

The catheter may also be readily introduced by placing the point of the finger just on the orifice of the vagina, and the instrument being then glided along the finger, it either at once, or by the slightest motion upward and downward, slips into the urethra.

This operation ought always to be performed in bed; and the patient is never to be exposed.

In cases of fractures, bruises, &c., where the woman cannot turn from her side to her back, the catheter may be introduced from behind without moving her.

When the bladder is turned over the pubes, as happens in cases of great deformity of the pelvis, it is sometimes requisite to use either a flexible catheter, or a male catheter, with its concavity directed forward.*

If the passage of a catheter is required in cases of prolapsus and retroversio uteri, the operation is conducted in a different manner from what has been just described; as in these affections the fundus of the bladder is drawn downwards and backwards,

* Principles of Midwifery, by John Burns, M.D., Ninth edition, page 43.

there is a corresponding change in the curve of the urethra, the concavity of which is directed towards the rectum; from such a change of position, it is evident that the convexity of the catheter should be directed to the pubes; the operator will find it more advisable, in such cases, to use the gum-elastic catheter than the silver one. A contrary effect is produced on the urethra during parturition. If the process is tedious so as to require the urine to be drawn off, the operator will find the urethra increased in length, and rendered more curved, in the natural course, as the bladder is forced above the pubes by the foetus and uterus, which in this way accounts for the elongation of the canal.*

In paralysis of the bladder dependent on disease or injury of the spine, the catheter should be passed with the greatest care, so as, on one hand, to avoid injury to the mucous membrane, and, on the other, completely to empty the bladder.

* A very ingenious improvement in the female catheter has been lately made by Dr. Montgomery, Professor of Midwifery to the School of Physic in Ireland: instead of closing it with a plug, he has substituted a stopcock, and has also adapted to the bell of the catheter a moveable silver cap, to which a fine bladder is attached; the instrument thus armed, is introduced into the female bladder, the cock is then turned, and the urine flows from one bladder into the other; after being filled it is removed from the catheter and emptied; the catheter remaining *in situ*, and as the cock is closed no urine flows, till the cap and bladder are again applied, which is then ready to receive it. This most comfortable contrivance prevents all exposure of the patient for the application of a urinal, no change of posture is necessary, nor admission of cold air to the patient, which is often very dangerous. It also prevents the necessity of frequent introduction of the instrument.—*Edin. Med. Surg. Journal*, vol. xxix. p. 325; also, Hargrave's *Operative Surgery*, p. 431, et passim.

On this subject Sir C. Bell makes some good observations:—"When the case is one of injury of the spinal marrow, and paralysis is the consequence, you must," he observes, "be especially careful in passing the catheter in these cases. You must pass it slowly, gently, with every possible attention and precaution, and avoid anything like that dexterity, which by French authors is called *tour de maitre*. It is especially necessary that you should be cautious in these cases, because there is no sensibility of the part, and you may twitch the instrument, and thereby make an abrasion of the membrane, or so injure the urethra as to lay the foundation for a false passage. Now, it will be found that when a false passage is made, or there has been a rupture of the urethra, and the point of the catheter has gone out of the urethra, there is the greatest probability, in introducing it again, that you hit upon the false passage, the edge of the ruptured part being so apt to catch the point of the catheter, and direct it out of the urethra."

These are points of the greatest importance, which, perhaps, have not always been sufficiently attended to in practice.

Cases are on record in which abscesses in the bladder and ulcerative perforations have been the result of the point of the catheter coming in contact with the bladder.

I need scarcely observe, that if, from any circumstance, as impermeable obstruction of the urethra or enlargement of the prostate, the catheter cannot

be introduced, the life of the patient must not be endangered by delay : the bladder must be punctured.

In some cases of paralysis of the bladder, in which the urine is alkaline, and loaded with adhesive mucus, the injection of this organ with water, containing a small proportion of nitric acid, will be of great use. I shall speak more particularly of this plan, in the chapter on chronic inflammation of the mucous membrane.*

In paralysis of the bladder, the constitutional treatment depends on the cause and the affection with which it is connected. In cases of disease or injury of the spine, of affection of the brain, and of general debility, the treatment required will of course vary.

Dr. Bally has employed strychnine internally in paralysis of the bladder, at the Hôpital de la Pitié, and has obtained from its use very decided benefit. Three patients have been cured in less than a month by this remedy, given in doses from one-tenth of a grain to two grains every four-and-twenty hours. M. Petrequin has likewise related several cases of the use and benefit of the same remedy in paralysis of the bladder, ensuing as a consequence of injuries done to the spine.†

If the complaint have not arisen from organic mischief, and the patient be not very old, recovery

* Vide Chap. v. on Chronic Inflammation of the Mucous Membrane, for the remedies best adapted to check the secretion of mucus.

† Gazette Médicale.

may take place. As the bladder recovers its tone, the patient fancies he could pass a little urine; and, on making the effort, he voids some, either drop by drop, or in a small stream. As recovery begins, the catheter should be less employed, until its use is entirely superseded. In other cases, particularly in elderly persons, the bladder never recovers its tone, and the use of the catheter is required as long as the patient lives.

A state of bladder, nearly resembling paralysis, occurs in hysterical females; but it requires local treatment different from that which is adopted in other cases of retention. These cases, if left to themselves, usually recover; but, if we once begin to pass the catheter, its use will be for a long time required, and the complaint will be protracted. I distinctly recollect a case of this kind, in which the catheter was introduced once or twice a day, for some time, until at last an opinion was excited that the malady was either feigned or nervous, and that it would be desirable not to introduce the catheter. After this the young woman escaped from my notice; but I learnt that the affection of the bladder soon subsided. As a general rule in these cases, the catheter ought not to be introduced.

CHAPTER IV.

ACUTE INFLAMMATION OF THE MUCOUS MEMBRANE
OF THE BLADDER.

THE symptoms of this disease are, frequent desire to micturate, accompanied by shooting throbbing pains in the region of the bladder, extending towards the urethra, and increased by pressure on the part, and by every motion of the body. There is a sense of heat or burning along the urethra, and a dull pain just above the pubes; the desire to make water is urgent; and the pain felt in passing a few drops is often compared by patients to the passing of melted lead. The pain subsides after the urine has ceased to flow, but returns as soon as a little urine collects in the bladder. The pain is not only felt along the urethra, and above the pubes, but it shoots into the perineum and down the thighs. The urine is generally acid, and varies in appearance; being sometimes of lemon colour; at other times deep red; and on examination in a transparent vessel by the light, numerous shreds of lymph, or mucus, are seen floating in it. At first, the urine is not albuminous; but it usually becomes so in the progress of this, as well as of the other inflammatory affections of the bladder. It is discharged in very small quantities, though its amount in

twenty-four hours may equal the usual quantity. Sometimes there is sickness, and uneasiness in the loins, which usually indicate that the kidneys are affected, from the extension of the inflammation up the mucous lining of the ureters. The pulse is quick and small; the tongue, white; the patient is thirsty; the countenance, anxious the skin dry, and often affected with some scaly eruption; the limbs are painful, with uneasiness and anxiety, augmented by the absence of rest and by the constant desire to make water.

If the disease be not arrested in the early stage, ulceration of the mucous membrane occurs; and it usually proceeds till the whole of that membrane is destroyed. It is difficult to decide as to the existence of ulceration, except in cases where the *fæces* are passed by the urethra; but there is always reason to suspect it when disease of the bladder has been of long continuance, when the pain is extensive and increasing, and when pus is clearly detected in the urine. The ulcerative process is attended with constant pain and irritation, keeping up the desire to void the urine, which is never suffered to accumulate; while, at the same time, increased difficulty and pain generally attend the passing of it.

Ulceration may extend so deep into the substance of the bladder, as to cause perforation of its parietes; and cases are recorded of extravasation of urine thence taking place into the abdomen. In these cases, life is soon destroyed by the extension

of peritoneal and cellular inflammation. But, when the ulcerative process extends to the other tunics of the bladder, it usually happens that it is accompanied by effusion of lymph exterior to the ulcer, which thus unites the neighbouring parts, and prevents the escape of the urine; and in this manner, a communication is sometimes formed between the fundus of the bladder, and the ilium or the sigmoid flexure of the colon, or between the under surface of the bladder and the rectum, in the former of which cases, the fæces pass into the bladder, and through the urethra; while in the latter the urine passes into the rectum, and is voided with the fæces.

Mr. Wilson* says, "I have preserved the bladder and ilium of a person, which had adhered fifteen years before the death of the patient. Ulceration to a large extent had taken place in this connected part; and for the whole of the above-mentioned period, the fæces readily passed from the ilium into the bladder. The patient died when sixty-eight years of age. Being a female, the shortness of the urethra had allowed the substances which passed into the bladder a tolerably free escape, and no calculus formed."

Two years ago, I attended, with Mr. Garrod of Hackney, a lady, in whom some fæces passed through the bladder and urethra, and who is still alive.

More recently, the following case came under my

* Lectures on the Urinary Organs, p. 317.

notice :—I was requested to see a gentleman, æt. sixty-two, a patient of Mr. Hingeston, of Finsbury Circus, in whom the fæces found their way into the bladder, and were passed by the urethra. He complained of frequent desire to make water, which was attended with smarting and scalding at the time of its passing. He had also great distension about the lower part of the abdomen. Micturition was usually followed by severe darting pains at the end of the penis, and by the escape of flatus through the urethra. The urine, which was acid and albuminous, contained much fæculent matter, with a good deal of mucus. It was clear, that in this case, there existed a communication between some portion of the intestinal canal and the bladder, through which the fæces passed; and, during their so passing, the pain was intense. On examining the rectum with the finger, no stricture could be detected. The urethra admitted No. 6, with difficulty. The bowels were pretty regular; the motions were often solid; and their passage was not attended with pain. The treatment which we adopted, consisted in the use of suppositories and other sedatives, so as to keep the rectum and bladder in as quiet a state as possible. By this plan, the escape of fæces through the bladder very much diminished; and the patient remains at this time in a tolerably comfortable state.

In a case which I visited with Mr. Rance of the City Road, and which terminated fatally, there existed a communication between the fundus of

the bladder and the colon, just above a stricture, in the sigmoid flexure.

I am indebted to Mr. Rance for the following account of it:—

“About the latter end of June, 1831, I was called to visit Mr. Henry Cooper. He complained of a deep-seated dull pain in the lower part of the abdomen, extending from the pubes to the sacro-iliac symphysis of the left side; he said he had been affected with pain in the bowels for nearly twelve months; and he also complained of considerable uneasiness in the urethra and of a burning sensation towards the extremity of the penis. The urine was high-coloured. On pressing the hypogastric region with firmness, he suffered considerable uneasiness; his tongue was dry, a little furred, and of a brownish hue; his pulse was quick, about 110, and rather firm. I bled him to the amount of about eight ounces; ordered a dozen leeches to the perinæum, and a blister to the lower part of the abdomen; and administered a purgative. On the following day, the pulse was softer, and the urine high-coloured, with a very considerable deposit of a purulent kind, and of very fetid smell. I ordered *Liquor Potassæ* and *Extract of Hyoscyamus*. On the following day, I found that the urine contained a considerable quantity of feculent matter, which led me to conclude that there must be an ulceration of the intestines. Flatus was also passed through the urethra; stools voided per anum, were always loose; and the patient said he had not passed a

solid stool for a very considerable time. On examination per rectum, the finger could not reach any ulceration or stricture; and it appeared that no urine had ever passed per rectum. The pain and uneasiness increased; and in the treatment I confined myself to sedatives, and administered various forms of opium. The strength of the patient gradually decreased; and he sank in the latter end of August.—I obtained permission to inspect the body, and found that a stricture existed in the sigmoid flexure of the colon. Above the stricture, there existed slight adhesion with the fundus of the bladder, towards the left side. There was an opening through the stricture, about the size of a goose-quill, through which some fæces passed into the rectum; but, from the narrowness of this passage, it was impossible that any solid fæces could pass. A portion of the intestine for about two inches above the stricture, as well as part of the fundus of the bladder, appeared gangrenous, and in a state approaching to sloughing; the coats of the bladder were thickened; the bladder itself was not bigger than a large orange; and, from being much thickened, it appeared incapable of further distension.”

The foregoing case is a good illustration of the effort which the system at times makes to evacuate what is extraneous by the most direct passage, when there exists an obstacle to its expulsion in the natural way; and is strictly analogous, pathologically considered, to what we sometimes see occurring when an abscess forms in the liver. There we

find adhesion first taking place between the liver and duodenum or colon ; and through an ulcerative process that follows, the matter of the abscess is evacuated by the gut.

The more usual course of this disease is, that ulceration gradually extends to the whole of the mucous membrane, which is destroyed ; and then the muscular structure is shown more clearly than any dissection can exhibit it. In the progress of the ulceration, disease commonly manifests itself in one of the kidneys ; and, as far my observation goes, usually in the left one. This is indicated by pain in the loins on pressure (for the pain is never very severe), by shiverings, sickness, and the albuminous state of the urine. At this stage, large quantities of pus are voided with the urine, and the latter is tinged with blood.

When pus and mucus exist in the urine in small quantities, it is difficult to distinguish one from the other. Pus, however, when well marked, may be distinguished from mucus by being composed of particles ; and, hence, when diffused through a fluid, the latter is rendered opaque. Upon standing, the pus subsides to the bottom of the vessel, in a state more or less pulverulent, and the fluid resumes its transparent character ; but it also mixes more readily with the urine. If in urine pus be present as well as mucus, the former is found lying on the latter, and presents a much yellower tint ; it is also quite opaque, whereas mucus is more or less transparent.

A ready test for determining whether the deposit

from the urine be of a purulent nature, is, after pouring off the clear supernatant urine, to add liquor potassæ to the sediment collected in a phial or test tube. If it be purulent, it will, on agitation, form with the alkali, a transparent viscid compound.

Mr. Brett* says, "that urine containing pus will almost invariably be found of a pale colour; it will be found sometimes acid, at others alkaline; and although somewhat, is not nearly so prone to undergo decomposition, as is observed in some of the worst forms of the phosphatic deposit. If urine of this character be allowed to remain at rest, the purulent matter subsides after some time, having a greenish-yellow tint, which is highly characteristic of it. This deposited matter is ropy, and capable of being, in some cases, drawn out into threads. When thrown upon a filter, it appears in the form of a perfectly opaque coagulum, of a greenish-yellow colour, very different from ordinary mucus, as found in the urine.

"The urine from which this deposit has taken place will be found to be invariably albuminous, coagulating by heat and by nitric acid. Tincture of galls, corrosive sublimate, and alum, all cause either a precipitate, or manifest turbidity. This albuminous impregnation of the urine, depends, I believe, on the serous portion of the purulent matter being diffused through the urine, the deposit consisting of the insoluble opaque par-

* London Med. Gazette, p. 924.

ticles, mixed with a larger or smaller proportion of mucus."

As to morbid appearances, it is known that, in a natural state, the inner membrane of the bladder is very seldom tinged with blood on its inner surface; but, when inflamed, it appears covered with a multitude of delicate blood-vessels, which are sometimes intermingled with little spots of extravasated blood.

The inflammation of the inner membrane of the bladder, extends itself either over the whole bladder, or is limited to some particular part of it: most commonly, that part which adjoins the neck of the bladder is found in a state of inflammation. The inner membrane is sometimes covered with coagulable lymph; this substance having been found projecting into the cavity of the bladder; and portions of it having been occasionally separated during life.

In Dr. Baillie's plate of ulceration of the mucous surface, the ulceration commenced from the fundus, and proceeded towards the neck. In a specimen which I possess, and in which part only of the membrane is destroyed, it commenced at the neck.

If the inflammation reach a high degree, the muscular coat is also attacked, presenting here and there gangrenous spots, or even being completely destroyed by it. But, as the muscular is connected but loosely to the inner membrane of the bladder, the inflammation does not easily pass from one to

the other. One of the kidneys is usually found in a state of ulceration containing pus, the ureter inflamed in its whole course, and ulcerated at its vesical extremity. In most of the cases which I have dissected, the whole of the membrane has been removed by ulceration.* Sometimes, however, round ulcerated spots, of the size of a sixpence, are found in different parts with elevated edges and a red surface, the muscular structure not being seen, and the remaining membrane being very vascular. The ulcers, when small, are not unlike primary syphilitic sores, by their excavated surfaces and raised margins.†

This affection may be confounded with inflammation of the muscular structure; but, in the latter case, there is not the power of passing urine, and the desire to void it is less frequent, as it is not experienced until a good deal of urine is accumulated in the bladder, and then comes on in violent paroxysms. Neither is there the burning sensation along the urethra which is felt when the mucous membrane is affected.

This disease is likely also to be mistaken for stone. The uneasiness in the bladder, the frequent desire to make water, and the passage of blood with the urine, are symptoms of stone as well as of this disease. But in stone the pain is principally experienced after the bladder has been

* Vide Plate I. at the end of the volume.

† Cyclopædia of Practical Medicine, vol. I., Article *Cystitis*, by Dr. Cumin.

emptied, whereas, in acute inflammation of the mucous membrane of the bladder, the pain is most intense when the bladder contains urine, and it subsides when that viscus is empty: in stone, also, larger quantities of blood are passed than in this disease, and the urethra is seldom so irritable.

If the disease of the bladder co-exist, or be connected with organic mischief in the kidney, or of any other organ, little or no good will be derived from medical treatment. But as I am speaking of idiopathic inflammation of the mucous membrane of the bladder, I pass over cases occurring from such causes.

At the commencement, blood should be taken by cupping or the application of leeches to the hypogastric region, and this should be repeated so long as the severity of the pain continues, and the strength of the patient will allow. Commonly, however, the loss of much blood cannot be borne. At the early stage, the most valuable remedy is morphia, or opium, (I prefer the former), given in sufficient doses to allay the pain about the bladder and along the urethra, as well as the frequent desire to pass urine. These are the most distressing of the symptoms; and if unmitigated, they soon wear out the strength of the patient; but if even a few hours' intermission be obtained in the day, some chance may exist of recovery.

In addition to the internal use of opium, or morphia, anodyne injections, or suppositories,

should be exhibited at bed-time ; and great relief will be experienced from their use. Some practitioners recommend the injection of oil and opium, and other remedies, into the bladder, by means of a gum-elastic catheter. In one of my patients, this plan had been tried at the suggestion of an eminent physician, prior to the patient being placed under my care : but no benefit was derived from the treatment. In fact, the pain and irritation caused by the introduction of any instrument along the urethra, are so severe, as to deter me from employing this method ; and unless there be retention of urine, which is very rare in this form of disease, the use of the catheter, sounds, and bougies, should be particularly avoided.

It is advantageous to employ counter-irritation above the pubes ; and the hip-bath at night will be found very serviceable.

In the treatment of these cases, however, we find that no remedy, opium or morphia perhaps excepted, long retains any influence over the disease. The practitioner must be provided with a variety of agents, so as to be ready to substitute one for another when it loses its effect. Infusion of diosma in the proportion of an ounce to a pint of water, small doses of copaiba and essential oil of cubebs, infusion of hops and the alkalies, will, all in their turn, be found useful.

Excepting at its commencement, mercury is not of use in this form of inflammation.

To the diet of the patient, the greatest attention

should be paid. Animal food, wine, spirits, and acid drinks, should be interdicted ; the diet should be light, consisting of bland, farinaceous food ; and the drink should be water, toast-and-water, and linseed-tea ; but not to such extent as to increase, in any very considerable degree, the secretion of urine. The patient should also be kept as quiet as possible, and in a rather warm temperature.

The prognosis of these cases is very unfavourable, if the ulcerative stage once set in ; and this is usually indicated by the continuance of the pain of the bladder on motion, and in making water. If, therefore, the pain be not subdued early, little hope can be indulged of a successful termination : by judicious management, life may be prolonged for some time, but the patients are seldom cured. Having witnessed several cases of this kind, most of which terminated fatally, I indeed fear that, if ulceration to any great extent exist, the disease is irremediable ; all we can then do is, by opium and other narcotics, administered internally, to endeavour to lessen the irritation and pain.

If a female (and females are more subject to this complaint than males) happen, whilst labouring under the disease, to become pregnant, this state greatly mitigates the symptoms, and for a time averts the fatal termination. In 1827, I examined the body of a French woman, who, immediately after her delivery, was attacked with all the symptoms mentioned above, and died within a week from the attack. On examination, the inner mem-

brane of the bladder was found to be completely destroyed. I could not obtain any accurate account of the case; but I learnt that the patient, during the few days she was in the hospital prior to delivery, did not complain of the affection of the bladder. One case, however, I watched from the commencement of the disease (which occurred a month after marriage) till the death of the patient, which took place a month after delivery. During the latter half of her pregnancy, the symptoms were much milder than before; but, soon after the child was born, they returned with their accustomed severity, and destroyed the patient.

CASE.

DESTRUCTION OF THE MUCOUS COAT OF THE BLADDER.

On the 17th of May, 1834, I was requested to visit Mrs. M., æt. thirty-six, who was supposed to be labouring under symptoms of stone. She had frequent desire to make water, attended by darting shooting pains in the region of the bladder, which were much increased by walking, and exercise of every kind. The urine itself was acid, and contained some shreds of lymph or mucus. No blood or gravel had ever been passed. On sounding the patient, it was evident that the instant the instrument was introduced into the urethra, the pain experienced was most intense, and this continued during the whole of the examination. No stone

could be felt. The pulse was small and quick, the skin dry and rough, the tongue white, the countenance anxious, and indicative of much suffering. From the first, I expressed a very unfavourable opinion of the case, believing, as I then stated, that there was ulceration of the bladder. She had been in this state for two months, and various remedies had been tried. I suggested the use of *pareira brava*, first in the form of infusion, then in that of decoction. For the first six weeks, leeches were occasionally applied to the hypogastric region, tartar emetic ointment was rubbed in, and at night, a thin starch injection, with twenty minims of Battley's sedative solution, was given. After this time, Mrs. M. tried only the decoction of *pareira brava*, till about two months prior to her decease, when perceiving more mucus in the urine than usual, and occasionally blood, I added a very small quantity of balsam of copaiva to the mixture (two drachms to eight ounces of the decoction, with some mucilage). This brought on sickness and deranged the stomach so much that thenceforward she was obliged to desist from the decoction. She now had sickness and nausea; pus was voided with the urine; there was complete loss of strength, emaciation of the body, and hectic flushes; and, on the 24th of November, death put an end to her sufferings. It should be observed that, for a few days prior to her death, no pus had been voided with the urine, and the pain and frequent desire to make water, for the only time during her long illness, had almost left her.

Within forty-eight hours after death, the body was examined by Mr. Merriman, of Kensington, and myself. The bladder was not thickened or contracted, but so completely divested of its mucous membrane, that not a single vestige of that coat could be seen. No dissection could exhibit the arrangement of the muscular structure so well as it was seen in this case. One spot, of the size of a shilling, towards the fundus was black, and almost gangrenous. The ulceration had not extended to the urethra; but its lining membrane was highly inflamed. The right kidney was in its natural state, but there was ulceration of the left kidney, and its interior was filled with pus. The renal extremity of the left ureter was blocked up by a detached portion of the substance of the kidney.

CASE OF ULCERATION OF THE BLADDER, URETER,
AND KIDNEY.

Deborah Mulloday, aged forty-six, was admitted under my care at the General Dispensary, for an affection of the bladder. She complained of great uneasiness, sometimes of pain in the lower part of the belly, and of frequent desire to void urine. After the bladder was emptied, the pain and uneasiness usually subsided. These symptoms were at first relieved by the use of the decoction of *pareira brava*. The pain was at times very acute, the desire to make water became more frequent; the urine contained a good deal of pus; and, on

two or three occasions, it was tinged with blood. The pulse was small and quick ; the countenance pale and sallow ; and there was emaciation of the body, with occasional shiverings and cramps. She had no pain in the loins ; and there was no sickness until about ten days prior to her death, when it was very distressing, and of some days' continuance. On Friday, July 26, she was seized with paralysis ; and she expired on the following Tuesday.

Twenty-four hours after death, the body was examined. The mucous membrane of the bladder was ulcerated in several spots, but was not so extensively destroyed as in the preceding case. The bladder, which was thickened and contracted, contained a good deal of pus. The vesical extremity of the left ureter was ulcerated ; the substance of the left kidney in some parts was completely destroyed by ulceration, and its pelvis full of pus. The right kidney was in a state of atrophy ; and its interior contained a deposition of chalky matter. The urethra was inflamed, but not ulcerated.

CASE OF ULCERATION OF THE BLADDER.

George Scandreth, æt. fifty-six, tailor, residing at 81, Great Leonard-street, Shoreditch, applied to me, Nov. 13, 1835, on account of an affection of the bladder. He complained of frequent desire to pass urine, of great pain at the time of passing it, as well as afterwards, of a scalding sensation in the urethra, and of pain above the pubes and across

the loins. The urine was high-coloured, and contained numerous fine shreds of lymph; it was also acid, scanty, and albuminous.—I ordered some soothing remedies which, for a time, diminished the pain in making water, but had no other effect on the disease. The symptoms of disease of the bladder became gradually worse; and he died, worn out, January 28, 1836.

On examination after death, I found the mucous membrane of the bladder almost completely destroyed, minute filaments hanging loosely from its inner surface; the bladder contracted in size, and a little thickened; the lining membrane of the urethra highly inflamed and ulcerated about the membranous portion; the prostate not enlarged; the left kidney in a state of ulceration, and containing pus. I have the preparation in my possession.

CASE OF ULCERATION OF THE BLADDER.

William David Sadler, aged seventeen, of a delicate constitution, and light complexion, applied at the General Dispensary, Dec. 3, 1832, for an affection of the bladder. He said that, about seven months before this period, he first felt pain in making water, which lasted for some minutes, and then went away. Since that time, this symptom had never left him. All of a sudden he occasionally felt a darting pain near the neck of the bladder, accompanied with an irresistible desire to make water. The pain then subsided; he made

water, and felt easier. These attacks varied as to the frequency of occurrence—sometimes every hour or oftener, at other times at longer intervals. The urine was turbid, voided in small quantities, and extremely acid. The appetite was good; the general health, not much deranged; the pulse, quick; the tongue, white and dry. A sound was introduced two or three times, but no stone could be felt: this operation always gave him great pain.

Alkalies and hyoscyamus; small doses of cubebs with carbonate of potash, the decoction of pareira brava alone, and also in combination with small doses of copaiba and mucilage, with hyoscyamus, were tried; but he benefited by nothing which he took.

This patient escaped from my notice; but he died a short time afterwards, and I was informed by the medical man who examined the body, that there was ulceration of the bladder, together with disease of the left kidney.

CASE OF ULCERATION OF THE BLADDER.

Charlotte Mason, æt. fifty-six, a married woman without family, and subject to pains in the limbs, was seized, in the month of March, 1837, with a frequent desire to void urine, which was always attended with great pain, and a burning heat in the urethra; the pain continued for some length of time after the urine was passed, so that she could scarcely stand or sit down: had great pain in her back and the lower part of the abdomen,

headach, and, at times, pains in the left hip and leg, attended with great weakness and trembling, and general debility. During the night she was generally obliged to get up to micturate four or five times at least: the urine was alkaline, of a light straw colour, and latterly contained a good deal of pus. The disease resisted all the remedies which I could devise. Morphium alone gave her relief. She gradually lost flesh and strength, and died on the 30th of December last.

I examined the body on the following day, and found the whole of the mucous membrane completely destroyed by ulceration. The left kidney was also in a state of ulceration, and the lining membrane of the left ureter, to the extent of two or three inches, close to its vesical extremity, thickened and lined with coagulable lymph.

CASES OF ACUTE INFLAMMATION OF THE MUCOUS COAT, WITHOUT ULCERATION.

Mary Boyer, aged seventeen, of good constitution, applied to me, Oct. 26, 1833, for an affection of the bladder. She said, that about six years before (three years before the catamenia had appeared) she felt frequent desire to make water, and uneasiness in doing so, accompanied with darting pain in the passage. These symptoms had continued, and latterly had been much aggravated. The desire to make water came on every half

hour, attended with great pain, which went off on the bladder being emptied. There was also pain within the labia, and sickness at stomach. The urine was very acid, and contained a good deal of albumen. The countenance was pale and anxious. The alkalies, the decoction of *pareira brava*, and the infusion of *diosma*, were tried in succession, and for a long time, without any relief. Great pains were taken by the parents to second my efforts, by attending to the diet, and keeping the patient as quiet as possible, and in a warm temperature; but, for several months, little or no benefit was derived therefrom. During the whole of the time morphium was used, the dose being occasionally increased. At last, the pain began to subside; and, from that time, a favourable change occurred. Her appetite and strength returned; the urine was less acid, and not tinged with blood; but the frequent desire to pass it, still remained. She married a short time ago; and, with the exception of the frequent desire to make water she is now quite well.

CASE.

John Leburn, aged forty, cook, applied to me 17th March, 1834, for an affection of the bladder. He said that, about four or five years before, he first felt a frequent desire to make water, particularly after drinking or exertion; that this symptom had, within the last twelve months, increased to so great a degree, as to occasion him to void urine

almost every half hour, and that the desire to do so, was attended with a burning sensation in the passage. There was pain in the loins, particularly in the region of the left kidney on pressure, a tickling sensation in the course of the left ureter, uneasiness in the left testicle, pain at the glans, and occasionally sickness of a morning. The urine was acid, and contained a considerable quantity of albumen. His appetite was good, and his strength was not much impaired, but he had lost a good deal of flesh. There was no stricture or stone.—The same treatment was pursued in this case as in the former; but, for more than ten months, he experienced no benefit. After that, he began to improve; and he is now pretty well, though he is not able to dispense with morphia at night. In this case, the left kidney was no doubt considerably affected as well as the bladder.

CASE.

Mrs. R., æt. twenty-eight, residing in Aldersgate-street, of a delicate constitution, and born of gouty and rheumatic parents, consulted me in Jan. 1835, for an affection of the bladder. She said that, soon after her first confinement, which took place in October, 1834, she could not pass urine, on which account it became necessary to use the catheter. This was done eight or nine times, and the operation was attended with great pain and difficulty. After that, a frequent desire to pass water came on, accompanied with considerable

suffering, which, however, subsided on the bladder being emptied. The urine was acid and albuminous, and contained some fine shreds of lymph. There was pain in the left kidney and over the region of the bladder, which was increased by pressure and motion of the body. There was pain in all the limbs, and down the inside of the thighs. The pulse was quick and small; the tongue, very red; the countenance, pale and anxious; the bowels, costive. There was also a great deal of leucorrhœal discharge.—I ordered morphia, together with the infusion of diosma, and a lavement to be used when the state of the bowels required it. I should observe, that previous to my seeing this patient, a variety of remedies had been tried, but most benefit had been derived from small doses of copaiba, in conjunction with carbonate of magnesia, made into pills. A month elapsed before any material amendment took place. As soon as the pain in making water had subsided, I gave the acetous extract of colchicum at bed-time, the alkalis after meals, and the decoction of pareira brava. To my great surprise, this lady recovered so as to be able to take a journey to some distance; and she is now well.

CHAPTER V.

CHRONIC INFLAMMATION OF THE MUCOUS
MEMBRANE OF THE BLADDER.

MEN are more subject to this complaint than women, and elderly persons than young ones. In some countries, the disease appears to be uncommon, as Hoffman calls it *morbis rarissimus*. In others, it occurs more frequently, and something like it has been known to assume an epidemic character.

An attack of the disease is sometimes preceded by a sense of weakness, shiverings, and other febrile symptoms. At other times, it manifests itself of a sudden by pain.

The discharge of mucus is the great characteristic of the disease; and hence the term *vesical catarrh*. This is accompanied by a sensation of heat in the bladder, extending along the urethra, and of weight in the perinæum, shooting pains towards the anus, and frequent desire to void urine, though not in so great a degree as in the acute inflammation.

Sometimes the symptoms are very mild, and cause but little inconvenience; at other times, the disease assumes a serious character, and even proves fatal, especially in old and weak persons. Then, the expulsion of the urine, but more particularly

that of the last few ounces, is more or less painful, according to the violence of the contractions of the bladder and abdominal muscles to expel the foreign matters united with it. The heat in the bladder and urethra are converted into scalding; the desire to make water becomes more frequent, and is attended with violent straining efforts to void it; and retention, usually caused by clots of mucus blocking up the passage, often takes place. On the urine being drawn off, the symptoms are relieved for a time; but they return on the filling of the bladder.

The patient is very restless and uneasy; there is great thirst; the bowels are irregular, generally very costive or relaxed; there exists pain at the extremity of the penis, round the anus, and in the region of the loins; there are great prostration of strength and wasting of flesh; and the patient at last dies completely exhausted.

The quantity of mucus secreted * varies: some-

* In healthy urine mucus always exists in minute quantities, and the following are the appearances which it assumes:—After the urine has stood for some time in a tall glass vessel, the lower strata of the fluid will be found to have lost their transparency, and an exceedingly light nebulous-looking substance will be observed floating in it: if the whole be thrown upon a filter with a view of examining the nature of this cloudy deposit when separated from the supernatant fluid, so exceedingly light and inconsiderable in quantity is the mucus, that no appreciable residue will remain on the filter unless a very considerable quantity of urine be employed. But although the mucous deposit from healthy urine is thus inconsiderable in quantity, it is very different in disease; then it is that the deposition for the most part takes place before the urine is evacuated from the bladder; consequently that fluid will be found turbid, and sometimes even ropy,

times it is small ; at other times it is considerable ; and cases are recorded, in which several pounds were passed during the twenty-four hours.

Small quantities of the mucus thus coming away, render the urine muddy, pale, and flaky, and afterwards settle to the bottom of the vessel.

The mucus, * however, is sometimes like panada, and, on being shaken, colours the urine without flakes : at other times, it is stringy, flaky, and of a lumpy consistence. It has been seen so glutinous, as, on pouring it out of one vessel into another, to be drawn out above a foot in length, without rending. Sometimes, it is transparent, white, yellow, green, with streaks of blue, often without smell : sometimes, on the contrary, it is dreadfully fetid.

at the moment of its emission. If urine of this character be allowed to stand for a few hours in a tall glass-vessel, a very abundant opaque deposit will take place ; this deposit is ropy and tenacious, and devoid of the yellowish green colour, which is so characteristic of the purulent deposit. When collected upon a filter and washed, it appears semi-gelatinous from the absorption of water, is sometimes less opaque, and sometimes, from its exceeding tenacity may be drawn out into threads. When allowed to dry on the filter, it shrinks considerably, and assumes the character of a yellowish varnish ; if it be then moistened with water, it regains its former pulpy appearance and viscid character, and will be found to be soluble in acetic acid. It is sometimes found associated with a very considerable quantity of phosphate of lime ; at other times, however, the proportion of the earthy phosphatic salt is inconsiderable, and in some cases the urate of ammonia is found in combination with the mucous deposit.—*Vide Brett on Urinary Deposits in Med. Gazette*, vol. xvii. p. 795.

Mucus is not coagulated by boiling, which sufficiently distinguishes it from albuminous matter. It is soluble in the acetic and nitric acids ; but not in the sulphuric acid. It is soluble also in caustic potass.—*Vide Rees on the Blood and Urine*.

* *Vide Sæmmering über die Krankheiten der Harnblase, &c.*

Blood and pus are often passed with the mucus in this disease.

When the properties of the mucus are but little changed, it diffuses itself throughout the urine for a time, and renders it turbid and of whitish colour, but it afterwards subsides to the bottom, and leaves the urine to assume its usual hue. Commonly it is thick, viscid, and ropy, and sinks to the bottom of the vessel at once: in this case, the urine is of a dark brown colour, and is either neutral or alkaline. The urine, however, is usually acid at the commencement, and continues so until the quantity of mucus secreted is great: in this case especially, if the patients are very feeble, the urine is alkaline or neutral.

If this mucus come away in large quantities, and is at the same time glutinous, it requires an effort to discharge it, and it often occasions retention. After voiding it, the burning sensation in the region of the bladder ceases, but that gradually returns as the mucus again collects.

If the secretion of mucus be copious, the patient becomes hectic, and at last sinks from exhaustion.

In slight cases, the mucous membrane is inflamed, and, as if blood had been effused beneath the surface, it presents here and there red spots; while some are seen of a darker colour, almost amounting to black. Sometimes the membrane is abraded, particularly around the darkest patches; and, in rare cases, it has been entirely removed so as to leave the muscular fibres exposed.

In the severe form of the disease, all the muscular fibres of the bladder are much enlarged, thickened, and occasionally covered here and there with calcareous deposits. I have, in my possession, a bladder taken from a man who had long suffered from vesical catarrh, presenting this appearance.* The fundus of the bladder is usually most diseased, but the whole of it is thickened, contracted, and harder than natural, and its mucous membrane is purplish, injected, and presents many folds or columns of greater or less thickness, according to the period of the disease and their situation. They are always longest and largest at the fundus. This thickening of the walls, as well as the columns, is exclusively owing to the hypertrophy of the muscular coat, some fibres of which, from increased action, have become more developed; and hence it is that the French call the disease, "*la vessie à colonnes*," from the resemblance these columns bear to the *columnæ carneæ cordis*.

The most prominent portions of these folds are usually of a blue or purplish red colour; while between them, the membrane is pale, swollen, soft, and offering little resistance; occasionally small ulcerations are found. But what is very remarkable, between the folds, pouches or sacs generally co-exist with dilated ureters, both being produced by the same physical cause, (forced distension,) in consequence of prolonged difficulty in expelling the urine; the formation of the former may be ex-

* Represented in Plate II.

plained in the following manner:—The contraction of the abdominal muscles, as well as of the bladder itself, when full of urine, forces portions of the lining membrane of this organ between the muscular fibres, and thus sacs or pouches are formed, and these pouches being lined by a diseased mucous membrane, secreting an alkaline mucus, sometimes become the receptacle of mortar-like matter, and, finally, of calculi, consisting generally of phosphate of lime.

The kidneys, too, generally suffer: either they are simply inflamed, with the infundibula and pelves much enlarged; or they are in a state of ulceration. The ureters are likewise inflamed.

The ureter and pelvis of each kidney are generally dilated, and this dilation is greatest where there has been a long continued difficulty in expelling the urine from the bladder.

It has been said that when vesical mucus is passed in small quantity, the disorder may be mistaken for an involuntary evacuation of semen, which accompanies in some persons the escape of the urine and fæces. These two fluids are analogous by their viscid and alkaline properties, and the substances which compose them; but semen differs essentially from mucus by its colour, by the property which it has of liquifying on cooling, by its insolubility in water when thick, and its solubility on the contrary when it is liquid, and especially by the radiated crystals which it produces after slight evaporation.

The urine in this disorder may be also distinguished from chylous urine, because the latter, immediately it is passed, presents a whitish appearance, and the sediment, on shaking, mixes with the urine; on the contrary, the urine in vesical catarrh is at first turbid; on standing, the sediment becomes viscid, ropy and flocculent, or united into one clot.

The exciting causes of catarrh of the bladder, are stricture, stone, enlargement of the prostate, exposure to cold, indulgence in ardent spirits, diuretic and irritating remedies, such as cantharides, violent exercise on horseback, venereal excesses; and it exists in connection with hæmorrhoids, and other diseases of the rectum. In injuries and diseases of the spine, this state of the bladder often occurs.

When this disease co-exists with stricture of the urethra, or is produced by it, it is extremely difficult of treatment. The pain and irritation along the urethra are often so great as to render the use of catheters and bougies impracticable; and, unless the state of the urethra improve, no material benefit can be expected from internal remedies. Under these circumstances, free use must at first be made of sedatives; and, when the pain and irritation of the urethra have subsided, this canal must be dilated with bougies or the gum-elastic catheter. If the stricture be of long standing and very narrow, I commence with armed bougies, introducing them once in three or

four days, and in very few cases have I failed, by this means, in dilating the urethra.

Sœmmering lays great stress on suppressed gout as the cause of the disease. Dr. Prout says, "Most frequently it attacks the gouty; and the worst case I ever witnessed, occurred in a gentleman, who, for many years, had been a martyr to gout, and in whom it succeeded to an acute seizure in the bladder, that took place during an attack of that affection."

There are some habits apparently more predisposed to this affection than others: such are those of irritable scrofulous temperament, with fair skin, and tendency to cutaneous affections, more especially if accustomed to live freely, or given to venereal excesses, or have suffered from venereal affections, or gout. In such individuals, exposure to cold seems one of the most frequent of the exciting causes of this affection, and those who actually labour under it generally suffer much more severely in cold weather.

Cases of milder character have been observed to terminate in a short time, or to assume an intermittent form, especially when associated with hæmorrhoids, or certain petechial affections; but the duration of this complaint is uncertain. Old persons mostly retain it as long as they live.

Chronic inflammation of the bladder often exists in cases of stone—in fact, in all cases of fusible calculus. When in a mild degree, it is not a sufficient reason for not performing the

operation; but when the quantity of mucus secreted is very great, the urine alkaline, offensive, and streaked with blood, the desire to make water very great, and attended with a burning sensation along the urethra, then the operation ought not to be undertaken, as it would only accelerate the patient's death.

The catheter, even if there be no retention, must occasionally be employed; but in severe cases, retention generally exists, and the water should be drawn off twice or oftener in twenty-four hours.

In particular states of this disease, injecting the bladder is highly serviceable.

"In aggravated cases of the disease," says Sir B. Brodie, "where the symptoms are at their greatest height, the mildest injections, even those of tepid water, will do harm rather than good. They are especially to be avoided when the mucus deposited by the urine is highly tinged with blood. When, however, the symptoms have in some degree abated, the injection of tepid water, or decoction of poppies, is in many instances productive of excellent effects. An elastic gum-catheter may be introduced into the bladder; and the injection may be made by means of a small elastic-gum syringe. The liquid should be allowed to remain in the bladder about thirty or forty seconds; and not more than an ounce and a half or two ounces should be injected each time. If the bladder be distended, so as to occasion any considerable

degree of pain, the effect is always injurious, instead of being beneficial. This operation may be repeated, according to circumstances, once or twice in twenty-four hours. When there is a further abatement of the symptoms, the disease having assumed a still more chronic form, and the mucus being free, except on extraordinary occasions, from all admixture of blood, we may venture to add to the injection a very small quantity of nitric acid. At first, the proportion ought not to be more than that of one minim of the concentrated, or ten minims of the diluted, nitric acid, to two ounces of distilled water; but afterwards this proportion may be doubled."

I use the same apparatus for acid injections as for injecting the bladder in lithotrity, as the minute quantity of the acid is not likely to act on the nickel-silver of which these instruments are composed.

Nitric-acid injections are of great use in cases where the effects of the disease are local; the general health not being much impaired, and the patient feeling comparatively well when the scalding and pain after passing urine have subsided. In cases, also, where the internal administration of acids appears to have no effect on the secretion of mucus, the injection of acid is of great service. The following case strikingly illustrates the beneficial effects of acid-injection.

Mr. F., æt. sixty-seven, slightly rheumatic, consulted me April 7th, 1838, on account of an affec-

tion of the bladder. He complained of frequent desire to make water, with severe pain and scalding along the urethra, just before and during its passage, and of uneasiness or sense of weight just above the pubes. He had occasional retention, and was frequently compelled to pass a catheter to draw off the urine. The disease was brought on by retaining the urine on one occasion, after the desire to void it had come on. There was no enlargement of the prostate, nor any stricture. The urine was alkaline, and contained a considerable quantity of mucus, which was of a dirty white colour, and sank to the bottom of the vessel; it was stringy, and on being shaken with the urine did not mix: it was free from blood. The urine on being passed, had a slight ammoniacal smell; but this became very strong on standing twenty-four hours. Its specific gravity was 1.015. His general health was not impaired; and he felt pretty well when the burning pain, which attended the passing of urine, had subsided, until a fresh desire came on.—I tried the decoction of *pareira brava*, with the dilute nitric acid and sedatives, without any relief whatever. May 8th.—The quantity of mucus with the phosphatic deposits increasing, I recommended the injection of the bladder, first throwing in, by means of a gum-elastic syringe and catheter, four ounces of decoction of poppy; and, on withdrawing this, four ounces of water, containing two minims of strong nitric acid. I kept this in for two or three minutes and with-

drew it. He took half a grain of morphia immediately after the injection. The symptoms were a little, but not materially, improved by the injection. May 10th.—I injected ten ounces of distilled water, with one minim of the strong nitric acid to the ounce of water (five ounces at each injection), and caused each quantity to be retained for two or three minutes, until he complained of slight pain or uneasiness. May 12th.—The symptoms and condition of the urine were slightly improved. I injected ten ounces of distilled water, with two minims of the strong nitric acid to each ounce of water, in the same manner as before. This injection was followed by considerable pain, which continued during several hours; but, on the following day, the urine was much changed in appearance, contained little or no mucus, and had lost its dark brown colour and become of a light straw colour. The irritability of the bladder was considerably lessened.—I injected the bladder twice after this, but with a smaller proportion of acid; the urine which had been alkaline became acid; the patient lost all his bad symptoms; and he has continued well up to the present time.

Professor Lallemand* has successfully practised cauterization of the mucous membrane of the bladder in chronic catarrh, with solid nitrate of

* I am indebted for this information to an able paper on Chronic Cystitis, by Dr. O'Bryen, in the *Dublin Journal of Medical Science*, September, 1838.

silver. The following is his mode of employing this remedy:—He uses a large catheter (of pure silver, as the caustic acts upon it if there is any alloy), open at both ends, having two sorts of stilet, according to the part intended to be cauterized; at the extremity of each stilet is a small excavation, containing the caustic, which is first pulverised, and then placed in the excavation over a spirit-lamp, which fuses and moulds it to the cavity.

When the instrument is prepared, introduce into the bladder an ordinary catheter, in order to empty it completely. This precaution is strictly necessary, for the urine would dissolve the caustic, and prevent its directly affecting the mucous membrane. When this has been withdrawn, the instrument bearing the caustic is to be introduced (closed), and the moment it has entered the bladder, you are to push the stilet, and rapidly turn the porte caustique from side to side two or three times, and then pull the stilet into the instrument, and withdraw it; our object should be to touch the surface in as many points as possible. While the instrument is within the bladder, the latter contracts and grasps it, while the kidneys secrete a small quantity of urine, as the lachrymal gland secretes tears when the conjunctiva is cauterized; but this small quantity of liquid, far from being hurtful, is on the contrary favourable, as it acts as a vehicle to the portion it does not decompose, and conveys it equally over the surface of the membrane. Patients

feel, at that moment, a sharp pain at the neck of the bladder, and in the rectum, described by them as if they were pinched, but much more supportable than the continued dull pain of chronic catarrh; there is now an irresistible desire to pass water, and as the bladder is nearly empty very little is voided, and this causes a burning along the urethra, often accompanied by some drops of blood. This desire is renewed every moment, causing violent but useless efforts. These gradually decrease, and on the second and third day, there is no longer any pain on making water, and a few small grey eschars, like burned paper, come away with the urine. This occurs in a large number of patients, but in some more susceptible the process does not proceed so simply, particularly if you have used the *porte caustique* too long. In this case retention of urine follows, which lasts from three to thirty-six hours; even here we must not be in too great a hurry to use the catheter, as a warm bath, a few narcotic lavements, emollient drinks, some tartrate of soda, with *infus. sennæ*, and sometimes a few leeches, will cause the spasms to yield; if not, some belladonna to the meatus may be tried, always taking care to use antiphlogistics with moderation in the beginning, as inflammation is necessary to the cure. In a majority of cases one cauterization is sufficient to effect a cure; when it happens otherwise, a second and even a third application may be necessary, but Monsieur L. states that he never saw a case requiring a fourth.

Dr. Devergie* has recorded eight cases of chronic catarrh, some of long standing, which were cured by injecting balsam of copaiba into the bladder. Some of these cases had succeeded to acute cystitis; in others the disease had gradually manifested itself, and maintained throughout its chronic character. If stricture of the urethra exist, this requires to be remedied before employing the injections. A moderate quantity of an emollient fluid must first be injected, to ascertain the capacity of the bladder, but not in sufficient quantity to irritate it. General means must be resorted to, to calm the inflammation and local pain, the general erethism, &c. Narcotics must next be added to the emollient injections; and these may be repeated three or four times a-day. When the irritation of the bladder and neighbouring parts is allayed, the copaiba should be injected. A dose of uniform strength is not suited to every case. A drachm of balsam of copaiba to an ounce of barley-water is strong enough to commence with; the quantity of balsam may be increased according to its effects. The combination of narcotics with copaiba renders the latter less exciting. The balsamic injections may be allowed to remain in the bladder for a period of from ten to twenty minutes. The quantity of copaiba is to be gradually augmented; and it should not be injected more frequently than once

* Gazette Médicale de Paris, and British and Foreign Medical Review.

daily, nor intermitted more than two days. The injection is to be continued until the muco-purulent secretion has quite ceased. It is necessary to guard against the occurrence of inflammation of the mucous membrane of the alimentary canal, and, under such a circumstance, to suspend the use of the balsamic injections.

The tenacious mucus produced in this state of the bladder, deposits phosphate of lime; and when phosphate of lime from this source coexists, as it often does, with the triple phosphate in the urine, a compound salt is formed. In such cases, a weak solution of nitric acid (beginning with a drop, and gradually increasing it to two, of concentrated nitric acid to two ounces of distilled water), if injected into the bladder, acts as a salutary astringent.

In these cases Chopart recommended injection of the bladder; and he mentions the case of a man sixty-five years of age, almost worn out by excessive secretion of mucus, who was cured by this means.

The medicines found most serviceable where there is much secretion of mucus, are the decoction of uva ursi, with the muriated tincture of iron, and small doses of powdered galls and nitre. If there be much pain and irritability of the bladder, the decoction of pareira brava is an excellent medicine; and it may be combined with nitric or nitro-muriatic acid, or dilute phosphoric acid, to lessen the secretion of mucus. If there be much pain and restlessness, mor-

phium or opium ought on no account to be omitted. Barthez mentions a case in which fifteen pounds of mucus were passed in thirty-six hours, and which was cured solely by the exhibition of large doses of opium internally, and in the form of clyster.

If there be any constitutional tendency to gout, colchicum should be administered. The form in which I am in the habit of giving it, is the acetous extract, in the dose of one or two grains at bedtime. In these cases, small doses of copaiba, or of the essential oil of cubebs, with hyoscyamus, will often do great good, and may either be added to the infusion of buchu, or decoction of pareira brava, or be given alone. Some surgeons put great confidence in copaiba in the treatment of this disease. Sir A. Cooper says—"The best remedy that can possibly be taken is the balsam of copaiba; no medicine so completely robs the urine of mucus as this. Eight or ten drops three times a day will usually be found quite sufficient; it may be given in conjunction with sweet spirits of nitre and camphor mixture, or in $\text{ʒij. mucilag. gum. acaciæ et ʒx. aq. font.}$ "

Copaiba may be given with advantage in combination with small doses of zinc, chio turpentine, or sulphate of iron; but whatever other remedies may be used, the surgeon must not omit the use of morphia or opium once or oftener in the twenty-four hours. Dupuytren used to rely very much on turpentine in this disease. But both cubebs and copaiba must be administered with care; for,

after the long-continued use of these medicines, chronic inflammation of the bladder sometimes comes on. When the urine is alkaline, and contains a good deal of mucus with the phosphates, the *alchimella arvensis* may be administered with advantage. An ounce of the dried plant is to be infused in a pint of boiling water for three or four hours; and two ounces of the infusion is to be taken three times a day. I need not say that, in this complaint, blood-letting is seldom required. In the severer form, where there is great depression of the vital powers, the patient should be sustained with light nourishment, and small quantities of wine given from time to time. In the milder form, patients may be allowed to take animal food; but beer, wine, and spirits, must be strictly prohibited. Patients must also be cautioned against exposure to cold, and against irregularities of every kind, and must be told the consequences of neglecting the advice given them. From want of care on the patient's part, the mild has often assumed the severe form, and an attack of acute inflammation has come on and destroyed life.

CASE.

In December, 1833, I attended with Mr. Holmes, of the Kingsland Road, Mr. T., æt. 80, who, for some time previous, had been subject to occasional difficulty in passing urine, and to the discharge of mucus, which latterly had very much increased. When I saw him, there was frequent desire to

make water, attended with great uneasiness and pain in the lower part of the abdomen, sense of burning in the urethra, inability to micturate, cramps in the legs, thirst, and slight shivering. On drawing off the water, these symptoms subsided for a time; but they invariably returned on the filling of the bladder. The urine was acid, of a dark brown colour, and contained a great quantity of mucus more of an amber colour than any other. This always subsided to the bottom of the vessel, was very tenacious on being everted, and could be drawn into long strings. Sometimes this mucus would come out in clots, and it was occasionally streaked with blood, and very offensive to the smell. On exposing some of it to the action of cold for a few hours, it became quite dense.—Morphium, the decoction of uva ursi, with the ammoniated tincture of iron, the decoction of pareira brava, lavements, and the regular introduction of the catheter, were employed, but without avail; the patient's strength gradually declined; and he sank at the end of six weeks. There was no post-mortem examination.

CASE.

The following interesting case occurred in the practice of Dr. Elliotson.

For a great number of years, the individual had laboured under cystorrhœa, as it is sometimes called, or a discharge of mucus from the bladder. A great quantity of mucus was constantly deposited

in the vessel which he used ; and that it was true mucus was evident, from its capability of being drawn out into long threads. This continued for a number of years, and various remedies were used ; but they were all rendered useless by his taking an excessive degree of exercise. Any remedy, however, that was at all irritating, did him a great deal of harm : mild means only were suited to him. I am not sure that even these did him any absolute good ; but certainly they did him no harm. The consequence of not taking care of himself, and of taking considerable exercise, was, that what at first was a mere increased secretion of the bladder, became at last organic disease of that viscus, slow inflammation, hypertrophy, and finally, pretty active inflammation.

The following were the morbid appearances found on dissection :—The bladder was amazingly thickened : its substance was in a high state of hypertrophy, the muscular fibres being considerably increased in size. There was a very considerable hypertrophy of the muscular coat, mucous membrane, &c., at the part corresponding with the trigone vesicale ; so that a large transverse fold and pouch were formed by it. This person had from 300 to 400 small stones in the gall-bladder, but he never suffered any inconvenience from them, and their presence was unexpected. He had no stone, no stricture, no difficulty in passing water, but an excessive gleet, if I may say so, from the interior of the bladder, for many years. We could almost

fancy, from its rugousness, that the interior of the bladder was the interior of the stomach. The symptoms preceding death were, agonising pain, a constant desire to make water, a discharge of blood as well as of mucus, which at last was rather pus than mucus. From excessive secretion, there came on chronic inflammation of the substance of the bladder; and finally, that chronic inflammation became acute, and destroyed the patient.

CHAPTER VI.

ACUTE INFLAMMATION OF THE MUSCULAR
STRUCTURE OF THE BLADDER.

SOME authors suppose that the muscular structure of the bladder is never inflamed alone, but that its peritoneal and mucous membrane always at the same time partake of the inflammatory action. Mr. Howship* says, "An acute inflammatory action of the bladder is, I believe, never confined entirely to the muscular coat. Either the mucous membrane within, or the peritoneal covering without, or both, have been always, as far as I have seen, more or less involved in the same state, and consequently the phenomena of irritation become blended with the symptoms of inflammation." Boyer likewise says, "Inflammation of the bladder, like that of all organs composed of several tunics and lined by a mucous membrane, may attack all the tunics at once, or only the internal coat. The first case is termed inflammation of the bladder or cystitis; the second, catarrhal inflammation, or catarrh of the bladder. At all events, it is right to observe, that, in cystitis, the mucous membrane partakes, more or less, of the inflammation; and that, in acute and very intense catarrh of the bladder, the other membranes of the viscus are

* On the Secretion and Excretion of Urine, p. 230.

also inflamed. Hence, without doubt, the difficulty in several cases of distinguishing the symptoms of inflammation of the mucous membrane, from those which belong to the inflamed state of the other membranes." "We must say," observes Mr. Johnson,* "that we have never seen a case in which we were satisfied of the limitation of the inflammation to this coat. That inflammation may, in one instance, be principally seated in one tunic, and that, in another instance, it may be mainly located in another, is too certain to admit of doubt; but its absolute limitation to one coat and particularly to a central coat, like the muscular, does not seem to us so well established in fact as in theory." Mr. Wilson, on the contrary, in his lectures on the urinary organs, says, "Inflammation may arise from various causes, affecting the whole of the coats; or it may arise from a cause acting only on one, and may be confined to that single coat." Now, the fact I take to be this—inflammation may confine itself to the mucous tunic, or it may limit its action to the peritoneal covering of the bladder; but with respect to the muscular coat of this viscus I am of opinion that it is seldom exclusively the seat of inflammation, unless it be at its very commencement. From the central tunic, inflammation has a great tendency to spread both outwardly and inwardly; and hence it is that we never observe the former to be much inflamed, without finding either or both of the latter more or less involved in the morbid action.

* Medico-Chirurgical Review.

With the exception of inflammation of the bladder, caused either by stone or by the operation to remove it, or proceeding from outward violence or wounds, idiopathic acute inflammation of the muscular membrane of the bladder, is comparatively rare; whilst, on the contrary, affections of the mucous membrane, and even chronic affections of the muscular tissue, are more frequently met with. Hence we find, that few cases of it are noticed by the surgeons of the last century; Vogel even says, "*Nulla fere fit hujus morbi a recentioribus auctoribus mentio.*" It more frequently attacks adults than the young or old, and strong robust persons than delicate ones. It is also more common in males than females, whilst the contrary is the case as to acute inflammation of the mucous membrane.

The patient first complains of a dull aching pain in the region of the bladder, which soon becomes more violent, and extends to the neighbouring organs. This pain is increased by pressure, and is attended by desire to pass urine, without the power to accomplish it. The desire comes on in paroxysms, attended with pain; the urine is at first evacuated in small quantities; and the attempt to pass it causes great pain. The small quantity which escapes is of a dark colour, sometimes not unlike coffee in appearance; at other times it is of a deep red, and even blood colour; and at last complete retention occurs. There is a sense of fulness in the lower part of the abdomen, and pains

in the lumbar region, in the groins and down the thighs; but there is not the burning sensation along the urethra and in the perineum which exists in inflammation of the mucous membrane.

The disease is ushered in by rigors, which are soon succeeded by great constitutional disturbance. The pulse is full and hard, the thirst great, and the skin hot, with general uneasiness and sickness. If the inflammation increase and spread, pains are felt in the intestines, particularly in the rectum, combined with tenesmus; delirium comes on; the pulse rapidly sinks; and the patient soon dies.

If the inflammation be seated in the neck of the bladder, as is frequently the case, the urine which has entered the bladder, is retained by the tumefaction ensuing from the inflammatory action, and the bladder soon becomes distended and projects above the pubes. There is a sense of weight in the perineum; there are often painful erections of the penis; and examination by the rectum gives great pain.

The anatomical structure of this part readily accounts for these symptoms. The triangular space is at once very vascular and highly sensitive: * its nerves arising from the third and fourth sacral pairs, as well as from the great sympathetic, descend

* With regard to the urethral opening of the bladder, Mr. Guthrie observes, "that fibres have been described surrounding this part, though no anatomist has demonstrated them so as to warrant their being called a sphincter muscle; that this part may be both muscular and elastic, but that the older anatomists supposed the power which prevented the flow of urine to reside in other muscles surrounding the membranous part of the urethra."

on each side through the inferior mesenteric and the hypogastric plexus, and communicate more particularly upon this space. We have, therefore, only to recollect the relative connexions and ramifications of these different nerves to be able to explain, not merely the strong and constant desire to evacuate the bladder that prevails when this part of the bladder is irritated or inflamed, but also the remote symptoms with which this inflammation is liable to be accompanied.

If the inflammation exists somewhat higher up in the bladder, where the ureters enter, the orifices of the latter become contracted, and the bladder being closed against the influx of the urine, the ureters become enormously distended. With Mr. Camplin, I examined the body of a young gentleman, who died of this complaint, and in whom one of the ureters was so enlarged, as to equal in size a portion of small intestine.

The orifice of the ureters is surrounded by a dense elastic substance, which lies between the muscular and the mucous coats of the bladder. Beginning at the base of the triangular space, this substance inclines inwards as it advances towards the neck, forming in a great measure the orifice, and appearing to be continued through the urethral passage as its elastic membrane. This elastic triangular substance yields, in some measure, to the pressure of the urine, when impelled by the detrusor, and returns to its original situation when the pressure is removed.

If the inflammation is situated more in the upper part of the bladder, there is danger of its extension to the peritoneum, and pain is greater on pressure; but the desire to pass urine is not so frequent, nor the difficulty so great.

The progress of the disease depends on the severity of the symptoms. Very severe cases, occurring, for instance, after suppressed gout, sometimes terminate fatally within a short time from the commencement of the attack; but, in ordinary cases, if active measures be employed, the pain, after two or three days, begins to subside, and the water flows with greater facility, is less acid, and of lighter colour. The febrile symptoms, and, at the same time, the local uneasiness, lessen.

This kind of inflammation sometimes terminates in the formation of abscess in the coats of the bladder; of which the symptoms are of a very formidable character, depending upon the size and situation of the abscess. The urgent symptoms of the inflammation then subside; but there is a dull pain in the region of the bladder, occasional rigors with febrile excitement, and uneasiness in passing urine and fæces. The abscess may open into the cavity of the bladder, and in this case, pus is evacuated with the urine, and the patient experiences great relief; or the matter may extend into the cellular tissue of the pelvis, and make its way either through the rectum, or to the perineum, or even to the groin, and in these cases the result is most frequently fatal. Mr. Wilson mentions an

interesting case, in which extensive suppurations had taken place in the coats, from the prostate even to the fundus of the bladder, the matter being lodged everywhere between the coats; while near the fundus several ulcerations had penetrated the internal membrane, by which the matter had passed into the cavity of the bladder.

This disease may easily be mistaken for acute inflammation of the prostate. The uneasiness and pain in the region of the bladder and the perineum, the occasional but strong desire to pass urine, every effort being attended with great pain and retention, are symptoms common to both diseases. In inflammation of the prostate, however, there is more fullness and tenderness on pressure in the perineum, and on examination per rectum, the prostate is found exceedingly sensitive, painful, and swollen.

In recent cases, the morbid appearances in acute inflammation of the muscular coat are, great vascularity, the tunic being thoroughly injected with blood, and of dark red colour.

Sometimes this coat is found even to be gangrenous; and instances are recorded where it has given way, and the urine has escaped into the pelvis. The mucous membrane is also found of a dark red colour. In other cases, the membrane is thickened, and the bladder itself contracted. Pus is found sometimes infiltrated through the tunic, or else circumscribed in the form of abscess.

Acute inflammation of the bladder is sometimes caused by exposure to cold, and indulgence in

spirituous liquors; but more frequently it occurs on a sudden suppression of the discharge in gonorrhœa, when metastasis takes place to the bladder.

Amongst its causes may also be classed, wounds and blows, or injuries from the incautious or violent use of instruments. The immoderate use of cantharides internally, and, in excitable persons, even the external application of that medicine will produce this disease. After an irregular or suppressed attack of gout, this affection comes on, and frequently assumes a very serious and formidable character.

CASE.

Richard Serigiter, æt. sixty-eight, watch-maker, after a slight attack of gout, was seized with rigors, which were succeeded by fever and great constitutional irritation. The pulse was extremely quick; the skin was hot and dry; and there were great thirst and sickness. He had a strong desire coming on in paroxysms to void urine; but he could pass but a few drops at a time. There was pain in the region of the bladder and loins.—Colchicum, and saline aperients, were administered; leeches and warm fomentations were applied to the region of the bladder; and the warm bath was tried. The bladder being distended, a catheter was introduced; and between two and three pints of very dark urine were drawn off. None of these measures gave relief: the constitutional disturbance increased, delirium came on, and the man died within forty-

eight hours from the commencement of the attack. On the day after his decease, I examined the body, and found the bladder in a state of intense inflammation: in its structure, there was no organic change; but the tunics, particularly the muscular one, were of very deep red colour. Of this I have a preparation in my possession; and although it has been in spirit several years, it still retains its redness.

The symptoms of this disease are so severe, and its progress so rapid, that prompt and decisive measures must be adopted. If the patient be strong or robust, general blood-letting must be first employed; or, if the patient be delicate, and of spare habit, local bleeding, as leeches to the pubes, or cupping in the perineum, may be substituted; or both of these may be put in requisition as auxiliaries to general blood-letting.

Hot fomentations should be constantly applied to the pubes; and, after the bleeding, the patient should be placed in a hot bath. As already observed, there is, in these cases, retention; and the urine must, from time to time, be drawn off by the catheter. Internally, our main reliance is placed on the use of calomel and opium, which must be given every three or four hours; this medicine affording the most speedy relief. As there is often tenesmus, the proportion of opium should be large; and sedative injections should, at the same time, be administered. After the urgency of the symptoms have subsided, saline aperients combined

with the vin. semin. colch. will be found beneficial, especially if the attack have occurred in a gouty subject. The diet must consist entirely of lukewarm mucilaginous drinks. If the complaint have arisen from the suppression of the discharge in gonorrhœa, it will subside on the reappearance of that discharge.

If these means be employed early, the patient soon experiences a diminution of pain. Urine is passed in greater quantities and with less suffering; his constitutional symptoms improve; and he falls into sound and refreshing sleep. If, on the contrary, these measures be delayed, the symptoms before described become aggravated; and delirium and death ensue.

CHAPTER VII.

CHRONIC INFLAMMATION OF THE MUSCULAR
COAT OF THE BLADDER.

It not unfrequently happens that, after an attack of acute inflammation, the bladder never recovers its usual tone, and the chronic form of the disease supervenes. At other times, chronic inflammation exists without having been preceded by the acute form of the disease ; but if its history be carefully traced, it will be found that inflammatory symptoms of a sub-acute character have for a long time been going on and neglected, which, though mild at first, have been gradually becoming exasperated, until a disease, which might have been perfectly tractable at its commencement, terminates in one that is extremely distressing, and which, I regret to say, is seldom cured.

In this disease, there is uneasiness about the region of the bladder, frequent desire to make water both night and day, but especially by night, and the urine does not flow so readily as usual ; there is also occasional prolapsus of the rectum ; and these symptoms are increased by exercise. The patient frequently complains of pains in all the limbs and in the region of the back, of a sensation of bearing down in the region of the bladder, with occasional fulness in the perineum, and

a sensation of trickling in the part, of difficulty or slowness in passing urine, and of a clasping or closing effort of the neck of the bladder in the act of micturating, which is increased by the muscular exertion. Occasionally, the bladder feels as if it were full and distended twice its size, even when it contains but little urine. The skin is dry, and suffering under psoriasis or lepra; and the urine is scanty, of deep colour, and of high specific gravity. The kidneys, after a time, are involved in the progress of the disease, the urine becomes albuminous, nausea supervenes, the patient loses flesh and strength, and he sinks at last from complete exhaustion.

In this state the coats of the bladder become thick and hard, so that they no longer admit of their former degree of extension. Now, it must be understood that the neck of the bladder and the urethra have around them the muscles termed the compressor prostatae, the levator urethrae, and the ejaculator seminis, besides the columns of the levator ani. All these muscles must relax before a drop of urine can pass; and any inflammatory action in them directly obstructs the passage, whilst it hinders the contraction of the bladder itself. The contraction, indeed, of one set of these fibres, and the relaxation of the other, belong to the same act, like the condition of opposing muscles in the motions of the limbs; so that if the bladder be not in a state to execute its functions, these muscles are not in a condition to relax. "The elasticity

of the neck of the bladder," says Mr. Guthrie,* "is impaired; it will not dilate with the ordinary action of the detrusor muscle; and this action is therefore augmented. A sensibly increased delay is experienced before the water begins to flow, the patient is obliged to expel it; and he becomes conscious of the augmented effort made by the bladder. The desire in which this originates, soon amounts to uneasiness, and rapidly afterwards, to pain—relieved indeed on evacuating a little water, but too soon to return; for now the bladder is never completely emptied, and the urine which remains is a source of great irritation, although the quantity be really inconsiderable."

On dissection, the bladder will be found more or less thickened; its inner surface presenting a considerable number of rugæ, caused by projection of the enlarged fasciculi beneath. Dr. Baillie has given the representation of a bladder nearly an inch in thickness; the prostate gland being at the same time enlarged. One of the most ordinary changes in the bladder, from its natural structure, says that physician, is the great thickening of its muscular coat. In a natural state, the muscular coat of the bladder, when it is moderately distended, consists of thin layers of muscular fibres, running in different directions. These are probably, altogether, not more than the eighth of an inch in thickness. The muscular coat of the bladder, however, is occasionally found at least half an

* On the Diseases of the Bladder, Lect. xv. p. 256.

inch thick. This arises from an additional quantity of muscle being formed in consequence of extraordinary efforts being necessary in the bladder. These efforts take place when there is any considerable difficulty in making water, as happens when the prostate is a good deal enlarged, when there is a stone in the bladder, or when there are strictures in the urethra. It is usual, therefore, to find this thickening of the muscular coat, when there is any of these diseases. When the bladder is thickened, the fasciculi of which its muscular coat is composed become much larger; but they never, or at least very seldom, acquire the full red colour which muscles of the same size have in other parts of the body. This is a deviation from the general plan of nature with regard to the increase of muscles from exercise. When muscles are enlarged in size from exercise, they also become of a deep red colour. There is no instance in the body, as far as I recollect, of a muscle being so much enlarged beyond its natural size, in consequence of increased exertion, as the muscular coat of the bladder. Between the fasciculi of the muscular fibres, little pouches are formed by the inner membrane of the bladder, which is impelled by the strong powers of the muscular coat. These pouches are often large enough to admit the end of the finger, and contain occasionally small calculi. The bladder in this state admits of very little distension, so that it is capable of containing little water: hence the inclination to make water is

frequent, and frequent efforts of the muscular coat are required, which increase more and more its thickness. When the disease has been of long duration, and severe at the same time, the mucous lining of the bladder becomes partially or wholly abraded, exposing the hypertrophied muscular fasciculi. Mr. Guthrie thinks this a rare occurrence: from my experience, I am inclined to draw an opposite conclusion, and do not consider it so uncommon a disease. When the mucous tunic is abraded on the spot where the ureters terminate, the inflammatory action and its consequences extend up these tubes to the corresponding kidneys, and hence we not unfrequently find the pelvis of one or both of the kidneys ulcerated, as well as the interior of the bladder.

This disease, though frequently the sequel of acute inflammation, is also caused by strictures in the urethra, enlargement of the prostate, prostatic calculi, cold, stone, indulgence in spirituous liquors, by irritating medicines, as cantharides, and, in some constitutions, by the long-continued use of cubebs and copaiba. In persons having an hereditary predisposition to urinary affections, as well as in gouty and rheumatic subjects, it occurs from slight causes. The retention of urine in the bladder, after the desire to void it has been felt, often brings on the disease.

This affection is likely to be confounded with simple irritation of the bladder; but the absence of pain, and of the constitutional symptoms I have described, is the great diagnostic sign.

Hysterical females are subject to a peculiar form of irritation of the bladder, which I have known in more instances than one to have been mistaken for inflammation. In these cases, there is usually great pain, and even retention of urine; but the temperament or constitution of the patient, and other characteristic circumstances, when carefully inquired into, will in most instances clearly show the true nature of the disease.

When this disease is caused by stricture or any local cause, it is clear that the primary affection should especially engage our attention; though even when that has been removed, the inflammatory disease often remains. In gouty, rheumatic, or plethoric persons, colchicum given at night, in the dose of one or two grains of the acetous extract, will be found of great service; and as, in these cases, the urine is acid, and often scanty, the alkalies should also be given. I usually advise them to be taken after meals; and I employ them in a combination of bicarbonate of potass, sesquicarbonate of soda, and nitrate of potass. In addition to these medicines, great benefit will be derived from *pareira brava*. Some years ago, I published some cases of the disease which were relieved by this remedy; and subsequent experience has quite confirmed the opinion which I then ventured to express of it. This medicine formerly had a place in the *Pharmacopœia*; and, after being omitted for a time, it is restored to the edition which has recently appeared. In the beginning of

last century, it was, in many parts of Europe, in great repute; and, in a work published at that period by Andreas Helvetius, it is mentioned as a specific in affections of the bladder and kidneys: his observations are, “La racine de pareira brava est un spécifique contre toutes les maladies des reins et de la vessie qui sont curables. Il agit avec tant de douceur qu’il n’y a point d’occasion où l’on ne puisse l’employer sans en craindre de mauvaises suites, et on peut comparer ses effets aux spécifiques du quinquina, de l’hypécacuanha, &c.”*

The mode of preparing this medicine, advised in the present Pharmacopœia, is to put six drachms of the root into a pint of water and to macerate it for two hours. I usually, however, order a decoction—an ounce to a pint and half of water, to be boiled to a pint.

Messrs. W. Allen and Co., of Plough Court, made some experiments for me as to the advantage of macerating the root previous to boiling.

Three decoctions of the radix pareiræ bravæ were prepared, with the following differences:—

1. Without previous maceration in cold water.
2. With previous maceration of 4 hours.
3. Ditto 12 hours.

On comparison, there appeared but slight variations in the results. No. 3, however, seemed to possess *rather a stronger taste* than No. 1. Perhaps the same may be said (in a less degree) of No. 2.

* Traité des Maladies les plus fréquentes, &c., par M. Helvétius, Liège, 1711.

These decoctions are filtered with difficulty; but by long standing the feculent matter was separated, and the supernatant portions compared together. No. 1 was perfectly bright, while Nos. 2 and 3 were not quite so; yet, contrary to expectation, No. 1 was found to be of rather greater specific gravity. This would imply that the previous cold maceration *does extract something, not permanently to remain in solution, but to be precipitated, and with it perhaps to carry down some other matter during the subsequent boiling.* If this be the case, it indicates the impropriety of the feculent part being separated—at least, until it is ascertained to possess no medicinal efficacy.

The extract of pareira brava is also a very useful medicine, and may be given in doses of ten grains, three times a day.

I have often, with great advantage, tried the infusion of wild carrot seeds in this form of disease; but this medicine should not be given nor persisted in, if there be any irritation of the mucous membrane.

The diosma, in the form of infusion, combined with the alkalies and tincture of hyoscyamus, will be found of great service. Should not the urine be acid, or, as is not unfrequently the case, should the alkalies produce headach and restlessness, or uneasiness about the region of the stomach, their use must be discontinued, and recourse had only to sedatives, as extract of hop, and of uva ursi, or nitric ether, with tinctura camph. comp.; and the

occasional exhibition of suppositories. The diet should be plain, but nutritious; and beer, wine, and spirits, should be prohibited. Exposure to wet and cold invariably aggravates this disease, and should, of course, be avoided.

As in these cases the bladder is seldom completely emptied by its own efforts, a catheter should be introduced from time to time, and the patient be instructed to do this for himself.

CHAPTER VIII.

INFLAMMATION OF THE PERITONEAL COAT OF
THE BLADDER, AND OF THE SUBJACENT CEL-
LULAR TISSUE.

INFLAMMATION of the peritoneal covering is seldom confined to the bladder, but generally extends over the whole of the membrane. It is often the close of a fatal disease of that viscus. That it takes place, however, under other circumstances, without any dangerous consequences, is sufficiently proved by old adhesions not unfrequently found connecting this part to the omentum, to portions of the intestine, to the uterus, or to the rectum.

On dissection, we not unfrequently find the abdominal or peritoneal tunic of the bladder inflamed, as well as the mucous and muscular coats. Inflammation sometimes attacks the peritoneal covering, owing to that action spreading to it from another part of the membrane. Nevertheless, though the circumstance is rare, cases have occurred in which acute inflammation was limited to the peritoneal tunic of this organ.

As a reason for limitation to this particular tunic, Dr. Baillie suggests the quantity of cellular tissue interposed between the serous and muscular tunic, and the laxity of their connexion.

The pain and its aggravation on pressure, the

state of the pulse, the countenance, and the position of the body, clearly indicate the nature of the disease.

The same treatment which is employed in general peritonitis, must be adopted in inflammation of the peritoneal covering of the bladder. The lancet, leeches, calomel and opium, and warm applications, must be vigorously employed. The disease rarely, if ever, proceeds to suppuration; but coagulated lymph is sometimes thrown out on the inflamed surface, forming adhesions with some other part of the peritoneum, where it covers other viscera, or lines the cavity of the abdomen.

The inflammation of the external covering of the bladder is, moreover, generally connected with inflammation of the adjoining lining of the pelvis.

In these cases there occurs a peculiar train of symptoms, requiring a different plan of treatment from that suited to inflammation of the peritoneal coat of the bladder.

“The pulse,” says Brodie, “is frequent, rising to 90 or 100, and at last to 140, in a minute; the heat of skin is great; the tongue dry; the countenance anxious. There is an occasional hiccup; the patient complains of some degree of tenderness in the lower part of the abdomen; the belly becomes tympanitic; its distension increases; the hiccups are more frequent; the pulse intermits, becomes weak and fluttering. In some instances, the patient retains his understanding, even to the last; while in others, he falls into a state of low

delirium previous to death. Occasionally, in the progress of such a case, the patient has a severe rigor, and sometimes he complains of pain in the loins. On dissection, we find the cellular membrane round the neck of the bladder, and between the prostate and rectum, bearing marks of inflammation, infiltrated with lymph and serum, and to a greater or lesser extent converted into a slough. If death have taken place at an early period, the intestines are found inflated with air, and there is a very slight effusion of serum in that part of the peritoneum which descends into the pelvis. But if the patient have laboured under these symptoms for many days before he dies, the peritoneum, where reflected from the bladder to the rectum, is seen of a darker colour than natural, and encrusted with lymph; and, at a still later period, there is the appearance of inflammation, to a greater or less extent, throughout the peritoneum generally. But the peritoneal inflammation is evidently not the primary disease: it is the inflammation and sloughing of the cellular membrane of the pelvis, which has induced inflammation of the adjoining portion of that membrane.

“It is important that we should not fall into the error of regarding these cases, as cases of simple peritoneal inflammation; for the remedies which would be useful in the latter case are useless here. The abstraction of blood, even the operation of an active purgative, will cause the patient to sink more rapidly, tending only to hasten his

death. The proper system to be pursued is the opposite of that to depletion. The patient should take such nutriment as his stomach is capable of digesting. The bowels may be kept open by injections, or by the exhibition of some very gentle purgative; and ammonia, wine and brandy, are to be administered when the state of the general system indicates that stimulants are necessary."

Sometimes the cellular tissue around the bladder is the seat of chronic disease; and abscesses may form in different parts of it, without the bladder being affected. These cases are always involved in great obscurity, and they often terminate fatally.

Dr. Elliotson* relates the case of a female forty-two years of age, in whom an abscess formed between the bladder and the symphysis pubis, which terminated fatally in about two months from the commencement of the disease. She complained of violent pain in the hypogastrium and over the pubes, shooting back to the loins, and frequently attended with a sensation of numbness and tingling in the right thigh extending to the toes. The hypogastrium and pubes were very tender to the touch; there was, occasionally, a copious discharge of puriform matter from the vagina, tinged with blood; and the urine generally passed freely, but had sometimes been retained for two days together. There was much tenesmus and pain in the rectum; the tongue was white; there was no appetite, but frequent nausea; the bowels

* Medical Gazette, vol. i. p. 130.

were usually opened twice a-day, and the pulse was weak and small.

On examination, an abscess was found in front and deeply behind the symphysis, extending laterally beyond the abdominal rings, so that the round ligaments passed through it. The surface of the bone was rough, blackened, and denuded of its periosteum, but not carious. The abscess contained a dark-coloured and very fetid pus, which had free exit through the urethra, a portion of the whole circumference of which was here destroyed. The suppuration was entirely anterior to the bladder, which was rather turned to the right side, but, with the uterus and vagina, was perfectly healthy. The pelvis was large and well-proportioned.

CHAPTER IX.

SPASM OF THE BLADDER.

IT has been questioned by some medical writers, whether the bladder be subject to spasm : a little attention to circumstances will, I think, furnish satisfactory data to remove all reasonable doubt on this head, independently of the question of fact. No truth in physiology is more unexceptionably established than that of structure determining the function of parts ; and whether that function be healthy or morbid, the phenomena it presents in both cases may differ in the degree and quality of their manifestation, but never in their essential nature. Now, the characteristic function of muscle is contraction and relaxation, alternating in health as occasion requires ; while in disease, either may be too great, giving rise to either tonic or clonic spasm in one instance, or to debility or total paralysis in the other.

With such undeniable principles as our guide, it only remains to ask, whether in the structure of the bladder there exist a muscular structure, at once to have implied in the answer whether the organ be subject to spasm or not. But the bladder is plentifully supplied with muscular fasciculi, traversing its structure in various directions ; *there-*

fore, the bladder is liable to be affected with spasm.

Having seen that physiology bears out the inference that such a disease may exist, let us proceed to show from circumstances, and the character of the attendant symptoms, that such is really the case.

One of the foremost of these is the circumstance that the disease comes on in fits, and the attack is for the most part sudden: the character of the accompanying pain is likewise diagnostic—it is constrictive, corresponding with what is felt in other muscular organs subject to spasm. The pain is usually very violent, almost insupportable; and during the continuance of the spasm, the peculiar function of the bladder is variously disordered, according to the particular set of fibres involved in the morbid affection. For example, if the fasciculi situated at the fundus and upper part of the bladder be the chief seat of the spasm, then it often happens that the contents of the bladder are suddenly and forcibly expelled on the first accession of the spasm: whereas, if the disease seizes on the neck of the bladder, the very reverse ensues—the urine is retained so long as the spasm persists.

There is one affection of the bladder with which spasm is apt to be confounded, and which frequently requires considerable acumen to distinguish with certainty the precise nature of the disease. I mean, acute inflammation of the mucous lining of

the bladder ; and this is not rendered more lucid in the discrimination, by the two diseases being at times more or less conjoined, by long-continued and often-repeated attacks of spasm being apt to induce inflammation, and lastly, by the symptoms common to the one, very much resembling those of the other. Nevertheless, due attention to the following circumstances will rarely fail to enable us not to mistake the one for the other. In inflammation, the pain is constant, coming on with more of uneasiness than of positive pain, and exasperating by degrees ; while in spasm, the seizure is as severe as it is sudden. In the former, the pain has the characters usual in inflammations—it is lancinating and throbbing ; whereas in the latter, it is, as I have already observed, constrictive, resembling, in fact, labour-pains—for these also result from the spasmodic contraction of the muscular fibres of the womb in promoting child-birth. In both there usually is retention of urine, but the cause in each case somewhat differs : in spasm, seated about the neck of the bladder, the spastic contraction of the sphincter vesicæ prevents the urine from being evacuated ; in inflammation of the same part, on the other hand, it is the tumefaction of the mucous coat and subjacent cellular membrane that is the cause of the obstruction. A distinction between spasm and inflammation affecting the bladder, may be partly deduced from the age of the patient, corroborative of other more positive indications, seeing it is the young and

robust that are most liable to be attacked by inflammation, and the aged, the nervous, and debilitated that are most subject to spasm. The colour of the urine in the two cases is likewise a diagnostic ; since in the former disease it is red and high-coloured, while in the latter it is watery and pale, especially if there be no organic affections, at the same time, in either the bladder, uterus, or kidney.

Old people, as was observed above, are more particularly subject to this disease ; and they are further subject to those affections which excite it sympathetically, as diseases of the bladder and kidney. A fit of the stone, as it is familiarly called, is nothing but a violent paroxysm of spasm, attended with intolerable pain, excited by the irritation of the calculus. This may arise in various ways, but there is none more frequent than anything disturbing the position of the stone, either by a slip of the foot in walking, or any violent concussion of the frame, or by whatever throws the abdominal muscles suddenly and violently into action, by the compression of which, the bladder is made spastically to contract on the stone : even the emptying of the bladder in such cases is usually followed by a slight spasmodic attack, extending to the extremity of the urethra ; and hence the pain which is sympathetically felt in the glans immediately after micturition. The spasm is, for the most part, not confined to the bladder alone : on the contrary, it

sometimes affects the rectum, causing it, as Dr. Willis observes, "to expel its contents suddenly, and, in spite of the patient, occasionally contracting so violently as to cause its own eversion." At other times, the spasm of the bladder shuts up the orifices of the ureters, and thus prevents the urine secreted by the kidneys from finding its way into its natural receptacle, the bladder; in consequence of which, the ureters and pelves of the kidneys become greatly distended, accompanied by severe pain in the loins and down the thighs: but the most frequent line of the spasmodic extension is along the course of the urethra, indicated by the violent pain felt in the whole length of the passage; and there is a constant desire to void urine without the ability.

The agony experienced by the continuance of the spasm is excessive, and, if not relieved, is followed by a train of the most dangerous symptoms, the patient evincing the greatest anxiety, and his whole body being bedewed with a cold clammy sweat. Attacks of this kind are apt to terminate in inflammation, or, if frequently repeated, in exhaustion of the patient: febrile disturbance is set up in the system from the retention of those excrementitious parts of the urine that are required to be evacuated by nature for the preservation of health; and when these seizures recur in the aged and infirm, they almost always prove fatal: the patient faints away, or is attacked with convulsions, or apoplexy.

Spasm of the bladder, as we have seen, is most

usually a sympathetic affection: it is at times sympathetic of hysteria; and when it has been so, I have known it to be mistaken for inflammation, and the treatment adopted has consequently been most pernicious: indeed, I knew one patient who, from the long-continued erroneous treatment pursued, was reduced to the utmost extremity; for, as the plan of cure was the one most certain to increase the nervous irritation, the attacks of spasm were the more frequent the longer it was continued.

This disease is almost invariably a concomitant of stone in the bladder, originating in the manner and from the causes already stated: and it is a very common attendant on gonorrhœa, especially when injections have been employed either too strong or too early in the treatment: in the latter instance the disease affects the sphincter vesicæ more especially, and usually is attended with more or less of inflammation.

Spasm of the bladder of frequent recurrence sometimes injures the tone of the bladder so much, as to eventually induce an opposite state of the muscular fibres: in other words, the disease terminates in paralysis of the bladder.

With respect to the treatment of the disease, this necessarily varies with the cause in which it originates. If spasm be conjoined with inflammation, we are called upon to adopt a strict antiphlogistic mode of cure: leeches are to be applied over the pubes, or to the perineum; if the symptoms be

violent, and go on increasing in intensity, venesection must be had recourse to, and repeated if demanded by the urgency of the case. These are to be followed by the warm bath, local fomentations, and opiates, which are to be administered both by the mouth, and in the form of enemata.

If there be reason to believe the affection to originate in a gouty diathesis, or to owe its presence to a suppression of a paroxysm of this disease, while we endeavour to allay the symptoms affecting the bladder, we are to strive at the same time to induce the gout to make its appearance; for which purpose we should apply sinapisms to the feet, and blisters to the calves of the legs. The operation, indeed, of the latter affords, as Soemmering has already observed, a diagnostic peculiarity, from their often proving most beneficial in the removal of a morbid state of bladder, which otherwise they are so apt to induce. Among the palliatives of the symptoms affecting the bladder, I have found none more efficacious than a combination of colchicum, opium, and camphor, or hyoscyamus. As soon as we have got rid of the arthritic strangury, we are to direct our attention to the systematic treatment of the disease, to avert its recurrence.

In cases where the cause of the disease is attributable to the improper use of injections in urethritis, the treatment does not differ in principle from that laid down for spasm combined with inflammation. It will rarely happen that

general bleeding will be required ; but as the effect of strong injections usually is to stop the discharge, we are to use every soothing means to procure its return.

If the cause of the spasm proceed from the kidney, our plan of treatment, after removing present symptoms, must be founded on the removal of the original source of the affection ; since, as far as the spasm is concerned, we can never expect to prevent its recurrence, but by the cure of the disease from whence it proceeds.

The same observations apply when spasm of the bladder arises from the presence of a calculus. Our treatment can only be palliative and of a temporising nature ; for nothing but the extraction of the stone can be relied upon for a permanent cure. As an immediate means of relief, no medicine is preferable to opiates, which may be exhibited by the mouth, or in the form of enema or suppository.

In all cases the introduction of instruments into the bladder ought to be sedulously avoided, unless where it has become necessary to ascertain whether a stone be in the bladder or not.

In cases of spasm of the bladder proceeding from sympathy with some contiguous organ that derives its nerves from the same source, the *tinctura ferri sesquichloridi* often proves of great service. The *sphincter vesicæ* is commonly the seat of the spasm, and with it we consequently have retention of urine. The operation, therefore, of the remedy

appears to be purely antispasmodic, and its influence frequently is almost immediate. The usual mode of administering it is to give from fifteen to thirty minims every quarter of an hour until the spasm yields.

There are several other topical means besides those enumerated above that may be resorted to. Where there is reason for suspecting that the acrid quality of the urine is a main exciting cause of the spasm, the indication of diluting the urine by drinking freely of some diuretic beverage is obvious; and when acidity is its predominant character, this must be abated by exhibiting alkalis with the diluent: or if strongly alkalescent, this must be altered by the administration of some mineral acid.

A poultice containing powdered camphor is frequently very serviceable when applied to the perineum. Some recommend a liniment composed of camphor and opium, to be rubbed on the same part. Emollient glysters containing some of the watery extract of opium often afford instant relief.

A tobacco enema has been recommended by some in cases of strangury in old people; but it is at all times a dangerous remedy, and, in my opinion, ought never to be employed. Others have given the same medicine by the mouth. It is one of the most powerful of the antispasmodics, it must be granted; but its efficacy is uncertain, and its hazardous properties unequivocal.

In all obstinate cases we are to watch lest inflammation supervene : in which case we must immediately have recourse to bleeding both general and topical, and rigorously adopt all the other means known to abate and remove inflammatory action.

CHAPTER X.

FUNGUS HÆMATODES, AND CANCER OF THE
BLADDER.

FUNGIOUS excrescences occasionally arise from the internal surface of the bladder, and are productive of symptoms of the most distressing nature, and often very similar to many of those which attend the stone. Fungous tumours of the bladder are of various kinds; some being merely projections from the mucous lining of this organ proceeding from a single pedicle—occasionally from several; others take their origin from the deeper-seated tissues; many are connected with the prostate; but perhaps their most frequent seat is the fundus of the bladder. They vary likewise in size; some being, when solitary, as large as a goose's egg, of which Lusitanus narrates an instance: *—when they are numerous, they are usually, at the same time, small; a remarkable case of which is to be found in Desault. †

The cause most frequently traceable as giving rise to fungous formations in the bladder, is any long-continued source of irritation; and among those none are of more frequent occurrence than stone. It is a disease which most commonly affects

Prax. Med. lib. ii. obs. 71

† Op. cit,

adults, although children are far from being exempt from it.

Their structure differs even more than their size : in some it is steatomatous or medullary ; in others, cartilaginous ; some have all the characters of carcinoma, others are soft and vascular, and polypous ; some, on the contrary, are calcareous both in texture and substance. In certain situations, as that immediately behind the neck of the bladder, they, by blocking up its urethral opening, cause considerable obstruction to the passage of urine ; and the bladder being thereby irritated, and frequently excited to stronger action than in a healthy state, its muscular coat becomes thickened. These excrescences are sometimes attended with discharge of blood and of viscid ropy mucus, the result of the irritation of the inner membrane of the bladder, as well as with pain along the urethra, and at the glans penis. The glands in the groins and pelvis, usually become enlarged.

“ There is a malignant medullary fungus,” says Mr. Travers,* “ of the mucous coat of the bladder, resembling that of the nares and uterus, breaking, bleeding, and re-produced as quickly as it is displaced. It is of very extensive attachment, and gradually reduces the cavity to very small dimensions. Portions of fungus and coagula of blood become plugged in the urethra, and form firm pellets, so as to produce retention. It is a very painful disease : it keeps the patient in constant

* Medico-Chirurgical Transactions, vol. xvii.

anxiety to void urine, which is more or less tinged with blood; and frequently he passes blood alone. He dies hectic and wasted."

In a case of fungus hæmatodes, which Mr. Mayo examined with the late Mr. Wilson, and in which, from pain in the bladder and occasional discharge of blood, the existence of stone had been suspected, a fungus was found attached by a narrow pedicle to the mucous membrane: the texture of the fungus was soft, and its surface shreddy and ragged. In one of the same gentleman's patients, who died in the Middlesex Hospital, with medullary sarcoma affecting the uterus and the neighbouring part of the vagina, the bladder was studded with white tubercles, about the size of peas, which had formed behind the mucous coat, but projected inwards. They appeared, when cut through, to consist of medullary texture similar to that which grew from the uterus and vagina.

A discharge of blood with the urine, observes Warren,* is the first sign of this disease. The quantity is, at first, so small as scarcely to tinge the urine, but it gradually increases till it becomes a formidable and exhausting symptom. There is but little pain attending it; but this symptom varies in different cases, both of fungoides and scirrhus, some cases going through their course with a very moderate degree of pain. Constant desire to pass urine is one of the most distressing consequences of this affection; and this is accompanied with sympathetic irritation of the

* On Tumours, p. 393.

rectum, and inclination to stool. The disease comes to a fatal issue rather from the consequent derangement of the stomach and intestines, than from pain or hæmorrhage.

The existence of fungous excrescences from the internal surface of the bladder, may perhaps, by the introduction of a catheter, be ascertained during life in some instances; but, in general, we are never certain of the nature of the disease till the parts are examined after death.

“In these cases,” says Sir B. Brodie, “the patient complains of frequent inclination to void urine, and of an uneasy sensation which he refers to the neck of the bladder, and which sometimes amounts to severe pain, extending in one direction to the perineum, and along the urethra to the glans, and in another direction to the pubes. This pain is generally aggravated after the urine is voided. In one case, I have known the patient to labour under retention of urine in consequence of the tumour pressing on the inner orifice of the urethra; so that it may become necessary to puncture the bladder above the pubes. In another case, there was a constant wearing pain in the loins, the cause of which was explained by the appearances observed in examination post mortem, the tumour having obstructed the orifices of the ureters, which were consequently dilated to the size of the small intestine, the pelves and infundibula of the kidneys being dilated also, so as to form considerable sacs or pouches, distended with urine.”

In these cases, there is always a disposition to hæmorrhage, and it is sometimes so great as to be the immediate cause of the patient's death. The urine, moreover, often contains small portions of the medullary matter.

A polypus, says Baillie, sometimes grows from the internal surface of the bladder; but this morbid appearance occurs very rarely. I have seen only one example of it; and, in that instance, it filled up the greater part of the cavity of the bladder. It was very irregular in its shape, consisting of various projecting masses, and it seemed pretty firm in its texture.—The symptoms which belong to polypus in the bladder are unknown to me; but they are probably much the same with those which attend fungous excrescences in that viscus.

When cancer affects the bladder, it proceeds most usually from the extension of the morbid action from some adjoining viscus, as the womb or rectum; but as an idiopathic and primary affection it is of exceeding rare occurrence,—so much so, indeed, that Soemmering has almost gone the length of denying its existence. There are, however, cases of carcinoma of the bladder on record too well attested to doubt their occasional occurrence.*

The symptoms of this disease are those usually indicating its presence elsewhere: there is the acute lancinating pain which characterises cancerous action, and when ulceration takes place, the

* See Lallemand and Desault on the Diseases of the Urinary Organs.

nature and appearance of the matter discharged affords another diagnostic distinction.

The common seats of this disease are the fundus and neck of the bladder. Cancer of the bladder always proves fatal eventually, and presents on dissection a hard medullary disorganisation often studded with excrescent vegetations.

In some cases of cancer of the rectum in men, and of the womb in females, the disease is communicated to the bladder; ulceration of that organ takes place; and a communication is established between the rectum and the bladder, and between this last and the vagina,—a circumstance which renders the patient's state deplorable. It is doubtful, however, whether the ulceration be of a true scirrhus character. In the paper just quoted, Mr. Travers says, "Scirrho-cancerous ulceration of the bladder, I never saw; scrofulous, often, particularly in children. When the bladder adheres extensively to the rectum in cancer of the latter, and when they communicate by a fistulous aperture, so that air passes by the urethra as well as feculent urine, I have not seen the coats of the bladder presenting the appearance of scirrhus cancer. The vagina and rectum in the female, on the contrary, are indistinguishably affected by the scirrhus ulcer and fungus."

In these cases, to allay pain and irritation by the use of sedatives, taken internally, as well as in the form of suppositories or injections, introduced per anum, is all that we can do.

The bleeding is sometimes so copious, as materially to exhaust the powers of the patient. In such cases, our endeavours must be directed to restrain the bleeding,* while we sustain the powers of life without increasing local excitement. Astringents should be given internally; and the patient should be kept in the horizontal position. On the necessity of keeping the patient in this position, too much stress cannot be laid; for, in severe hæmorrhage from the bladder, especially in old persons, syncope has come on whilst the patient has been sitting up, or exerting himself; and death has occurred. The powers of life are generally much exhausted; and the urine is often alkaline, and contains albumen, and a large proportion of the phosphates.

I have already observed, that when albuminous urine is alkaline, it is sometimes incapable of being coagulated by heat. It was supposed that this depended on the presence of some fixed alkali, holding the albumen in solution. Mr. Rees made an analysis of two different specimens of urine taken from the same individual: one was neutral, and coagulable by heat; the other was not so coagulable, and was capable of alkaline re-action. From analysis it appeared, that the alkaline specimen contained a greater proportion of albu-

* The following will be found very serviceable in these cases:—R Infus. Rosæ Comp. ʒvj; Aluminis pulv. ʒss; Gallarum pulv. ʒiiss; Acid, sulph. dil. ʒi. Mix. Two table-spoonfuls to be taken every four hours.

men, and a much smaller proportion of alkaline salts, than the neutral urine. This goes strongly, he observes, against the probability of any fixed alkali being the solvent of the albumen; for in this case we should expect a redundant quantity of fixed saline matter, in proportion to the albumen present, whereas exactly the opposite was the result.

If, in these cases, the urine be very alkaline, the decoction of *pareira brava*, with nitric acid, will be very serviceable: on the contrary, if the urine become acid, *uva ursi*, with the fixed or volatile alkalies, will be the most appropriate remedy.

CHAPTER XI.

CALCULI AND OTHER FOREIGN BODIES IN THE
BLADDER—OPERATION FOR STONE—LITHOTOMY
AND LITHOTRIPSY.

OF the foreign bodies found in the bladder, stone is the most frequent. An acid (the lithic) was at first thought to be the sole constituent of all calculi; and writers of good chemical knowledge maintained this opinion. Dr. Austin was the first to dispute its correctness; but he adopted the not less exclusive, and still more unfounded notion, that all calculi were composed of indurated mucus only. The progress of chemistry has shown that, in the composition of calculi, considerable variety exists, but they may be arranged under the following heads, viz.:—1. Uric acid calculi; 2. Mulberry do.; 3. Phosphate of lime do.; 4. Ammoniac-phosphate of magnesia do.; 5. Carbonate of lime do.; 6. Cystic oxide do.; 7. Xanthic oxide do.; 8. Alternating do.; 9. Fibrinous do.*

1. *Uric acid calculi*.—The uric acid calculus is by far the most common: at least two-thirds of the concretions found in the kidney or urinary bladder, owe their origin to the deposition of

* For the following account of their chemical composition, I am indebted to an article, by Dr. Thomson, of Glasgow, in the *Cyclopædia of Practical Medicine*.

uric acid, either in a pure state or combined with ammonia. As healthy urine contains urate of ammonia to the amount of about 1-813th part, and as the salt requires about 480 times its weight of water to dissolve it, we see at once, that, if by any derangement in the digestive organs, the quantity of urate of ammonia should be tripled in urine, a portion of it would of necessity be thrown down, as the urine would not be sufficient to hold the whole of it in solution: in this case, the urate of ammonia would amount to 1.271st part of the urine; so that about three-eighths of it would be precipitated.

Calculi composed of urate of ammonia are always small, and seem nearly peculiar to children. They are undoubtedly to be ascribed to the existence of an excess of urate of ammonia in the urine; a very common consequence of indigestion, proceeding either from the use of an excessive quantity of food, or of food which does not agree with the constitution of the child.

2. *Mulberry, or oxalate of lime calculi.*—Next to uric acid, the oxalate of lime most frequently constitutes the nucleus of urinary calculi. This calculus is usually of a dark colour, approaching to that of dried blood. Its surface is very rough and tuberculated. It is usually hard and compact, and when cut through, it exhibits an imperfectly laminated texture. Mulberry calculi are commonly of a spherical form, and are never very large.

3. *Phosphate of lime, or bone-earth calculus.*—

This is generally of a pale-brown colour, and its surface being smooth like porcelain, appears as if highly polished. It is very regular and laminated. The laminae are usually thick, and very easily separated from each other. The shape is mostly oval, and the size is sometimes very considerable—so much so, indeed, as nearly to fill the bladder. It does not fuse before the blow-pipe. It dissolves readily in muriatic acid, without effervescence, and is precipitated undecomposed by caustic ammonia.

4. *Ammoniaco-phosphate of magnesia, or triple phosphate calculi.*—These are always nearly white.

The surface is commonly uneven, and covered with minute shining crystals. The texture is not at all, or very imperfectly, laminated. This calculus is soft, and easily broken and reduced to powder. But it is said to be sometimes hard and compact, and when broken exhibits a crystallized texture, and is somewhat transparent. In the Hunterian Museum, belonging to the University of Glasgow, there is a remarkable calculus of this kind. It was taken, after death, from the bladder, which it completely filled. It is an oval stone, constituting a pretty exact cast of this viscus.* Near the centre it is a little smaller, indicating in that place a stricture of the bladder. The length

* There appears, indeed, to be no limit to the growth of certain calculi, as long as the receptacle in which they are contained is capable of further distention. Ruysch also narrates the case of a young man in whom a stone was found that filled the whole cavity of the bladder, but he mentions neither its dimensions nor weight.

of this stone is five inches and a half. Its circumference where thickest is fourteen inches and one-sixteenth; but at the stricture it is only ten inches. Its weight is one pound fourteen ounces and eight grains avoirdupois. It is white and crystallized on the surface, bearing some resemblance to agalmatolite. It is composed of a nucleus of uric acid, having a brown colour, and of many concentric laminæ. The external crust is ammonia-phosphate of magnesia, mixed with some animal matter. Before the blow-pipe, this calculus gives off the odour of ammonia, and at length melts with difficulty. When treated with caustic potash, it gives out ammonia, and it is very easily dissolved by very dilute acids.

5. *Carbonate of lime calculi*.—In the inferior animals,* these calculi are not very rare, though they are very uncommon in man. Mr. Smith describes some he had met with that bore a close resemblance to mulberry calculi, and yet consisted of carbonate of lime.† Dr. Prout‡ mentions some small calculi which he had seen composed almost entirely of carbonate of lime: they were perfectly white and very friable.

The carbonate of lime calculus is easily detected

* Urinary stones, often of very considerable size, are found not unfrequently in horses. Their composition differs considerably, according to the investigations of Fourcroy and Vauquelin, from the urinary calculi of the human subject; since they contain neither phosphoric nor lithic, but carbonic acid.—*Blumenbach's Comparative Anatomy*, by Lawrence and Coulson, 2d Edit. p. 132.

† Med.-Chirurg. Trans. xi. 14.

‡ Prout's Inquiry, p. 19.

by its property of dissolving in muriatic acid with effervescence; and the neutral solution is abundantly precipitated by oxalate of ammonia.

6. *Cystic oxide calculus*.—This calculus is of yellowish-white colour, and its surface, which is commonly smooth, exhibits a kind of crystallized appearance. It is not composed of distinct laminae, but appears as one mass, confusedly crystallized throughout its substance. The fracture exhibits a peculiar glistening lustre, like that of a body having a high refractive density. When in small fragments, it is semi-transparent. This calculus is very rare, only four or five specimens having yet been recognised. When treated by the blow-pipe, it gives out a peculiar and characteristic odour. It is very easily dissolved either in acids or alkalies, and crystallizes with either.

7. *Xanthic oxide calculus*.—Of this very rare calculus only a single example has hitherto been observed. It was given to Dr. Marcet by Dr. Babington, who had it from one of his patients; but nothing farther is known respecting its history. It had an oblong spherical shape, and weighed about eight grains. Its texture was hard and laminated, its surface smooth, its colour cinnamon brown, much heightened by adding caustic alkali to the calculus in powder. Before the blow-pipe, it split in pieces, burned black, and was consumed, leaving a minute particle of white ash. When distilled, it yielded a fetid ammoniacal liquid, from which carbonate of ammonia crystallized.

When in fine powder, it was mostly soluble in boiling water, and the solution reddened vegetable blue. On cooling, the greatest part again subsided in white flocks. It dissolved in either acids or alkalis, though much more readily in the latter than the former. When its solution in nitric acid was evaporated to dryness, the residue had a bright yellowish colour. This residue was partly soluble in water, to which it communicated its colour. Hence the reason of the name xanthic oxide, by which Dr. Marcet distinguished it. It was insoluble in alcohol, ether, and oxalic acid, and very sparingly soluble in acetic acid.*

8. *Alternating calculus*.—This, as the name imports, may consist of different layers of any of the preceding kinds. Hence its appearance may be very varied. The nucleus usually is uric acid or oxalate of lime; and the outermost crust is not unfrequently composed of triple phosphate.

9. *Fibrinous calculus*.—This calculus was sent to Dr. Marcet by Sir Astley Cooper. It was about the size of a pea, and had a yellowish-brown colour, somewhat resembling that of bees'-wax. Its surface was uneven, but not rough to the touch,—its texture rather fibrous than stratified, and the fibres seemed to radiate from the centre. When heated, it took fire, swelled out, and burned like animal matter. It was insoluble in water and muriatic acid; but when boiled with caustic alkali,

* Marcet's Essay on the Chemical History and Medical Treatment of Calculous Disorders, p. 95.

it formed a soapy solution, from which it was precipitated with difficulty. When boiled in very dilute acetic acid, it swelled to a great size, and was at last dissolved; and prussiate of potash, when added to the solution, threw down a yellowish precipitate. These characters lead to the conclusion, that this calculus was composed of fibrin.* This kind of calculus is very rare, having been observed only in the case of a gentleman between fifty and fifty-five years of age, who passed, in succession, three such calculi.

In the earlier stages, and before the bladder becomes secondarily affected, little is felt, says Dr. Willis,† beyond a dull sense of weight about the neck of the bladder, or an uneasiness referred to one or other of the parts connected with it, as the hypogastric region, perinæum, or groin. In addition to this, the bladder generally shows itself more impatient of distension than usual; so that corresponding frequency of desire to make water is experienced, and the last drops of the fluid are scarcely expelled without the sense of weight and uneasiness increasing to actual pain, which then shoots along the perinæum, or seems to accumulate and centre in the glans penis. Sometimes when the urine is flowing in a full stream, it is suddenly stopped, evidently owing to a foreign body in the bladder being carried by the current into contact with the inner orifice of the urethra, and there acting as a plug.

* Marcet's Essay, &c., p. 101.

† Vid. Dr. Willis on Urinary Diseases, p. 285 *et seq.*

Symptoms of stone in the bladder, though they may be slight at first, do not usually continue long without undergoing a change for the worse. The calls to make water, in particular, become more and more frequent, urgent, and distressing; nor is the act of voiding the bladder accomplished without a continually increasing amount of pain; the last drops are often expelled in agony, and their emission is succeeded by a kind of spasm or cramp of the bladder that endures, with but little remission, till there is another call to make water, and the torture has to be undergone again. Under these circumstances, patients grind their teeth, and with the last drop of urine, the contents of the rectum, of the mucous receptacles about the neck of the bladder, and I believe also of the vesiculæ seminales, are frequently expelled involuntarily, much to the distress and with singular increase to the patient's feelings of exhaustion. It is now that the urine is very regularly tinged with blood, and begins to contain a larger quantity of mucus than natural, which is deposited from it, intermixed, as it cools, with sedimentary matters of other kinds in the shape of a cloud.

Hæmorrhage, to a very considerable extent, sometimes take place from the bladder, the urine being mixed with blood, in consequence of the mechanical irritation of stone in the bladder. "I remember," says Mr. Lawrence, "being sent for to a gentleman, about the middle period of life, labouring under symptoms of stone in the bladder, who

was suffering excessively from an effusion of blood into the bladder. He became unable to discharge this urine, so that at last the bladder was excessively distended. At intervals of half an hour or an hour, he was perhaps able to force out about a tea-spoonful of bloody fluid, with great suffering. I introduced a large catheter, and a very considerable quantity of bloody urine, with coagula of blood, was expelled with great force : this gave him material relief. A recurrence of the bleeding, however, took place, and it was again necessary to use the catheter several times within the twenty-four hours ; by the expiration of which time, owing to the application of leeches, the warm bath, fomentations to the perinæum, &c., the bleeding ceased, and the symptoms disappeared. This gentleman, however, had another attack of a similar kind, in consequence of taking too much exercise, or some improper indulgence, and it lasted for a longer period, but ultimately went away in the same manner."

When a urinary vesical calculus has been formed for years, and has brought on severe symptoms, and especially if attended with stricture of the urethra, or enlarged prostate gland, the kidneys, though before healthy, become involved ; the severe dysury causes enlargement of the ureters from distension of the retained urine, and inflammation extends along them, even to the kidneys themselves. The pelvic cavities become altered in shape and enlarged, the infundibula extended or

unfolded, and the internal membrane of all the cavities thus acted upon, from repeated attacks of inflammation, is thickened and furnishes a catarrhal secretion. The parenchymatous substance of the kidney is more or less absorbed, the mammary projections are obliterated, spurious hydatids occupy the cortical part, and all the serious evils, ulceration, contiguous abscess, or gangrene, are met with as the sequelæ of vesical calculus.

Persons affected with stone, and at the same time subject to gout, (which is by no means an unfrequent coincidence,) require the greatest care as regards the operation; for any increase of irritation may bring on an attack of gout, in which the bladder sometimes participates. It is in such cases as these that operations must be performed promptly, and that useless and long-continued manipulations may be most injurious.

Patients with diseased and enlarged prostate do not, in general, suffer more than others from stone in the bladder. Sir B. Brodie says, that he is inclined to believe that, on the whole, they suffer less; probably in consequence of the tumor of the prostate preventing the stone falling down on the neck of the bladder.

The importance of acquiring a knowledge of the causes of urinary calculi must be apparent to every one who considers that it affords the only means by which we can prevent the formation of this disease, the most painful in

the catalogue of human maladies, as well as its recurrence after the sufferings and hazards of lithotomy. Calculus is more common in temperate than in warm or very cold climates; it is also much more incident to early years than to any other period; and to old age more than to the prime of life. Hippocrates notices the fact, that infants at the breast are not exempt from the disease; and our old English author, Philip Barrough, in his *Methode of Physick*,* observes, "Stones in the bladder do ingender oftener in children than in older folke." Among those beyond middle age, it occurs more frequently in persons of sedentary habits than in those who lead an active life, and much more in those who indulge in luxurious living than in the temperate and abstemious: a marked connexion has hence been long observed between a calculous and a gouty tendency.† However, although the rich, the luxurious, and the indolent, are at a certain age more prone to calculus than other classes, the poor and the destitute in early years enjoy no immunity from it; for the ill-fed and half-clothed children of the manufacturing and labouring population are frequently afflicted with stone. All authors who have written on this subject concur in stating, that females, notwithstanding their sedentary habits,

* Lib. iii. c. 41, edit. quinta, 1617.

† "Stone is commonly the constant companion of gout"—(Sydenham, *Epidem.* 1675-80)—an observation which he repeats in his epistle to Dr. William Cole.—See also Schroeder and Rupp, "*Disp. de Cognatione inter Arthritidem et Calculum.*" 1767.

are much less subject to calculus than males ; and one reason for this is apparent, besides their more temperate and regular mode of life, namely, the lesser complexity in the form and construction of the urethra in females than in males, its more dilatable nature, and the absence of the prostate gland. When a calculus descends from the kidney into the bladder, or when a nucleus by any accident is formed in that viscus, it is most usually expelled during micturition, by the mere efforts of the bladder to empty itself, and it is sometimes surprising to what an extent the female urethra spontaneously allows of being distended. Tulpius (l. iii. obs. 7) relates the case of a lady, aged eighty-nine, who spontaneously passed a calculus per urethram, weighing three ounces and two drachms ; but it appears to have paralysed the sphincter vesicæ, as she was ever afterwards troubled with incontinence of urine.

It is a popular belief that water strongly impregnated with calcareous matter is apt to produce stone, and the prevalence of this disease in Paris countenances the supposition—a supposition which even the philosophical Hales entertained. But were this a cause, calculous disorders would be far more frequent than they are.

The water of the Seine abounds with carbonate of lime, and were the disease attributable to the drinking of it, we naturally should expect the nature of the calculi would correspond with the

character and quality of the water: but we know this not to be the case, and few calculi are more rare than those composed of the carbonate of lime.

Van Swieten observes, that the Caroline hot baths quickly incrustate with a stony matter whatever bodies are immersed therein; yet they are extolled by many for their lithontriptic virtues.

We have the high authority of Van Swieten for the fact, that calculous disorders are very common in Holland, and the circumstance is the more curious, considering that gin, a powerful diuretic, is the spirit most in use in that country. Nevertheless, among the Dutch who come from Europe, and inhabit Batavia, (Java,) stone is a very rare disease, although their manner of living does not differ from that pursued at home. Denys, who resided in that island for some years, tells us, that he could find only two persons who were obliged to submit to the operation of lithotomy. He further observes, that the water they drink, flowing from the neighbouring mountains, is much impregnated with earthy matters.

Calculous diseases are well known to prevail in Norfolk, more than in any other county in England; the cause of this greater prevalence is, however, not yet ascertained: whereas, according to Soemmering, these affections are unknown in some situations bordering on the Rhine.

There is not any body to which the elements of a calculus are more easily united than to a calculus itself. Whence, if a small stone formed in the kidney, should descend through the ureter into the bladder, unless it be soon voided, it will in a short time increase in bulk, by the daily apposition of fresh calculous particles; for which reason, a renal stone is most frequently the basis of one in the bladder; and Denys declares, that all whom he had cut for the stone, had first felt symptoms of it in the kidneys.

It had long been believed by medical authorities of the highest estimation, even before the chemistry of calculous concretions was understood, that acids and acescents were among the most active causes of gravel. And since chemistry has advanced a still more exact and intimate knowledge of the sources of disease, pathologists have been able to trace a new and more hidden cause of urinary concretions, in acidity generated in the alimentary canal, from a morbid condition of the digestion.* It is to this latter source that lithic acid has been traced; and all know how large a share this has in the composition of stones in the bladder.

On this head, I cannot perhaps serve the reader more, than by quoting the conclusions with which Dr. W. Philip sums up his excellent *Observations*

* "Wherever," says that accurate pathologist, Murray Forbes, "sour fermented liquors are a common beverage, stone and gravel have been observed to be more than usually frequent."

*on the Nature and Treatment of the Calculous Diathesis** :—

1. That acid and acescent ingesta tend to increase the deposition of lithic acid from the urine, and to prevent that of the phosphates.

2. That a diet, composed of a large proportion of animal food, tends to lessen the deposition of lithic acid, and to increase that of the phosphates.

3. That everything which promotes the action of the skin, tends to prevent the deposition of lithic acid, and to occasion that of the phosphates.

4. That dyspepsia tends to increase the deposition of lithic acid, and to lessen that of the phosphates, both by producing acidity of the primæ viæ, and by rendering the skin inactive.

5. That indolence has the same tendency, both by inducing dyspepsia, and by lessening the activity of the skin in proportion as it impairs the vigour of the circulation.

6. That an acid passes by insensible as well as sensible perspiration.

Van Swieten (Comm. on Aph. 1414) gives a very lucid account of the origin and growth of calculi. "Stones," he says, "proceed from elementary principles, which, under the appearance of a fluid, previously existed in the humours; and when these meet with an indissoluble basis, they fix themselves thereto and form a calculus, which continually increases in bulk, from the application of fresh calculous matter."

* Transactions of the Royal College of Physicians, vol. vi. p. 172.

Cheselden, in his *Anatomy of the Human Body*, represents two extraordinary calculi found in the bladder. One was cut out from the bladder of a soldier in St. Thomas's Hospital, the nucleus of which consisted of a bullet that had been discharged from a musket and lodged in the bladder; the other was extracted from a boy, five years of age, which, when broken, discovered a needle in its centre. The celebrated Nuck* demonstrated the above fact by an experiment. Having opened the abdomen of a live dog, he drew the bladder out of the wound, and made an incision in the bottom with a sharp knife. Through this wound he introduced a little round wooden button; and as soon as the fibres of the bladder were in a state of contraction, he replaced the bladder in its natural situation, and sewed up the wound. The animal, for the first two days, seemed dull and sick; but in a little time the natural appetite and alacrity returned, and the only uneasiness observed, was a more frequent inclination to make water than usual. Some weeks after he dissected the dog in his private theatre, and the button being extracted, appeared covered over with a calculous crust.

Many physicians, Hippocrates tells us, believed that when they saw sand in the urine, there was a stone in the bladder; but this he contradicts. Neither can we at all depend on the character of the sediment as affording a certain indication of the constitution of the stone.

* *Adenograph. Curios.* p. 80.

Dr. Wells* gives the case of a man in whom sounding detected the presence of a calculus, and his urine deposited "a white powdery sediment." "This," he adds, "I examined, and found to consist of the urate of ammonia." The patient eventually died, when, on analysis, "the whole of the calculus, except the nucleus, was composed of the triple phosphate of magnesia and ammonia. The nucleus, which was very small, consisted of uric acid."

Calcareous depositions are not confined to the pelvis of the kidneys or bladder: they have also been found in the heart. Hottinger relates a case in the *Ephem. German.* in which a congeries of whitish stones were found in the right ventricle of the heart of a man who had died of dropsy. Bonetus (*Sepulcretum*, l. ii. s. 8, obs. 15) cites a case wherein three calculi were found in the septum of an enlarged heart of a youth, who, while alive, was troubled with so loud a palpitation as to be audible to by-standers.†

Singular, as it certainly is, that stones should be found in the heart, it seems no less so that they should be found in the blood-vessels: and yet this has happened. Cheselden, in his *Anatomy*, (fig. xxx.,) delineates two calculi which were taken from

* Trans. of a Soc. for the Improvement of Med. and Chir. Knowledge, vol. iii. p. 192.

† See also, in the *Phil. Trans.* for 1665, the case of Lord Balcarras, in whom two calculi were discovered towards the base of the heart, between the right and left ventricle.

about the origin of the aorta. Hoffman* relates a case of a Batavian nobleman, who, during his lifetime, was afflicted with a most obstinate pain, for which he could get no relief. On opening the body after death, the kidneys were found quite sound and without calculi, but at the bifurcation of the aorta six unguiform calculi presented themselves.

Greiseliuſ likewise relates that, on opening a vein in the arm of a man ſeventy-two years of age, who was troubled with catarrh, four ſtones paſſed with the blood into the baſin; and Betiuſ, in his appendix to his work on the nature of the blood, mentions a ſimilar occurrence from a vein on the external ankle.

If, as we have ſeen, calculi are formed in the cavities of the heart and arteries, we cannot be ſurprized to find them alſo in the different viſcera: indeed, no viſcuſ can be ſaid to be exempt from attacks of ſuch morbid depositions. They are found in the lungs, and are frequently expectorated in coughing; in the thymuſ gland; in the liver, ſpleen, and pancreaſ, and in the meſentery. Valentine relates a ſingular caſe of a calculuſ being met with in one of the *veſiculæ ſeminales*, which is preſerved in the muſeum at Frankfort. Not leſſ rare and curious is the generation of calculi in the uterus; and yet Hippocrates mentions this fact in his book *De Morbis Popularibus*; theſe calculi Ramazzini very ingeniouſly conjectures had found

* In Mantiffa Obs. Select.

their way by passing from the urethra into the womb.

Calculi have been found in the brain, especially of oxen.

Bertholin gives an instance wherein the surface of both the cerebrum and cerebellum of an ox was converted into a substance as hard as stone. Stones have been found in the substance of the optic nerves; the pineal gland is well known as a common seat of calcareous deposition.* Descartes imagined, as every one has read, that this gland was the seat of the soul: however, the case related in the Philosophical Transactions for 1686, in which this gland was found petrified in a distinguished literary character, was a death-blow to such an absurd hypothesis.

When stone is suspected to exist in the bladder, the patient should be carefully sounded, and for this purpose he should be placed horizontally, in which position his shoulders may be raised into the half-sitting posture, or they may be depressed greatly so as to have the pelvis on the top of an inclined plane, and make the axis of the spine form with the plane of the horizon, an angle of forty-five degrees, this latter being the method best calculated to remove a stone from the neck of the bladder, and carry it to the fundus. Mr. Liston † gives the following directions for sounding:—"If

* De Graaf (*De Succ. Pancr.* p. 113) relates that he had seen stones in the pineal gland above twenty times, in persons who died both by natural and violent deaths.

† *Operative Surgery*, p. 425.

the patient has not emptied his bladder for an hour or two, the sound may at once be introduced. If the bladder has been emptied, or if there is a difficulty felt in exploring the cavity, then a sufficient quantity of tepid water should be injected through a catheter, with a properly adapted syringe or gum-bottle. The patient is laid in the recumbent position, with the pelvis somewhat raised, on a couch of a convenient height. The silver catheter with a short and sudden curve is sometimes used for sounding, but it is better to withdraw this if it has been used for the purpose of injecting the bladder, and substitute a solid steel sound of the same shape. The posterior part of the fundus can be better examined with a short beaked instrument than with the old-fashioned long-curved sound."

"The bladder requires to be examined," says Mr. Crosse,* "when empty, as well as when containing urine; and a silver catheter is often advantageously used for this purpose. We introduce it into the distended bladder, using it as a sound; we then draw off the urine, and again move the catheter about; when we often feel a stone that escaped detection before, particularly a small stone, brought down to the neck of the empty bladder, which, by pressing against the catheter, affords a distinct grating feeling and sound."

In every case, before undertaking an operation for the removal of a vesical calculus, the surgeon ought to examine with the finger in ano.

* On the Formation, Constituents, &c. of Urinary Calculi, p. 53.

Various attempts have from time to time been made to dissolve stone in the bladder, sometimes by internal remedies administered by the mouth ; at other times by medicines injected into the bladder. But when we reflect on the minute quantity and dilute form of any solvent that can be conveyed unchanged through the kidneys into the bladder, or that can with safety be injected into the bladder, we at once perceive how inefficient every such attempt must be ; and this obstacle is totally apart from the difficulty of ascertaining the chemical nature of the substance we wish to act on. The chemical nature of the sediment deposited from urine in calculous cases is no guide ; since experience has demonstrated that, though co-existent, the sediment and the stone may differ—and we have further to recollect, that calculi are frequently composed of laminae that differ alternately from one another, and, therefore, that the solvent for one is not the solvent for another. I may call attention to another circumstance tending to counteract our endeavours to dissolve the stone by injection, even when most judiciously directed, and that is, the continual fresh deposition of calculous matter from the urine, by which that which may have been dissolved by the solvent injected, is replaced by a new aggregation. It therefore appears to me, that all attempts to dissolve stone in the bladder, are futile ; and whatever benefit has accrued from the employment of any such means, is to be attributed to its partial operation in removing any asperities from

the surface of the calculus, and in preventing its further growth, if the remedy has been administered by the mouth. Hence, beyond palliating the symptoms, there is no effectual means of getting rid of stone in the bladder except by an operation.

Prior to performing the operation for stone, the surgeon should be extremely particular in preparing his patient by those means which experience has shown to be most conducive to that end. Celsus was aware of the necessity of bringing the patient, by diet and abstinence, into a fit state for the operation: in fact, the most successful lithotomists are those who are most attentive to that point. If the patient's health is much impaired, and the bowels are relaxed, which is not unfrequently the case in children, or if the urine is alkaline, we must, before the operation, lessen the irritability of the bladder and bowels by an anodyne, and improve the patient's health, as far as we can, by medicine and attention to diet. I generally give, on the night preceding the operation, a few grains of hydrag. c. creta, with the pulv. rhei, and, early on the following morning, some castor oil. Two clysters should be given before the operation; one, two or three hours after the oil, composed of gruel, olive oil, and salt; and the other about an hour before the operation, with common gruel, and twenty or thirty drops of laudanum in it. If, when the surgeon arrives to perform the operation, the last injection has not come away, he should

urge the patient, if an adult, to go to stool: if a child, it will generally happen that the injection, if it has not passed off, will do so at the time the staff is introduced. On no account should the surgeon undertake the operation till the injection has come away. The patient should be placed on a table of sufficient height, so that the perineum shall be opposite to the breast of the surgeon. The table should be rather a little too high than too low, for it will be an advantage in the operation to be a little under the work rather than above it. After the patient is bound, his shoulders and back should be raised and supported with pillows; he should also be brought to the edge of the table, and his thighs be widely separated by an assistant, but it is of great importance that the nates be kept straight, and that an inclination be not given to one side more than the other.

There are three different spots at which the bladder may be opened for extracting calculi: the first is at its anterior and superior surface above the pubes; the second at its inferior and anterior part, through the perineum; and the last at its posterior and inferior part by the rectum.

In order to perform the high operation, or that above the pubes, it is necessary that the bladder should rise above the superior edge of the pubes, which does not take place when this viscus is empty: hence, it is necessary to begin by distending it with injections, or waiting till sufficient urine is accumulated, to produce the desired effect, or by

elevating the anterior and superior part by means of a sound, the point of which must be made to glide from below upwards, against the posterior surface of the pubes. The external incision must be made vertically on the median line of the body, immediately above the pubes, and about two inches in length. The linea alba must then be divided, taking care not to open the peritoneal cavity. The surgeon commences by making an opening of about two or three lines immediately above the pubes, in the spot which corresponds to the space filled with fatty cellular tissue, and bounded inferiorly and posteriorly by the peritoneum, which is reflected on the wall of the abdomen only at a certain distance above this long arch. A grooved director is then introduced between the aponeurosis and peritoneum, which serves to guide the knife in the division of the linea alba. Lastly the operator endeavours with his finger to feel the extremity of the sound before introduced into the bladder, and then divides the anterior wall of that organ. This method of operating is now nearly abandoned.

The lateral operation for stone has been modified by a great number of surgeons : in the mode usually employed, the surgeon begins the incision of the integuments on the left side of the raphe, about an inch in front of the anus, and terminates it between this opening and the tuber ischii. The fatty cellular layer comprised between the left erector penis and accelerator urinæ, as well as the fibres

of the transversi perinei muscles, are then divided ; and after these the membranous portion of the urethra, the levator ani, the lateral part of the prostate gland, and the neck of the bladder.

In order to avoid with greater certainty the spongy portion, some surgeons advise the operator to push the internal lip of the wound inwards, with the fore-finger of the left hand, and to cut on the nail of that finger. A division of the trunk of the internal pudic artery would be a much more serious occurrence ; but this is very rare, for to reach that vessel, the incision must be extended downwards and outwards, even as far as the bony parts of the pelvis, against which the artery rests. On the other hand, if, to avoid this accident, the operator does not carry the incision with sufficient obliquity outwards, he runs the risk of wounding the rectum. The direction which ought to be given to the incision of the prostate, and its extent, are also points of the greatest importance to the success of the operation. As Scarpa justly observes, the operator must take great care to divide the base of this gland only to the extent of eight lines ; for, if the prostate gland be completely divided, the lips of the wound could not be kept in contact posteriorly, and nothing would oppose the infiltration of the urine into the surrounding cellular tissue. It is then necessary always to leave a small portion of the posterior edge of the prostate untouched, whilst the top of that gland ought to be completely divided, for this is the part

which most opposes the extraction of the stone. According to Scarpa, the direction of the incision ought to be obliquely downwards and outwards; so as to make, with the axis of the neck of the urethra and prostate gland, an angle of sixty-nine degrees. For a larger opening can in this way be made with safety to the patient, than by carrying the incision directly outwards, as M. Boyer advises, in order to avoid the rectum and pudic artery. In making the incision and in extracting the stone, the object of the operator should be to obtain a sufficient aperture to allow the stone to pass without bruising the gland; and not to carry the knife so far laterally, as to divide the deep perineal fascia, and thus expose the cellular basin of the pelvis. The knife, if used incautiously, exposes the patient to this danger. If the prostate be large and the stone of considerable size, a large aperture is required; and if, in addition to this, the substance of the gland be indurated, the lips of the incision do not yield. To obviate these inconveniences, the surgeon carries the knife more freely through the prostate, and thus adds, to the risk of opening the deep fascia, that of hæmorrhage from the arteries of the gland.

In the transverse or bilateral operation, the surgeon makes a semi-lunar incision, the centre of which is situated in front of the rectum, behind the bulb, and the extremities of which are turned outwards and backwards towards the tuberosities of the ischia. The membranous portion of the urethra

is then opened, and the incision extended from right to left in the substance of the prostate, so as to form a triangular flap, which contains the vasa efferentia and verumontanum, and the inferior half of the prostatic portion of the urethra. By this means an opening much larger than by the lateral operation is obtained, and the injury of the ducts is more certainly avoided; while there is no hæmorrhage of importance to be dreaded.

The following is the plan of operating which I adopt:—After introducing a curved staff, I give it to the care of an assistant, and direct the handle to be inclined a little towards the ground, with the groove turned towards the left side. By this inclination of the handle, the groove of the staff is certainly made less prominent in the perineum; but there is this advantage attending it, that when we have cut into the groove, there is no occasion to alter the position of the staff, and the fore-finger of the left hand is quite at our disposal for protecting the rectum, and guiding the knife. I find that I can perform the operation much more rapidly in this way, than by taking the staff into my own hand. M. Langenbeck is a strong advocate for this mode of holding the staff; he, however, advises the handle to be inclined still more towards the ground than I do. I begin the first incision rather low, about two fingers' breadth above the anus: the bulb of the urethra will then be avoided. In fact, the external incision, if commenced higher up, can, in so far, be of no use to the operator; and

I find that this, the upper part of the wound, is often the slowest to heal. For the division of the prostate, I use the long straight knife, with the beak in the middle line of the point. I began, in 1828, with the gorget; but whatever merits this instrument may possess in the hands of an experienced operator, I feel confident that, for a beginner at least, the knife is the safest and best instrument he can employ.

It is scarcely possible to say too much as to the caution necessary in the extraction of a large stone. We are to draw out the stone gradually, endeavouring to dilate the parts through which it is to pass, instead of tearing them; and it is astonishing to what an extent this gradual dilation may be accomplished in the hands of a prudent surgeon.

If any hæmorrhage occur, we must endeavour to compress the bleeding vessel with the finger. It is always a most untoward circumstance when it occurs, though it is rare that patients die immediately from loss of blood. The arteries are not large enough to afford a hæmorrhage sufficiently rapid to induce fatal syncope; but the draining sometimes continues for hours, either backward, into the bladder, or slowly by the external wound gradually exhausting the powers of the patient.

The recto-vesical operation is performed by dividing the external sphincter of the anus, and inferior portion of the rectum, on the median line, and in the direction of the raphe; the inferior sur-

face of the prostate will be exposed, rendering it easy to separate with the finger the intestine from the bladder, and open the bottom of this viscus, or the prostatic portion of the urethra on the median line, and penetrate into the bladder by its neck. By following the first mode, the operator must take great care not to extend his incision of the bladder more than two inches beyond the edge of the prostate; for, by so doing, he would run the risk of dividing the fold of peritoneum, situated between the superior part of the bladder and the rectum. On the other hand, if the incision be not made on the median line, he would wound the vasa deferentia, or the vas efferens, an occurrence which would cause the atrophy of the corresponding testicle.

If no inflammatory symptoms ensue, the after treatment consists in merely keeping the patient quiet, though, with children, it is extremely difficult to carry this into execution. The knees, by some surgeons, are tied together; by others they are not; but they should always be kept raised, and the scrotum supported. No application is required to the wound; but the urine should be received on sponges, and the parts kept clean. Some urine soon begins to flow through the natural passage. In a man above sixty, on whom I operated some time ago, a considerable quantity of water came through the urethra on the morning following the operation. The time, however, varies at which the water entirely ceases to pass through the wound; and, in some rare cases, urinary fistulæ remain.

Inflammation and suppuration of the cellular tissue surrounding the bladder, are invariably found after fatal operations for lithotomy, attended with the symptoms which have been already described in Chapter VIII.

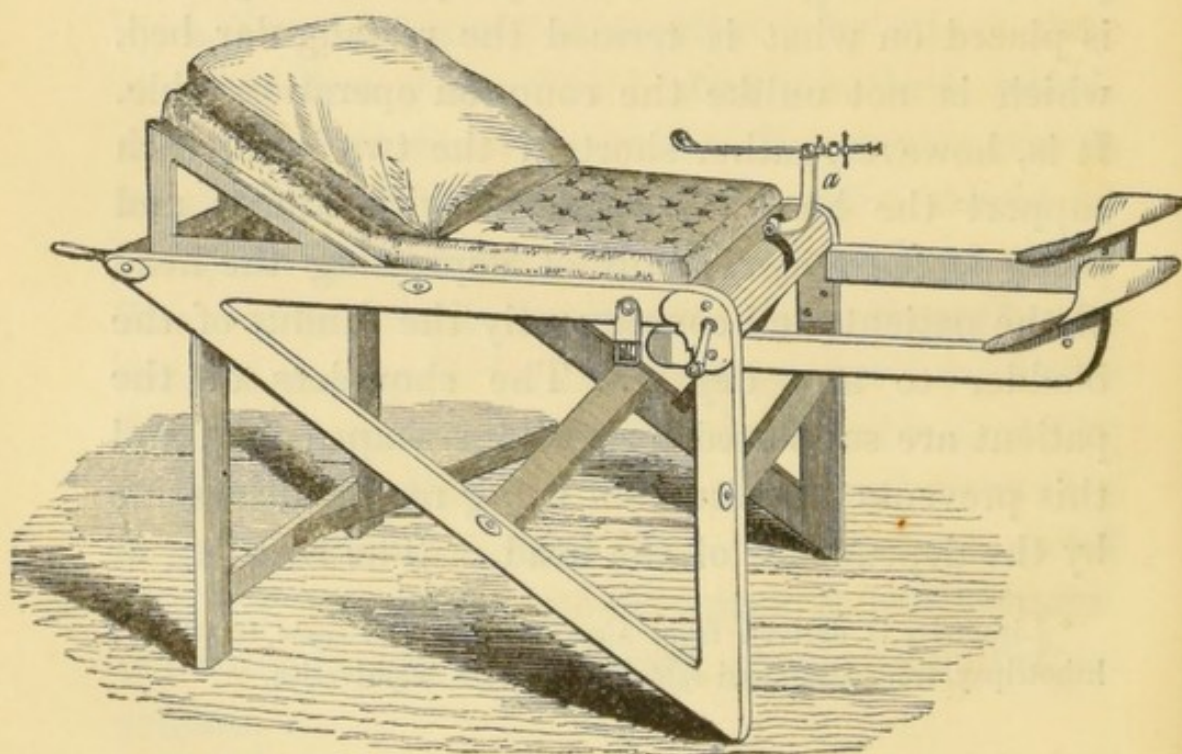
In many, or perhaps most, of the fatal cases of lithotomy, inflammation of the peritoneum investing the fundus of the bladder, is also found to exist to a greater or less extent.

Of late years, an operation for destroying stone in the bladder, lithotrity or lithotripsy,* has been much practised; and in many cases it is more applicable to the patient's condition than lithotomy. As every surgeon who undertakes the management of calculous patients ought to make himself master of this new branch of surgical practice, I have thought it advisable to give a summary account of the mode of operating. In the first place, according to Heurteloup's plan, the patient is placed on what is termed the rectangular bed, which is not unlike the common operation-table. It is, however, rather shorter; the two legs which support the head are attached with hinges, and being folded under, admit of depressing the head of the patient, and consequently the fundus of the bladder to any degree. The shoulders of the patient are supported by a wedge-shaped box, and this prevents the situation being rendered irksome by the dependence of the head. The receding of

* Lithotrity is derived from λίθος, a stone, and τερέω, to pierce; lithotripsy, from λίθος, and τρίβω, to triturate or pulverise.

the patient is prevented by a leather strap passed round the shoulders, and buckled to the sides of the bed, and the feet are secured in slippers attached to the foot. The object of Baron Heurteloup, in the construction of this machine, is, to raise the pelvis in such a considerable degree, that stones situated behind the neck of the bladder, in the horizontal posture of the patient, may be thrown back, and with greater facility seized. Another object proposed by this invention, is the supplying a fixed point for the instrument during the process of comminution: this is fulfilled perfectly by a curved bar of iron which is attached by a screw to the foot of the bed.

The following is a representation of the bed, taken from Mr. Belinaye's excellent compendium of lithotripsy, to which I am indebted for much of the following information on the subject.



This bed is composed laterally of a framework of wood, representing a right-angled triangle, and on it is laid a small mattress. Anteriorly there are two pieces of wood, having at their extremities two slippers for the patient's feet. These can be lengthened or shortened at pleasure, to suit the height of the patient. In front there is a cross piece of wood, very thick, uniting the two triangles together. In this is seen a mortice for the small vice to play in, which holds the instrument during its action on the stone. This bed can be lowered, if required, to an angle of 45° , a strap being passed behind the neck and before the shoulders, and attached to a buckle on each side of the bed, so as to prevent the patient slipping off.

Many surgeons, however, dispense with this bed, and merely place the patient on the back, on a sofa or couch, with the pelvis supported by a thick cushion, so that it may be higher than the shoulders.

It is to Baron Heurteloup that the profession, and indeed mankind, are indebted for bringing to the greatest perfection the instruments by which calculi are pulverised in the bladder. After employing various instruments for the purpose of boring holes in calculi, sawing in pieces the perforated stones, and afterwards breaking them into smaller fragments, the Baron was led to adopt the instrument which he at present employs, and which he calls the *percuteur* or *percussor*.

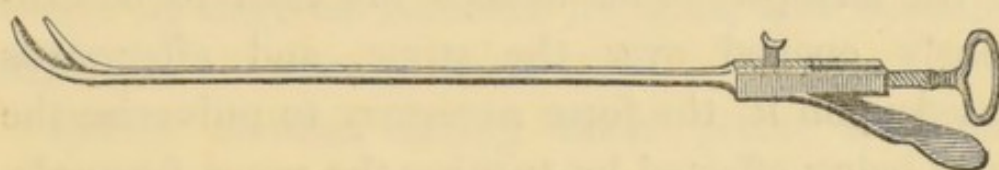
It is formed of a straight and curved portion,

the two parts of which are separated from one another by drawing back the stem, with which the moveable plane is connected. When the stone is got within the grasp of the separated portions of the instrument, comminution is effected by striking the stem of the instrument smartly with a hammer. The percuteur is firmly fixed in the vice during its action on the stone, and is represented in the wood-cut of the bed given above.

The Baron thinks that by the proper use of percussion, the laminæ of stone are more gradually separated, and that the particles fall more gently to the fundus of the bladder than by the employment of the screw, which I shall presently describe. But the Baron's principal objection to the pressure by the screw is, that it gives no exact indication of the hardness of the stone; whereas the sound and resistance afforded by percussion, disclose the compactness of the calculous body, and enable the surgeon to regulate the play of his instrument accordingly. He, moreover, frequently found, that where the stone presented an unusual degree of hardness, the instrument warped by the compressive force, and even was in danger of breaking. For very large and hard stones, this instrument is perhaps the best adapted.

The instrument commonly used by English surgeons is composed of two pieces of steel, one sliding longitudinally in a groove of the other. The extremity which enters the bladder is curved, but not in the manner of a common catheter; the

curve being more abrupt, and the curved part considerably shorter. When the forceps are to be opened, the sliding piece is drawn towards the handle of the instrument, and thus the blades, in being separated, are still kept parallel to each other. They are closed by an opposite movement, effected by turning the screw forwards.



This is the screw lithotrite of Mr. Weiss, and is suited to all cases of calculi of small and moderate size.

The patient having been placed on the rectangular bed, or a common couch, with the pelvis raised, the bladder is to be injected with five or six ounces of luke-warm water ; and if any considerable quantity of the water escape, the injection should be repeated, as it is absolutely necessary that the operation should never be attempted on an empty bladder. Resistance is sometimes experienced to the injection of water, in consequence of the end of the catheter not being fully introduced into the bladder, the eyes of the instrument being obstructed by the side of a large prostate gland. The force required to overcome this obstruction is considerable, and occasions the patient great pain.

The forceps are next to be introduced ; they are first to be used as a sound, so as to ascertain the exact situation of the calculus. If this be not

readily detected, they may be withdrawn, and an ordinary sound may be used instead ; or the patient may be directed, if he is not on the rectangular bed, to turn on one side, placing himself on his back again afterwards, by which change of position the stone may probably be made to roll into some more convenient place, and be more within reach of the forceps. The forceps are then to be cautiously opened over the stone, and afterwards closed upon it, the force necessary to pulverise the stone being effected by turning the screw forwards. By this simple management, with a light hand, the stone is seized with facility in the great majority of cases. Otherwise we may succeed by the following method, which is especially adapted to those cases in which the bladder contains several stones of very small size :—Let the forceps be opened, with the convexity of its blades pressed against that part of the bladder which is towards the rectum, so as to make it the lowest or most depending situation : then, by a slight motion given to the handle of the instrument, the stones are made to roll into its grasp.

The fragments of the calculus may be seized several times during one sitting. When the bladder is not irritable, the seizure of the fragments may be repeated from five to eight times, and a large part of the stone reduced to a state fit for expulsion. In repeating the operation at the first sitting, the sensations of the patient become the surgeon's best guide. Before the instrument is

withdrawn, or even closed, it should be moved from its situation, to ascertain that no fibre of the prostate is entangled between the blades: it is then to be closed, and withdrawn. In a minute or two the patient voids the water, and some sand or small particles of the stone; the larger portion remaining behind to be expelled by the bladder, which by degrees recovers its tone, and becomes excited to contract with effect.

Before another sitting takes place, sufficient time should be allowed for the escape of the fragments. The sand and smaller particles are voided first from the bladder; and then, by a more powerful action of the organ, the larger pieces are expelled. Three or four days are usually sufficient for the expulsion of the whole of the fragments, especially if the patient is able to walk about, and to excite the bladder to contract. In healthy persons who experience but little suffering from the operation, no subsequent inconvenience is produced, and they are able to take their usual exercise, and to attend to their ordinary occupations.

In many cases it has been seen that where a stone has been broken, before the fragments have been removed, patients have felt so greatly relieved from all the various sufferings attending calculus, that, if not urged, they would not have sought any further means of extraction. This is against our preconceived notion, but well worthy the observation of surgeons who may be naturally prejudiced

against the multiplication of stones by comminution, which would be supposed to irritate the parts by their uneven surfaces. That this relief should follow so immediately the first application of lithotripsy, it must of course have been performed by a dextrous, practised hand; otherwise the instrument will leave behind pain unjustly ascribed to the comminution of the calculus. The angles of the broken stone are probably removed by the slight solvent power of the urine, or depositions of fresh matter take place upon them which round their asperities.

The best test of the crushing process being conducted properly, is the absence of pain and hæmorrhage. Baron Heurteloup says that during the most powerful use of the hammer, consistent with the strength of the instrument, little or no pain is experienced by the patient, if it be well secured in the vice. The vibration occasioned by the blows of the hammer, and transmitted to the chair, are so slight, that frequently the patient is unconscious of the instrument being struck. The operation is usually bloodless. In some persons whose vascular tissue is delicate, a slight tinge of blood is discerned in the water; but more frequently, where gentleness is observed, in all the manipulations of the operator, the water is expelled colourless.

The state of the prostate has great influence on the degree of facility with which lithotripsy may be performed. This gland is situated chiefly

under the neck of the bladder, which it sometimes completely envelops, forming a kind of furrow, in which the commencement of the urethra and the neck of the bladder are lodged. It is evident that the difference in the size and form of this gland will have especial influence on the canal to which it is so closely connected. The state of this gland ought then to be particularly examined, when considering the propriety of performing lithotripsy.

A catarrh of the bladder is a very common disease in calculous patients, and it gives rise to considerations of importance to our operation.

The first of these is, that a patient seldom has a stone and a catarrh of the bladder, without the latter being symptomatic of the former; it is only when the stone has existed for a long time, and when the bladder is contracted and thickened, that the catarrh becomes idiopathic, that is to say, that it does not cease when the stone is removed. A proof of this is found in patients who have undergone the operation of lithotomy, and have been cured, but still retain a catarrh of the bladder after the wound has healed. These examples are rare, because, when the bladder is thus catarrhal, hypertrophied, and much diseased in its structure, it is seldom that patients recover after lithotomy.

If the muscular coat has been long involved, the bladder becomes small and contracted, and impedes the action of the instruments by its small capacity, and often also by the extreme sensibility it has then acquired.

Although a simple mucous catarrh does not prohibit the operation of lithotripsy, it is not the same when it is muco-purulent, especially if attended with an hæmorrhagic disposition; for this catarrh is generally found in those who have suffered from stone for a long period, and in whom, consequently, the calculi have acquired considerable size, which is in some cases another prohibition: it is also very frequently accompanied with great disease in the kidneys. These patients are not, therefore, fit subjects for lithotripsy, but it is, perhaps, even more hazardous to perform lithotomy upon them.

Another cause which renders lithotripsy difficult, is the great degree of contractility of the bladder in some subjects; whether the organ be at the same time possessed of great sensibility, or whether, on the contrary, this sensibility exists only in a slight degree. Although the parts are healthy, a small stone, not long formed, sometimes produces such a state of spasm and contraction, that the operation is, in most cases, rendered painful. We have seen in these patients to what an extent the contractile power of the bladder may arrive: sometimes it allows a moderate injection of water; but when introduced, the liquid is immediately expelled with great force, although an instrument has been used, apparently of sufficient size to stop up the canal. In other cases this contraction is so powerful, that it will scarcely allow one or two ounces to be injected.

The fact is, that the sensitiveness of the bladder, although considerable, like that of the eye, has been greatly exaggerated. It were against reason, that nature should have invested (in its normal state) a vessel destined to contain so acrid and impure a secretion, with such habitual overwrought sensitiveness. But the bladder partakes of the peculiarities of other less sensitive parts of the body: like the bones and cartilages, when once diseased, its maladies are formidable, its recovery slow and difficult.

Amongst the objections and obstacles to resorting to lithotripsy for relief, is the age of the patient. Very young children are the least calculated to bear this operation. Some of the reasons for this are equally applicable to certain grown persons—as the smallness of the bladder and urethra, consequently the smallness or slightness of the instrument to be employed, and the disproportion of the size of the stone to the organs through which it is to be extracted;* together with the irritability

* I consider no apology necessary for introducing the following extract as bearing on this subject, besides the state of the case being so admirably exposed:—"If lithotripsy has been invented for the purpose of avoiding the dangers of lithotomy, its importance diminishes when considered with regard to children. For it is remarked, that lithotomy performed on children up to the age of seven or eight years proves fatal much less frequently than when performed upon adult, and more especially upon old, persons.

"This observation naturally leads us to feel less regret that lithotripsy should not be so applicable in cases of children, as in those of persons more advanced in years. One of the principal causes of this is, that those who have the care of very young children seldom perceive the symptoms of stone at its commencement, or at all events

and mobility of the individual, &c. Other palpable difficulties, sometimes constituting insurmountable objections, are lesions, cicatrices, and strictures in the urethra; such of those diseases of the prostate as are deep and irremovable; very large and hard stones contained in highly irritable and contracted bladders; hypertrophy to an excess, ulcers, tumours, fungous growths of large size, stones impacted in the bladder; but those calculi which are pediculated or attached by small and rather long pedicles of flesh, can be removed.

As additional, and sometimes insurmountable obstacles, we may further add—a large scrotal hernia, which, by throwing the urethra on one side, impedes the manipulations necessary to the performance of the operation—excessive sensibility on the part of the patient, with a strong tendency to feverish excitement—a calculus imbedded in the

trace them to their right source. A child states nothing, perceives nothing, during the first two or three years: the calculus, having fallen into the bladder, continues to enlarge without any effectual remedial measures being adopted; the sensations he feels, he takes to be natural ones, and bears them for long time, till at last, the instinctive movements, resulting from these painful feelings, increased to a considerable degree, denote a state of local suffering which can no longer escape the eye of an attentive mother. It is remarked that he has frequently his hand at the end of his penis, drawing it out to ease the painful sensation existing there: this he does to such a degree as to produce hypertrophy; his urine stops suddenly whilst he is voiding it; he stamps; his face becomes red; he cries, screams, struggles; and convulsions very frequently supervene in very young subjects."

I have extracted these observations from Baron Heurteloup's *Principles of Lithotripsy*, p. 306.

urethra so as almost entirely to obstruct its channel, until the stone is removed, and the urethra restored to its calibre; malformations of the bladder—as, for example, when it is bilobed, sacculated, &c.

A great degree of organic disease, whether in the urinary apparatus, or in the vital organs, appears a sufficient reason to determine the impropriety of lithotripsy, if the stone is sufficiently large to require several repetitions of the operation.

For further particulars on the above important subject, the reader may consult, with advantage, the following works, to which I am indebted for much valuable information :—

Marcet's "Essay on the Chemical History and Medical Treatment of Calculous Disorders." 8vo. London, 1817.

Prout's "Inquiry into the Nature and Treatment of Diabetes, Calculus, and other Diseases of the Urinary Organs." 8vo. London, 2d edition, 1825.

Brodie's "Lectures on the Diseases of the Urinary Organs." 8vo. London, 1835.

Crosse's "Treatise on the Formation, Constituents, and Extraction, of the Urinary Calculus." 4to. London, 1835.

Willis's "Urinary Diseases and their Treatment." 8vo. London, 1838.

Leroy's "Exposé des divers Procédés employés jusqu'à ce jour pour Guérir de la Pierre." 8vo. Paris, 1825.

Civiale's "Parallèle des divers Moyens de Traiter les Calculeux." 8vo. Paris, 1836.

Heurteloup's "Principles of Lithotrity." 8vo. London, 1831.

Belinaye "On the Removal of Stone from the Bladder without the Use of Cutting Instruments." 8vo. London, 1825.

Liston's "Practical Surgery." 8vo. London, 1838.

Aston Key's able paper in Guy's Hospital Reports for April, 1837.

Cooper's "Surgical Dictionary"—articles, "Urinary Calculi," "Lithotomy," and "Lithotrity."

"Cyclopædia of Practical Medicine"—articles, "Calculus" and "Calculous Diseases."

The number of foreign bodies which have found their way into the bladder is immense. Both in males and females, beans, fruit-stones, ears of corn, portions of bougies, nails, bullets, small bones, pins, needles, string, stalks of flowers, have been found in the bladder, and these foreign bodies have frequently formed a nucleus for stone.*

Several instances of hair voided by urine, are mentioned by Sir Hans Sloane: one particularly of a brewer, who suffered from the occasional passage of long hairs, matted or woven together, passed with great pain, but with little or no calculous matter attached to them. Mr. Powell relates a case of a

* I would refer the curious on this subject to the "Dictionnaire des Sciences Médicales," t. vii. p. 38.

middle-aged lady, who, after being teased with disordered stomach and bowels, and evacuation of whey-coloured and fetid urine, passed little masses of hair, mingled with a peculiar viscid mucous substance, partially crusted with calculous matter. The extrication of these substances was attended with aggravation of the distress and pain in the bladder, from the urine bringing them into contact with the orifice of the urethra. This complaint, which continued long, induced great weakness, and much wasting of the body. Dr. Wallace, also, met with an instance, in which hair was several times voided with the urine; and on the body being examined after death, a stone was found in the bladder, large as a goose egg, from parts of which hairs had grown out. It was thought that the hairs voided during life, which were a great many, and some of an extraordinary length, grew out of that stone; because when the hairs hung out of the urethra, as they frequently did to his great torment, they were obliged to be pulled out, which was always done, with a resistance, as if plucked by the root.*

Musket-balls have found their way into the bladder, sometimes occasioning very little inconvenience, at other times giving rise to very distressing symptoms. Larrey, Ballingall, and other writers, mention cases of this kind. The presence of these bodies in the bladder is indicated by pain, more or less acute, weight in the perinæum, tenesmus, dysury, strangulation, and bloody urine.

* Howship, *op. cit.* p. 167.

"Some time ago," says Mr. Ingleby,* "I was called to a woman, a female catheter having unfortunately been allowed to pass entirely into the bladder. The patient was in the fourth month of pregnancy, and had experienced a retention of urine, by no means uncommon, just before the uterus finally quits the pelvis for the abdomen, but in this instance occasioned by the womb being considerably prolapsed—a circumstance which it is material to mention. At the time I saw the patient, the catheter had been in the bladder eight hours. It lay in the centre of the organ, quite transversely; and, the urine having dribbled away, the bladder was in as contracted a state as the catheter admitted of. By means of a long and very slender pair of forceps, passed per urethram, I embraced the instrument near one end, and with the two first fingers of the left hand, passed by the vagina, carefully elevated the other end; and having thus brought it into the horizontal direction, gently extracted it. As little injury as possible was inflicted upon the patient; nevertheless, the ovum was discharged on the third day, but without hæmorrhage. The fœtus presented a perfectly white and beautiful appearance, the scalp excepted, under which there was a considerable extravasation of blood; and to mechanical injury (occasioned no doubt by the difficulty in giving the catheter the horizontal direction) its death may be directly ascribed."

* On Uterine Hæmorrhage, p. 106.

Mr. Toogood, of Bridgewater, has recently published in the Medical Gazette two interesting cases, where a female catheter slipped into the urethra. In both cases, the instruments were extracted by dilating the urethra by the sponge tent, so as to enable the fore-finger to be introduced into the bladder.

Mr. Key and myself saw, two or three years ago, a case, where three inches of a thin gum-elastic catheter broke in the urethra, near to the bladder, and although we were called to the gentleman immediately after the occurrence of the accident, we could not lay hold of the broken portion. Three weeks after this, the fragments (for there were two, one an inch in length, and the other two inches) were voided by the urethra.

If the body be small and has not fallen into the bladder, so that one of its extremities rests in the neck of the bladder, or in the canal of the urethra, they may be expelled by the urine a short time after their introduction, and before they become coated with much saline matter. If the foreign body be not passed by the urethra, the efforts should be made to extract it by means of Weiss's instruments for extracting small calculi. Hunter and Desault invented forceps for extracting foreign bodies from the urethra, and Bichat states that he had never succeeded in any attempt in extracting from the dead body portions of bougies inserted into the bladder; but it is only of late years, since the improvements of vesical instruments, that the operation has been successfully performed.

Hydatids have been discharged from the urethra, and after death numbers of them have been found floating loose in the bladder. In such cases, it is most probable that they have descended from the kidney along the ureters, or that they have been introduced into it from a cyst formed in the pelvis, which had opened by ulceration into the bladder. Worms also have been discharged with the urine; an instance of which is related by Mr. Lawrence in the *Medico-Chirurgical Transactions*.

CHAPTER XII.

WOUNDS AND INJURIES OF THE BLADDER.

RUPTURE of the bladder may either be complete, or may involve only the mucous and muscular tunics. After the reception of an injury, the sudden occurrence of pain in the region of the bladder, incapacity to expel the urine, absence of tumour of the bladder when examined through the rectum or vagina, and a scanty discharge of jets of bloody urine by the catheter, will in general point out the real nature of the accident. In relation to diagnosis, it is to be observed, that although the bladder have been ruptured, there is often a circumscribed tumour in the hypogastric region.

Wounds of the bladder within the peritoneal sac, says Liston,* “or even behind the reflexion of the pelvic fascia, are almost inevitably mortal: they may be inflicted from without, by pointed weapons; or from within, as in rash and ill-conducted operations for stone; or they may be the result of violent injury and solution of continuity in the bones of the pelvis. I have seen some accidental wounds of this viscus from which patients have recovered very favourably. A wound of the posterior fundus, through the rectum, if it do not pass beyond the bladder, is not necessarily attended

* Practical Surgery, p. 393.

with great risk." Foreign bodies, as bullets, have, at various parts, entered the viscus, the immediate effects of which have been recovered from; and their removal has, after a time, been accomplished by incision of the perinæum.

In fractures of the bones of the pelvis, the bladder is often injured, either by the force of the concussion, or by a spiculum of the fractured bone penetrating the coats of the bladder.

I have known the bladder to be ruptured by a fall from the top of a coach. A gentleman was riding on the box, with his coachman, when the carriage was upset, the coachman fell on him, and by this accident the bladder was ruptured. The patient lived from the Sunday on which it occurred till the following Wednesday.

The bladder is sometimes ruptured by external violence, in boxing-matches. If, in these, one throws the other on the ground, he may fall upon him with his knees; and, as from previous drinking, the bladder may then be full, its rupture has occurred.

It would appear from Dr. Harrison's investigations, that when the distended bladder in the male has been ruptured by a fall or blow on the hypogastric region, or by a general concussion, that portion of it which is covered by the peritonæum has very generally been the seat of rupture; the urine has consequently been effused into the abdomen, and the patient has been destroyed by peritonitis.

The following is the explanation offered by Dr. Harrison of the fact, why, when the bladder is ruptured by a blow, or general concussion, the laceration is always found in that part of the organ which is covered by the serous membrane. The several tunics of the bladder allow of considerable distension, but least of all the peritoneal: when, therefore, the bladder becomes fully distended, and is then subjected to any sudden or violent compressing force, this tunic, which is then tense, and comparatively unyielding, will crack, while the subjacent tunics which are connected to it will be torn along with it; whereas, in other situations where cellular tissue occupies the place of the serous membrane, the coats of the bladder will yield considerably before they give way or admit of laceration. (See *Dub. Jour. of Medical Science*, vol. ix. p. 371.) The bladder being pressed forcibly against the promontory of the sacrum in the male, seems to Dr. Harrison also to account for the rent being usually in the posterior region of that viscus. The rarity of the accident in females is ascribed by him to the greater size of the pelvis, the cavity of which is not so extensively occupied by the bladder when this is full of urine. Nor (says he) does the bladder incline so much backwards as in the male; on the contrary, it inclines more forwards, and enlarges more in the transverse direction; while the uterus and its lateral broad folds, may assist to break the shock of any external violence, applied to the hypogastric

region, and so prevent the direct concussion of the bladder against the sacral promontory.* The comparative unfrequency of a rupture of the bladder in children and boys, is referred by Dr. Harrison, to their rarely suffering the bladder to become much distended with urine, and, in part, to the smaller size of the sacral promontory, and to the bladder, when full, lying in early life more in the abdomen.

When excessively distended, the bladder may give way: a case of this kind is mentioned by Sir E. Home,[†] and another by Dr. Johnstone.[‡] In such cases, the urine escapes into the cavity of the pelvis; and all that we can do, is to introduce a catheter, and leave it in the bladder, in order to limit, as much as possible, the quantity of urine effused.

These cases almost always terminate fatally. On examination, the cellular tissue of the pelvis is found in an inflamed, or rather sloughing state; there is one or more small pin-holes, with black and ragged edges, near the fundus of the bladder; and the viscus is found relaxed and empty, whilst the abdomen is full of urine. It is not properly a rupture which then takes place, but more like that ulceration which occurs in the urethra, and lays the ground-work of fistula. Owing to exces-

* Harrison in *Dublin Journal of Medical Science*, vol. ix. p. 352 & 372; and Mr. S. Cooper's *Surgical Dictionary*, 6th edition, p. 266.

† Home on *Strictures*, vol. ii. p. 241.

‡ *Memoirs of the Medical Society*, vol. iii.

sive distension, ulceration takes place; the coats are weakened; and the urine bursts through them.

In cases of labour, the bladder has been known to burst; and most practitioners concur in thinking that such an accident must always be the effect either of neglect or of improper interference.

In a case of this kind related by Mr. Hey, in the fourth volume of *Medical Observations and Enquiries*, the bad symptoms attendant on retention of urine did not take place till the second day. The patient was thirsty, vomited, had frequent desire to void urine, which she did very suddenly, but not in greater quantity than a tea-spoonful at once. The pulse was quick, the belly swelled, and pressure gave her pain. She died about the eighth day, and the bladder was found to be ruptured at its upper part.—A case is also related by Mr. Bedingfield, in which the bladder seems to have burst during a very easy labour of only two hours' duration. The patient died of peritoneal inflammation.*

One cause of laceration of the bladder may be the use of instruments in a distended state of that organ. If the forceps be applied whilst the bladder is full, the action of the instrument is likely to produce laceration; and this is known by the immediate and continued flow of urine through the opening.

In consequence of great pressure from the head of the child, destruction of a portion of the vagina

* *Lancet*, June 1837, p. 371.

and bladder may take place,—an occurrence attended with most distressing symptoms. The urine dribbles away as fast as secreted, and excoriates the neighbouring parts. The protruded mucous surface of the bladder is then very sensitive, and the vagina is frequently contracted in size by firm bands, extending across it in various directions. With all these local symptoms, the patient's general health is but little affected. I have seen four or five instances of this injury, in all of which little could be done in the way of relief. The difficulty of closing an opening through which urine is constantly passing, deterred surgeons, until late years, from attempting other than a palliative treatment, consisting of ablution and a ball-pessary, the application of which may be understood by referring to a case related by Mr. Barnes, in one of the volumes of the "Medico-Chirurgical Transactions." For the same purpose sponge has been employed in a case, which resisted some attempts to effect a cure.*

The cure of the disease by ligature was first contemplated by Mr. Preston, and the operation has been performed successfully by Mr. Leeke, Mr. Gosset, and the late Mr. H. Earle. Two cures are also recorded in the second volume of the "Dublin Medical Journal," and one by Mr. Hobart, of Cork, in the "London Medical and Physical Journal," for 1825.

* Transactions of the Provincial Medical and Surgical Association, vol. i. p. 542.

The late Mr. Earle published, in the fifth volume of the Medical Gazette, a valuable paper on this subject, an abstract of which I subjoin:—

“The sources of difficulty attending these cases are manifold. One is, the continual flow of urine, and the vicinity of the termination of the ureters. Another is, the very narrow space for performing any operation, often rendered more narrow by preternatural contractions, and firmly cicatrized bands. A third arises from the exquisite sensibility of the exposed mucous membrane of the bladder. Then the moist, unresisting, elastic surface, eludes the impression of any cutting instrument, the edge of which is almost immediately blunted by the action of the urine. Even when these difficulties are surmounted by perseverance, and a modification of the various instruments, such is the influence over the pelvic viscera exerted, by the slightest movements of the viscera of the abdomen, and by the action of the abdominal muscles and the diaphragm, that the adaptation of the denuded surface is often frustrated, and even the sutures forcibly torn away, by a single effort to cough or sneeze.

“When the opening,” continues Mr. E., “is not situated between the urethra and ureters, or in the neighbourhood of the latter tubes, when it is not of great magnitude, and when there is not much hernia of the bladder, we may attempt to remove the callous edges, and unite them by the assistance of sutures. We shall be much facilitated in this

operation by previously dilating the urethra sufficiently to admit the fore-finger of the left hand ; by which we shall be enabled to draw down the bladder, and to afford a support and resistance in removing the edges. The instruments best adapted for this purpose, are very narrow double-edged scalpels, or lancets, with which we may pierce through the membranes, and cut our way outwards. These should cut only to a short distance from the extremity. It will be better to commence at the extreme edges of the opening, and not to attempt too much at any one operation. By several operations, we may gradually diminish the aperture, but, by attempting too much, we shall be foiled altogether. In order to convey a suture through the edges, to hold them in contact, it will be necessary to employ *porte-aiguilles*, with grooves, which will hold a glover's triangular needle at different angles, and with slides adapted for holding or letting loose the needle. The following is the mode in which I have employed this.—An armed needle should be fixed at the angle most convenient for piercing the denuded edges of the wound, which should be directed by the finger, and carried through the two edges. The point should be received by the other *porte-aiguille*, and the slide pushed up to fix it. The slide of the first should then be drawn down, which will leave the needle in the grasp of the second, by which it may be drawn through with its thread attached. To effect this in so narrow a space as the vagina,

is often most difficult, and requires much patience and dexterity. The ligature should be drawn tight, and the ends cut off. I have also employed short hare-lip pins, and the twisted suture; but these are still more difficult to pass, and they cause much more irritation. In those cases, which, from the situation of the opening, or its magnitude, no curative means can be attempted, a well-adapted truss, with an elastic gum-pad, will often enable the patient to retain a considerable quantity of water, and to enjoy comparative comfort."

Mr. Coley has recently published a case in which he cured a vesico-vaginal fistula by ligature. In this instance, in lieu of a female catheter, a wood sound, one-third of an inch in diameter, was used during the operation on which the edges of the fissure were divided, and a forceps with a moveable ring, by means of which the needle may be retained at any angle with the greatest firmness, until the surgeon wishes to liberate it, which he can do by moving the ring towards the joint. The length of the instrument is eight inches and a half, and a drawing of it is given in the *Lancet*.*

Mr. Beaumont has suggested an ingenious instrument to be used in operating for this complaint; it is in the form of forceps, one blade of which is a needle curved towards its point, and close to the point is the eye of the needle. The other blade is broader on its opposing surface, less curved, and at its extremity has a hole, through

* 1838-9, p. 86.

which the needle-point, and just the loop of the ligature, are carried when the blades are closed. On the back of the broad blade is a spring, which, when pushed forwards, the blades being previously closed, catches the ligature on its point, and holds it at the extremity of the blade.

In using this instrument the operator has only to seize in its points, as he would with a pair of forceps, the border of the fistulous opening; the blades should then be closed, and the ligature will be carried through one lip of the aperture. The opposite border is then in like manner to be seized, and the blades to be again closed and firmly held so. The spring on the back of the broad blade is now to be pushed forwards, by which the ligature will be caught and held at its point. The blades after this are to be opened and gently withdrawn, leaving a double ligature passed through opposite points of the fistulous aperture. A second or more stitches may be made in the same manner, leaving in each a double ligature, so that the quilled or other suture may be afterwards formed.

The late Baron Dupuytren* extolled the actual cautery, except in those instances in which there was much loss of substance. Mr. Liston has succeeded in curing four or five cases by this means, and some interesting cases where the cautery was used, are related in the second volume of the *Dub. Medical Journal* by Doctor Evory Kennedy. Its application is extremely simple, and attended with

* *Journal Hebdom.* No. 58.

inconsiderable pain to the patient. Some have succeeded in closing slight apertures with nitrate of silver; * while others recommend the excision of the callous edges, and the application of some kind of suture.

When the accident happens from laceration, without loss of substance, it may occasionally be cured by a catheter retained in the urethra, with a bladder attached to its lower end, provided the treatment is commenced soon after delivery. By this contrivance Mr. Gaitskell effected a cure in a few weeks. †

In all cases where we have the least reason to apprehend sloughing of these parts, the most scrupulous attention should be paid, from the period of delivery, to cleanliness, &c.; for this purpose tepid injections frequently thrown up the vagina, containing seven parts of infusion of chamomile, with one of camphorated spirit, or the decoction of poppy, with sulphate of zinc or alum, will be found most useful. Where sloughing is decidedly threatened, injections more active must be had recourse to.

* Lancet, No. 619, p. 485.

† Blundell's Lectures, Lancet, No. 222, p. 334.

CHAPTER XIII.

ACUTE INFLAMMATION OF THE PROSTATE GLAND.

THIS gland, in common with every other part of the body, is subject to inflammation, which may be either of an acute or chronic nature. Each has its characteristic symptoms and consequences, the acute being distinguished by the following:— There is heat and pain in the perinæum, near the anus; frequent micturition; tenesmus vesicæ; intense scalding in making water, which is increased as the acceleratores urinæ contract to expel the last drops of urine. Evacuations from the bowels also cause great uneasiness, and there often remains a sensation as if the rectum was not completely emptied, giving rise to distressing tenesmus. If the finger be introduced into the rectum the gut feels hot, and sometimes the prostate is felt as a smooth, round, and hard body, projecting downward on the bowel, which the pressure made by the finger renders exceedingly painful.

If a catheter or sound be introduced into the bladder, it passes without difficulty or uneasiness as far as the membranous part of the urethra; but its passage through the prostatic portion of this canal is attended with most acute pain, and accompanied with severe spasmodic contractions. All

the above symptoms are much aggravated in the sitting or standing position.

In acute prostatitis, the inflammatory action, if not checked, shortly extends to the neck of the bladder, and, not unfrequently, thence to the inner lining of the bladder, when, along with the frequent expulsion of its contents, the urine becomes abundantly charged with mucus; sometimes it is bloody, and, in all cases, high-coloured. When the inflammation has attained this height, total retention of urine frequently succeeds; intense febrile symptoms supervene, accompanied with delirium; and in this stage the patient may die, if the bladder be not relieved, and the inflammation subdued.

With respect to the predisposing and exciting causes of prostatitis, these originate either in different morbid states, or in the abusive exercise of the genito-urinary organs. The pressure made by vesical calculi on the neck of the bladder, the constant irritation their pressure creates, and which, by the continuity of mucous tissue, is so readily transmitted to the prostatic portion of the urethra—all act as causes predisposing to inflammation of the prostate itself. Of the same nature are the morbid secretions proceeding from vesical catarrh, or from a diseased kidney, which directly or indirectly act upon the prostate, and excite inflammation either in its follicles, or in the cellular tissue that envelops them.

Another common cause of this inflammation are

strictures in the urethra, and it rarely happens that the obstacle they present to the free flow of urine, does not produce inflammatory affections in the prostate, the intensity of which usually is in relation to the degree and extent of the constriction.

When the obstruction is trifling, the emission of the urine, though somewhat retarded, is nevertheless accomplished without very great effort: but when the bladder is emptied, the contractions of the *acceleratores urinæ* not being sufficient to expel the last drops of urine, these lodge between the obstruction and the neck of the bladder, and by remaining in contact with the mucous lining of the urethra, irritate it; whence, not unfrequently arise urethral discharges, swellings, and sometimes even suppuration of the prostate.

Another occasional source of prostatic inflammation, is the long-continued or improper use of dilating, or other instruments in the urethra, such as bougies, sounds, or catheters. Catheterism performed by unskilful persons, often produces lacerations and injuries of the passage, that ultimately terminate in acute prostatitis. Surgeons who use metallic catheters or sounds of small diameter, run the greatest chance of producing such accidents. With sounds or catheters of small diameter we may seriously injure the prostate, particularly if one or more of the mucous follicles of this gland have their orifices much dilated.

The gonorrhœal virus is at times a cause of

prostatic inflammation. In this case, the discharge diminishes, or nearly ceases, as soon as the gland becomes inflamed, and the pain which was confined to the anterior part of the urethra is referred to the perinæum, accompanied by a disagreeable sense of fullness, and by tenderness, increased by standing or sitting.

The internal use of the gum-resins and astringent injections employed in the treatment of gonorrhœa, are also among the exciting causes of prostatitis.

Gravel proceeding from the bladder, lodging among the prostatic lacunæ, and those concretions that not unfrequently form in the same situation, likewise produce prostatitis.

As the prostate partakes of the excitement of the venereal orgasm in sexual intercourse, we can perceive why excessive venery may be an occasional cause of the same affection.

Exposure to wet, particularly of the feet, or the immersion of the feet in cold water, especially in rheumatic subjects, is apt to produce acute inflammation of the prostate, where there is the slightest predisposition to the disease.

Too nutritious and highly-seasoned viands, and the excessive use of vinous and spirituous liquors, can often be traced as giving rise to prostatic inflammation.

The French writers on this disease, impute its occurrence occasionally to the use of strong coffee as a refreshment.

Cantharides are well known as inflammatory excitants of the genito-urinary system, whether employed externally or internally, and often set up inflammation in the prostate.

Persons who, by their profession or otherwise, are obliged to travel much on horseback, are often the subject of prostatitis, occasioned by the constant friction and concussions to which the perinæum is exposed in horse-exercise; and the same is apt to happen even to those who take long journeys in a carriage: hence, also, the frequency of hæmorrhoids, and other affections of the rectum, to which the same persons are liable.

This disease very often affects those of the very opposite pursuits—I mean, not the traveller, but the sedentary; and prostatitis may justly be enumerated among desk diseases. The man who sits long and daily in his counting-house, and the studious, too often neglect to obey the call to stool, or to satisfy the natural desire to empty the bladder; whence, in the one instance, we have piles, fistula, &c., in the other, disease of the prostate gland, and other urethral and vesical affections.

Worms situated in the lower bowel have been observed at times to cause considerable irritation in the prostate, proceeding from a sub-acute inflammation which they excite and sustain; and which is allayed only by the expulsion of those parasites. But besides worms, other causes that keep up a continual irritation in the rectum are capable of setting up inflammatory action in the

prostate, such as habitual, obstinate constipation. The same cause will also produce a varicose state of its veins, as well as of those of the extremity of the rectum. During the efforts of defecation, the venous blood being forced to the bottom of the pelvis distends the veins, and makes them varicose; and thus the prostate is increased in bulk, independently of any other lesion of its tissue.

Although I have enumerated the causes of this disease separately, I do not mean it to be understood that they act thus isolatedly. On the contrary, it mostly happens that two or more of them concur at the same time in exciting the disease—thus, the person much confined to his desk, besides the constant pressure made on the prostate by a sitting position acting as one cause, we, in all probability, have the existence of hæmorrhoids and of habitual constipation co-operating at the same time in exciting inflammation of the prostate. Again, in those obliged to be much on horseback, as dragoon officers, we may have a gonorrhœa, an accidental contusion of the perinæum, cold, fatigue, sudden vicissitudes of temperature, the excessive use of wine or ardent spirits, as concurrent causes all conducing to the same result—that of setting up inflammation in the prostate.

When, through active and appropriate treatment, acute inflammation of the prostate terminates in resolution, all the symptoms indicated above diminish; at the same time, the liquid secreted by the follicles of the gland augments in

quantity, and, mixing with the urine, in the form of a whitish or greyish viscid matter, settles at the bottom of the vessel without adhering to its sides, having a good deal the appearance of pus imperfectly elaborated. This matter diminishes in its turn, and finally disappears, as the functions of the affected parts return to their healthy and natural condition.

Acute prostatitis demands the employment of the most active antiphlogistic treatment.

If the attack is severe, blood may be taken, by cupping, from the loins or perinæum. Leeches, moreover, may be applied above the pubes, particularly when pain is there experienced, or in the perinæum. The French practitioners recommend the application of leeches on the rectal surface of the prostate, by means of a speculum introduced into the anus. In elderly persons, the efficacy of taking blood is more doubtful, the relief obtained being evanescent, (probably because change of structure has occurred,) and the debility permanent.

After depletion morphia allays irritation, and assists in removing inflammation. Its preparations may be given internally, or may be used per rectum, and repeated so as to subdue irritation, its constipating effects being occasionally obviated by a previous enema of hot water, and by small doses of gentle aperients.

Hot bathing generally, as well as locally, gives relief.

Febrile symptoms and constitutional derangement must be attended to, by withholding food, and permitting the use only of bland and diluent drinks.

In many cases the secretion of urine is considerably augmented. In young persons, however, it will be unnecessary to introduce a catheter, except when suppuration is about to take place, and there is retention of urine.

When rigors occur, with increase of febrile symptoms, quickened pulse, hot skin, furred tongue, &c., as well as greater sense of fulness and tension in the perinæum, more frequent calls for, and greater difficulty of, micturating, giving rise to the probability that matter is forming, an examination per rectum, added to observation of the external swelling, will often give considerable information.

The fibrous investment of the prostate, softened by inflammation and distended by pus, favours the escape of a creamy and sanguineous matter into the urethra, the rectum, or the bladder: then the tumour diminishes, the urethra becomes free, the urine flows in a large stream, and as the bladder empties itself, the patient feels his sufferings decrease.

If the abscess opens into the urethra, a very copious purulent discharge instantly manifests itself from that passage: the urinary discharge is accompanied, but more frequently preceded or followed, by the evacuation of a large quantity of

phlegmonous matter, the specific gravity of which is much greater than that of the urine and the vesico-prostatic mucous products.

It is desirable that the matter of the abscess should find its way neither into the rectum, the urethra, nor behind the bladder, which may be fatal, but should pass to the surface, in order to discharge its contents more freely, and heal more readily. We must not, therefore, hesitate, where fluctuation can be discovered, to make a puncture with a lancet, without waiting its presenting at the surface. The slight bleeding which ensues under such circumstances does good, and an abscess, either artificially or naturally opened in this way, heals with little difficulty; which may be further promoted by the internal use of sulphate of quinine, steel, or other tonics.

Should the disease have anticipated the operator, and the abscess have opened in the perinaeum or the rectum, nothing can be done beyond maintaining the general health. Should the abscess have burst into the urethra, or at the neck of the bladder, it would be better to allow a flexible catheter to be retained in the canal, until there is reason to believe the abscess is healed, than to practise its frequent introduction. Most commonly the matter gradually diminishes in quantity, and ceases entirely after a time. In other instances the discharge disappears for a time, and then comes on, and this may occur several times before the patient completely recovers.

In these cases, ulceration of the surface of that portion of the prostate which projects into the bladder sometimes occurs. In this state, or even in that of mere enlargement, the gland is liable to bleed. This usually will cease by antiphlogistic treatment, and keeping the patient entirely in the recumbent position.

CHAPTER XIV.

CHRONIC INFLAMMATION OF THE PROSTATE
GLAND.

IN the preceding chapter I have described the terminations of the acute form of this disease by complete resolution, and by suppuration ; but these two modes, as Verdier* justly observes, are not the only ones in which it terminates. The inflammatory action very frequently is subdued only, not totally extinguished, by the treatment that has been adopted : a state of engorgement still remains, which either spontaneously, or through some accidental excitement, readily resumes that action, which, in its abated form, is known as chronic inflammation.

This prolongation of the inflammatory action under a chronic form, very frequently occurs in those who are subject to rheumatism and cutaneous eruptions.

Sometimes, also, in feeble subjects, the antiphlogistic treatment stops the progress of the inflammation at a period of the disease when pus has already formed in the parenchyma of the prostate, but which has not effected its discharge outwards. Disseminated in the cellular tissue, or contained in several small abscesses, this purulent matter under-

* Obs. sur les Phlegmasies de la Prostate, p. 110.

goes the same change as sometimes happens in the pulmonary tissue, and which is not wholly re-absorbed : it is deprived of its more liquid parts, and reduced to its elements of greatest consistence. Thus we perceive formed tubercular depositions that soon become the subjects of frequent inflammation, while each fresh attack only increases the deposition ; and in doing so, necessarily augments the size of the gland.

The above is one of the modes in which chronic inflammation of the prostate takes place ; but besides this, the disease may originate in this form primitively, and the result of the long continuance of the morbid action be analogous to, if not perfectly identical with the preceding—that is, deposition of serosity into the cellular tissue ensues on every fresh exacerbation of the inflammation ; the more liquid portions of it being removed, and the albuminous that remains becoming organised.

As the progress of chronic inflammation of the prostate is usually slow, so the symptoms characterising it are far less distinct than those of acute prostatitis.

In this case the patient experiences a gradual increase of inconvenience and difficulty in micturating. When the enlargement is slight, he usually attributes his sensations to internal piles. When the enlargement is greater, he feels a sense of weight and bearing down, and a desire to evacuate the fæces, although the rectum is empty.

As the disease advances, the urine is voided

every hour, or even oftener; and that is effected so slowly, that it drops perpendicularly from the orifice of the urethra, or perhaps dribbles away involuntarily; a slight degree of pain being experienced in the course of the urethra, and in the glans.

These symptoms are all increased by much standing or walking; rheumatic pains are felt down the thigh and leg, and likewise in the loins; occasionally there is hæmorrhage from the penis; there is constipation, dyspepsia, headach, and frequently some scaly eruption on the skin.

Owing to the prostate being intimately connected with the neck of the bladder, every increase in the size of the former must affect the latter; causing some alteration in the exercise of its functions. The loss of power to empty the bladder, is apparently the first effect thus produced, and its consequences are very serious. If, after the patient has exerted himself to empty the bladder, an ounce or two of urine are left in it, the desire to micturate scarcely ceases before it returns, and requires efforts similarly vain to expel it.

Sometimes these symptoms occur suddenly. The patient awakes with a strong desire to micturate; he finds that he can scarcely pass any water; and, on inquiry, it is found that exposure to cold or wet, or irregularity in diet or exercise, had previously occurred.

In other cases, the enlargement is, from the first, accompanied by incontinence of urine.

Tumefactions of the prostate, which are brought on by strictures, disappear when these are cured: it is necessary, therefore, to distinguish them from more permanent disease.

As all the symptoms of this disease arise from the urine being obstructed in passing from the bladder, they are removed by an artificial mode of emptying that organ. This renders necessary a perfect knowledge of the passage, in order easily to pass the catheter.

Now, when the prostate is enlarged, the growth of its sides renders its cavity deeper, and the posterior extremity forms a projection into the bladder. This projection is owing to the enlargement of a separate lobule of the prostate gland.* According to the degree of such projection, both the urine, and any instrument for drawing it off, are passed with difficulty, and it is evident that, the prostate being once enlarged, a small addition to its bulk may be sufficient to prevent the expulsion of urine. Owing to this deepening, the cavity may occasionally contain a little urine, which running through the catheter before it enters the bladder, may deceive the inexperienced operator. Of course, this also lengthens the urethra, and renders a long catheter necessary.

These symptoms are frequently produced by enlargement of the whole gland, or one of its lateral lobes; and in these cases a ridge is sometimes thrown up, which acts like a bar to the

* Vide Plate III.

vesical extremity of the urethra,* and which makes it necessary, if we expect to pass an instrument into the bladder, that we should suddenly depress the instrument at this point, else we are certain to perforate the ridge.

We have the authority of Desault, Hunter, and Dr. Baillie, for setting the prostate down as the occasional seat of scrofula. Dr. B.,† after stating that he has seen a common abscess situated within it, adds, that it is also subject to scrofulous disease, as, on cutting into it, he has met with the same white curdy matter which is formed in a scrofulous gland: he has likewise forced out of its duct scrofulous pus.

“I have never seen a case,” says Mr. S. Cooper,‡ “in which a retention of urine from chronic enlargement of the prostate gland terminated in extravasation of urine from rupture of the bladder. Sir Astley Cooper never met with but one instance of it; and the reason of its rarity is given by Desault, who remarked long ago, that in every case of retention, where the urethra is free from obstruction, the urine, after distending the bladder to a certain point, generally dribbles away through that canal, and the patient may live a good while in this condition. But the case is different when the retention depends upon any stoppage in the urethra, for the urine then does not partially escape; the distension increases,

* Vide Plate IV.

† Morbid Anatomy.

‡ Surgical Dictionary, p. 110.

and if relief be not speedily afforded, the urethra gives way behind the stricture or obstruction."

The size to which a diseased prostate attains, particularly when the lateral lobes are principally affected, is often very considerable. Mr. Guthrie,* speaking of a case of this kind, mentions that "the prostate was larger than a closed hand, had partaken of a cheesy-like suppurative process of this kind, and the whole pelvis was nearly filled up by a mass of disease of a similar character. In the more common kind of enlargement, the part is rather soft than hard, yielding a little to the touch, but is not elastic or springy, like a spongy tumour. The enlargement is sometimes but trifling, in which case the prostate retains its natural shape, and merely projects a little into and around the orifice of the bladder; but when it is considerable, as in very prolonged and neglected cases, it is often as large as a full-sized orange. One lateral half is usually much larger than the other, and protrudes into the bladder, giving rise to one or more projections, which cause great distress to the individual. The left side, I am led to believe, undergoes this change more frequently than the right, although no satisfactory reason can be given why it should be so; and whilst one projection is directly backwards and inwards, it sometimes is seen to form a second immediately behind the orifice of the bladder, and which is frequently supposed to be an enlargement of that part of the

* Op. cit. p. 227.

gland behind the entrance of the vasa deferentia, and which has been called, by Sir E. Home, the third lobe."

Among other pathological effects of enlargement of the prostate, is its tendency to favour the formation of vesical calculi. On this subject, M. Civiale observes* — "The prostate is liable to a variety of diseases, most of which have the effect of changing the direction of the urethra, and diminishing its natural pliability. Hence urinary concretions are, in such cases, usually retained in the bladder, and increase in proportion to the length of time which they are retained, and the tendency to urinary deposits. Unless the surgeon be careful to remove this state of the prostate gland, or neutralize its influence, all medical treatment must be unavailing. Independently of the direct obstacle produced by organic disease of the prostate, or any tumour near the neck of the bladder, there is one which I would term *vital*, and which depends on increased sensibility and contractibility of the urethra and neck of the bladder. This morbid sensibility is itself connected with some commencing disease of the prostate, or with urinary concretions; and the surgeon has thus to combat two distinct states, each of which acts on and augments the other."

A winding passage is, moreover, formed through the prostate, by alterations in the shape of its

* On the Treatment of Gravel: vide. *Lancet*, Sept. 7th, 1839.

cavity; the channel being thrown to one side, frequently to the right one—a circumstance to be recollected on passing the catheter, when obstruction is felt at the neck of the bladder. This state may be discovered by an examination per rectum. It obviously is one of the cases in which an elastic catheter will pass easily without a stilet, though difficultly, or not at all, with one.

The catheter should either be passed every six or eight hours as the irritation returns, or it should be left in the bladder. In the latter case, after the first two or three days, it is a general rule to withdraw it, and repass it occasionally. If, however, it is not easily introduced, it will be better to secure it in the bladder, allowing the water to flow through it at intervals.

The usual mode of securing the catheter, is to apply a common T bandage, of which the longitudinal band is divided up the middle, into two portions, one of which lies in each angle between the scrotum and thigh, and to which the catheter may be secured by ligatures.

Should the patient not empty his bladder when the catheter is withdrawn, it must be re-introduced, and after a few days again taken out.

In some cases of diseased prostate, the urethra being very irritable, is liable to spasm at the membranous part; and as the gum catheter on an iron stilet is then certain to bring on spasm, a flexible gum catheter should be passed skilfully, and with the slightest possible force. When the bladder is

emptied, the catheter should be retained by the means already pointed out, the water being drawn off at intervals till the first symptoms go off, and till the bladder can retain the water for the usual length of time.

The following method has been found successful, in cases rendered difficult by spasm: namely, to pass a gum catheter as far as possible without a stilet, and this will probably be to the enlargement of the prostate; then to introduce a stilet into the catheter, without withdrawing the latter from the urethra; and, finally, to employ the stilet to direct the point over the tumour of the prostate.

In thus using the gum catheter in a flexible state, if it do not pass readily, owing to its having been softened and lost its curve by passing through the straighter part of the urethra, it should be withdrawn, and another employed.

Hitherto we have been going on the supposition that, though there be an obstruction to the evacuation of the urine, it is to be surmounted by appropriate remedies and the employment of the catheter. But it happens at times, not merely in this disease, but in other affections both of the bladder and urethra, that all our endeavours to relieve the distended bladder fail; and in order to save the patient's life, our sole remaining resource is that of puncturing this viscus, and thus drawing off the urine. The spots usually selected for this operation, are either above the pubes or through the rectum. The following are Mr. Liston's

directions for the first of these modes of operating:—

“When the bladder has risen high into the abdomen,” says Mr. Liston,* “together with its peritoneal covering, the puncture above the pubes can be effected by a previous simple division of the skin, and separation of the recti and pyramidales. A straight, long trocar is used for the purpose of perforating the bladder; care must be taken to retain the canula, and, by position of the patient, infiltration may, perhaps, be guarded against. Patients have, now and then, lived after these operations, but the chances in their favour are few, compared to those afforded by the withdrawal of the fluid, properly and without lesion, through the natural passages.

The puncture above the pubes is always attended with great danger from infiltration, which it is difficult to guard against, or from peritoneal inflammation, to which the parts in this state of matters are liable.”

The puncture from the rectum can be performed without injuring any important parts. The canula of a curved trocar is to be guided by the finger to the triangular space, bounded by the vesiculæ seminales and peritoneum; the stilet is then protruded, and the whole instrument pushed forwards into the posterior fundus of the organ. The canula is retained for a certain time, until the cause for the proceeding is got rid of. I have performed

* Operative Surgery, p. 419.

this operation four times, and it is the one which I prefer.

Hæmorrhage from the prostate, whether arising from ulceration, from the accidental rupture of vessels, or from injury by the catheter, may be treated by opium and galls, or the subacetate of lead with opium, in doses of from one to two grains of the former to one of the latter, every six hours, or the infusion of roses with sulphuric acid and sulphate of alumen. In plethoric patients, or those subject to active hæmorrhage, such remedies should be preceded by general and local bleeding, injections of cold or iced water, &c. The catheter should, if possible, be avoided, during hæmorrhage; or, if irritation and useless effort render it necessary, it should be allowed to remain, in order to keep the part at rest. The bladder, if filled by coagula, should be washed out.

When painful sensations occur in the rectum, of which the symptoms are, distress in going to stool, painful tenesmus increased by efforts, or, when exertions are no longer made, and there is an aching uneasy feeling in the parts, the best applications are suppositories of extract of hemlock, with or without the extract of opium, and glysters of warm water, as a tepid bath, and as a means of procuring regular evacuations with little disturbance.

In middle-aged persons, and sometimes in young ones, the prostatic portion of the urethra and the neck of the bladder are often affected by irritation

and low inflammation, which in both cause troublesome symptoms.

In advanced life, the slow return of the blood from the neck of the bladder, caused by its low and remote situation, as well as the complication of its veins, tends to dilate these, and to favour an accumulation of blood in them. This gives a tendency to disease, which, in elderly persons, is increased by violent horse exercise, by the irritation of the urine when of an irritable quality, dependent on a disordered state of the stomach and bowels, and especially by gonorrhœa and great sexual excitements.

Abscess of the prostate resulting from mere chronic inflammation, occurs generally from forty to fifty years of age, or even later: and it is usually, though not always, the consequence of stricture, accompanied by inflammation of the inner membrane of the bladder.

Fistulous communications are sometimes formed between an enlarged prostate gland and the rectum, by incautious introduction of catheters or bougies.

I conclude these remarks with the following narrative of a CASE of enlargement of the prostate, given in the patient's own words:—

Mr. J. W., æt. 65, not rheumatic nor gouty. The patient is troubled with a frequent desire to make water, almost every hour, but sometimes oftener, especially in the morning; at other times, especially when the mind is engaged, and abstracted

from thinking on his infirmity, he will go two or three hours without being urged to void it: there is more irritation at some times than others; when most irritable, the urine is pale, colourless and very clear, and the pulse much accelerated with palpitation of the heart, and a laboured respiration with a feeling of distension at the stomach, and other symptoms of indigestion.

The quantity of urine discharged at a time is generally but small, and is not promptly made; but, after waiting a few seconds, it is then discharged tolerably freely, and will then cease to flow, and after waiting a few more seconds, will flow again, and then again cease, and return a third time, after a longer cessation of a minute or so. The bladder evidently is never completely emptied. These peculiarities occur in the night; during the day, the patient cannot conveniently make more than a single effort.

Sometimes the stream is tolerably large, but occasionally there is only a sort of dribbling, especially when there is a good deal of urine in the bladder, and it is then squirted out by muscular efforts, such as are made in voiding the last drops in the healthy subject. The urine so squirted out, comes in a rather larger body than when voided in a stream, and so far denoting the remains of a good deal of muscular power. The quantity of urine voided in twenty-four hours, corresponds nearly with that of the fluids taken during that time.

There has been heretofore occasionally a quart or more of urine drawn off at one time by the catheter ; from which it is inferred there is not much alteration in the capacity of the bladder.

The urine is always more or less acid, and changes blue litmus paper, to a red, varying in depth of colour, and is sometimes tolerably clear ; but there are slight thready filaments floating in it ; and it is never (except in the pale state before referred to) without some cloudy appearance, which is at first held in solution, and does not form any sediment for a day or two, or more, or but slightly so ; but lately, on some being kept accidentally about ten days, a considerable settlement had taken place, having a white jelly-like appearance, similar to the thick discharge from the nostrils in catarrh. No sand or grit is precipitated from the urine, neither has it any unusual smell.

The foregoing symptoms, it is supposed, had their origin as follows :—The patient, many years ago, had a stricture in the urethra, about the bulb, which was treated with kali purum, with apparent benefit. He was advised to introduce a bougie occasionally, which was done for some years.

About seven years since, after drinking rather freely of white wine, he was taken with a retention of urine, which was relieved two or three times by the use of the catheter. Being told that there was no remaining stricture, although he had had frequent calls to make water, which passed in a diminished stream, he left off the use of the

bougie, in order to keep the parts quiet. About three years afterwards there was a return of the retention, to which he has occasionally been subject ever since, at intervals sometimes of a year, at others of a few months. On some occasions the catheter was used only once or twice, before the urine again passed naturally; at others, it was used daily, and sometimes two or three times a day for a week or more. The patient has no doubt that the necessity for such a lengthened use, arose from delaying its use until there was a considerable distension of the bladder, causing great consequent irritation. The patient having at length acquired some knowledge of the anatomy of the passage, and the way of passing the catheter himself, from having employed it at an early period of the symptoms, he generally finds a single introduction suffices. He uses an elastic gum-catheter, and latterly without a stilet, and only a drop or two of blood will follow; whereas when a silver catheter was used by another person, however skillfully, and passing pretty freely, though of nearly a full size, sometimes a rather extensive hæmorrhage would take place.

After using the catheter himself, he finds a small coagulum, as much as might be produced by two or three drops of blood, is generally discharged with the first urine made, when, for a few days, it flows in a better stream, but soon afterwards the stream again decreases, but varies somewhat capriciously, being sometimes almost as free as in the

healthy state. The coagulum is supposed to proceed from an old abrasion which seems never to effectually heal, as there are always a few spots on the linen indicating some urethral discharge of a slight yellow tinge.

The patient did not use the catheter for nearly a whole year, until within about two months ago, during which period he has used it twice; but he has occasionally been a good deal inconvenienced apparently by the quantity of urine in the bladder, which he did not like to draw off, so long as it would pass naturally, though slowly, thinking that the introduction of the instrument had a tendency to prevent the injured membrane from healing.

The patient used only to have recourse to his surgeon when retention had actually taken place, and when relieved, did not pursue any systematic medicinal plan in the intervals; but for the last year or so, he has regularly taken from forty to sixty grains of carbonate of soda, and an ounce of gum-arabic daily, in two doses, adding to each dose, when there was increased irritability, from ten to thirty drops of tincture of hyoscyamus. The object of this treatment was to render the urine bland and mild, and lessen its acidity, so that it might not excite the mucous membrane of the bladder; but there is still great acidity in the urine, and consequent irritation. The patient lives plainly, drinking tea only, and taking milk at his meals. His tongue is never clean, and his appetite is diminished, but he does not get weaker; he has

no pain in the loins, and the kidneys act properly.

On introducing a full-sized catheter, after he had made water, I drew off six or seven ounces of urine. There was no stricture, but an enlargement of the prostate. I gave some medicine to allay the irritability of the bladder, and afterwards directed the patient to introduce the catheter once in four days, so as to completely empty the bladder: by this means his symptoms have been much relieved.

CHAPTER XV.

PROSTATIC CALCULI.

DR. BAILLIE has given an accurate description of the cavities that are sometimes found in the body of the prostate, communicating either with the urethra or the bladder. "The prostate gland," he observes, "is sometimes seen with its cavity very much widened, and its ducts enlarged. In the natural state of the gland, the orifices of its ducts can hardly be seen, but they sometimes are so much enlarged as to be capable of admitting a crow-quill. When the ducts are so enlarged, there is always great obstruction to the passage of the urine through the urethra, arising most commonly from stricture there. The urine, either passing in very small quantity, or being entirely prevented from passing, is accumulated in the cavity of the prostate gland and the bladder. The effect of this accumulation is, that the cavity of the prostate gland is widened, and the ducts very much enlarged. The bladder too, from making extraordinary efforts to overcome the obstruction, has its muscular coat gradually thickened, and often to a very considerable degree. Attending, therefore, this state of the prostate gland, there is a thickened bladder, and an obstructed urethra."

It has been thought by some that the calculi found in cavities of the prostate, had a similar origin and nature with stones in the bladder, but analysis has demonstrated the contrary; and that they are to be regarded pathologically in the same light as those concretions sometimes found in the salivary ducts and elsewhere—that is, as peculiar products of secretion.

The concretions form sometimes in great numbers at a time, and of small size, but occasionally in smaller numbers and of a size nearly as large as that of a hazel-nut.* Often they do not exceed the size of the head of an ordinary-sized pin, and they are rarely larger, judging from those we have seen, than a pea. These calculi were first examined by Dr. Wollaston, who found them composed of phosphate of lime, mixed with more or less of animal matter. Dr. Prout informs us that he has met with calculi from the prostate gland containing a considerable proportion of carbonate of lime, and with five or six which contained very little earthy matter, but which were composed chiefly of a substance having considerable analogy to cystic oxide.

These calculi, when small, are nearly spherical, and have a yellowish-brown colour: those of a large size are smooth and polished, and have the appearance of porcelain; precisely similar, indeed, to the phosphate of lime calculi. Dr. Prout is of opinion that these porcelainous calculi always origi-

* Vide Cyclop. of Pract. Med., p. 339.

nate in abscesses of the prostate gland. But there are not a few of them in Dr. Hunter's collection of such a size that they could not possibly have been deposited in any cyst of the prostate gland. These calculi sometimes give little uneasiness, and are not suspected till after death.

It is only when large, or numerous in one large cyst, or projecting into the urethra, that prostatic concretions give rise to the symptoms of stone; frequent, painful micturition, and discharge of mucus, from inflammation of the urethra and neck of the bladder.* They seem to be sufficiently often combined with stone in the bladder to lead us to suspect that the one disease contributes to the arising of the other; and, indeed, I consider that urinary calculi, stricture of urethra, or whatever other diseases, here situated, causing inflammation of the prostatic part of the urethra, and interrupting the free exit of the excretion of the prostatic ducts, dispose to the formation of calculi of this description. When severe symptoms are produced by prostatic calculi, dysury, stricture, sacculi, and inflammation of the bladder, all ensue: and, in extreme cases, where a large prostatic calculus, or a cyst containing numerous small ones, is discovered, it may be right to cut down to the prostate gland from the perinæum, and in the lateral method of litho-cystotomy, to remove such concretions.†

* Vide Crosse, *op. cit.* p. 34, *et passim*.

† Wilson (on Diseases of the Urinary Organs, p. 356) says, when prostatic calculi are very troublesome, and can be felt through the

A distinction to be kept in mind in respect to prostatic calculi is, that they are not urinary concretions, but are formed and may increase without the urine having access to them; they may, notwithstanding, rise to the orifices of the prostatic ducts, or get into, and be detained in the urethra, or pass retrograde into the bladder, becoming the nucleus around which a deposit from the urine takes place.

Concretions of another sort about the neck of the bladder ought to be noticed. In aged persons, particularly with hypertrophy of the prostate gland, a bladder diseased, and the veins about it and about the rectum varicose, concretions of phosphate of lime, varying in size from a pin's head to a kidney-bean, are often found in the veins; sometimes they present the appearance of a white pea, and an inequality or projection is observable, answering to the surface by which the body adhered to the coats of the vein. These concretions have no connexion with the urinary or any other excretions, and should not be regarded as calculi; they are a morbid growth from the coats of the vein, to

rectum, they may be cut out, as in operating for stone, by the gripe. When inclosed in a pouch towards the rectum, and not communicating with the urethra, it seems to me that they may be safely removed by an incision from the rectum, this bowel being held open by a speculum, at the time the incision is made. Sir B. C. Brodie, in his Lectures on Lithotomy, says you may extract prostatic calculi with Weiss's forceps. Sir A. Cooper (Surgical Lectures) cut upon the staff, down to the prostate gland, and removed numerous calculi, which had not only excited painful feelings in the perinæum, but a degree of mental irritation bordering on insanity.

which, at an early period, they are invariably adherent.

Their chemical composition is chiefly phosphate and carbonate of lime, and they approach nearer to ossific than to calculous concretions. Professor Meckel* has well represented these concretions; but I know of no English author from whom they have received the same attention.

Morgagni has taken notice of retention of urine arising from calculi in the prostate gland.† Calculi also sometimes form in or about the prostate gland, when, after lithotomy, the outer part of the wound heals sooner than the bottom. A kind of urinary fistula then ensues; and, as the extraneous substance is constantly exposed to the contact of fresh urine, it may increase to a large size. The diagnosis of prostatic calculi is seldom very clear. A retention of urine, or pain about the neck of the bladder, and frequent desire to make water, are the only symptoms, and these are common to several other affections of the prostate gland and urethra. When the finger is introduced into the rectum, the gland may indeed be felt to be enlarged; but the nature and cause of such enlargement cannot in general be distinguished. In one instance, however, recorded by Dr. Marcet, the calculi could be plainly felt through the coats of the rectum, and a

* *Tabulæ Anatomico-pathologicae*, auctore T. F. Meckel, fasc. ii. tab. xiv. fig. 4, 5. Tiedeman, Otto, and Lobstein, have treated upon these concretions, and met with them in the veins of the uterus, vagina, and spermatic cord.

† Cooper's Surgical Dictionary, p. 1117.

proposal was made to extract them by an incision in that situation ; but the patient did not accede to so judicious a measure. (Med. and Chem. Hist. of Calculous Disorders, 8vo. 1817.) When a calculus projects from the prostate gland into the urethra, the end of a sound will strike against it ; but then it can rarely be known whether the extraneous substance may not be a calculus that has passed out of the bladder into the urethra, or lies close to the neck of this viscus.

From the irritation caused by their presence, inflammation eventually sets up in the containing sac or sacs, the sides of which suppurate ; and thus it comes that by extension of the ulceration, prostatic calculi present themselves under the skin of the perineum, scrotum, or below the rectum. When this happens they are to be removed, and the fistulous aperture cicatrised in the usual way.

DESCRIPTION OF THE PLATE

PLA

In this plate, the whole of the human skeleton is
displayed, and the skull is shown in two views.
The pelvis is not dissected. The feet are shown in two views,
and labeled under the names of the bones.

DESCRIPTION OF THE PLATES.

PLATE I.

IN this plate, the whole of the mucous membrane is destroyed, and the bladder diminished in size. The prostate is not diseased. The patient was fifty-six years of age, and had laboured under the disease three years.

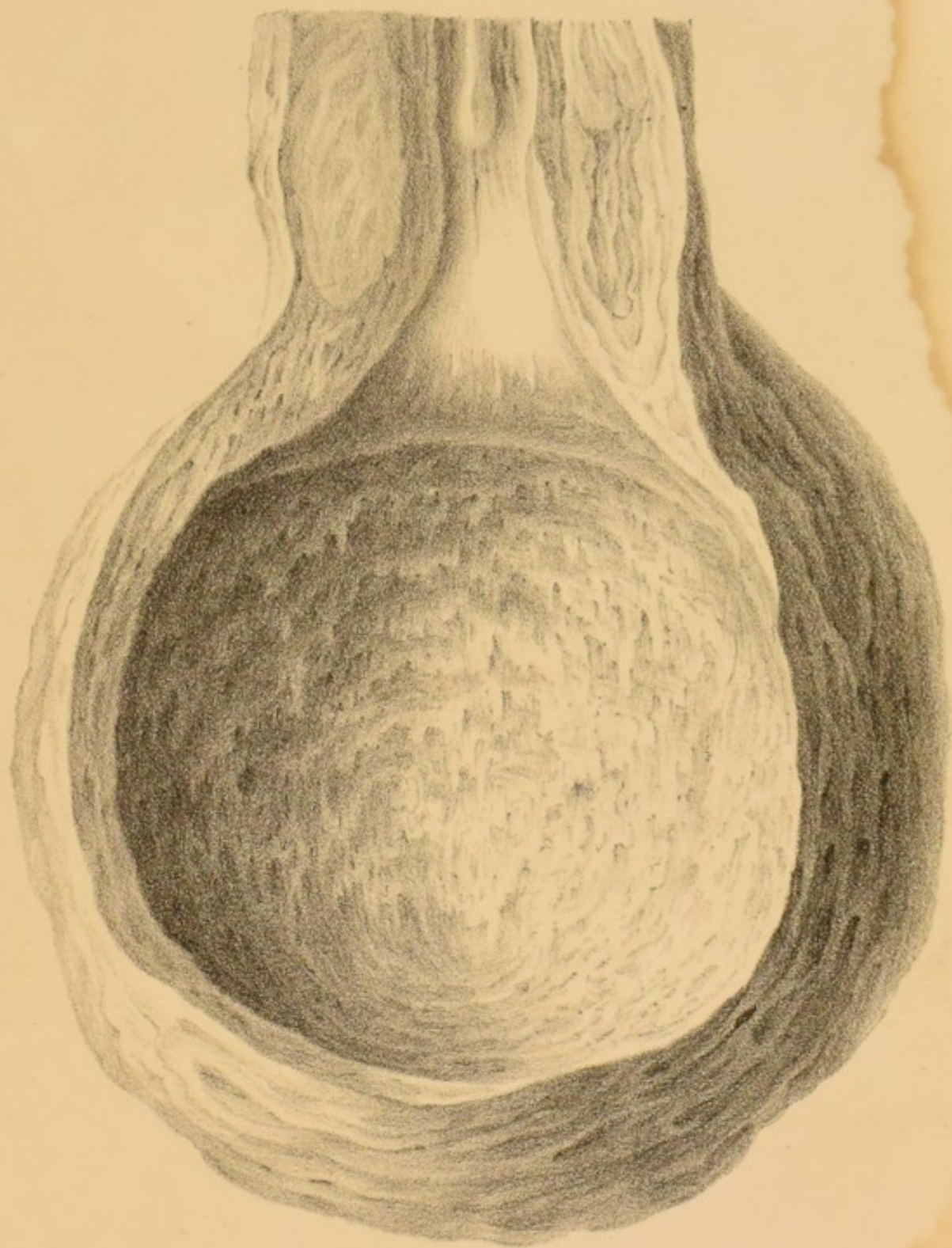
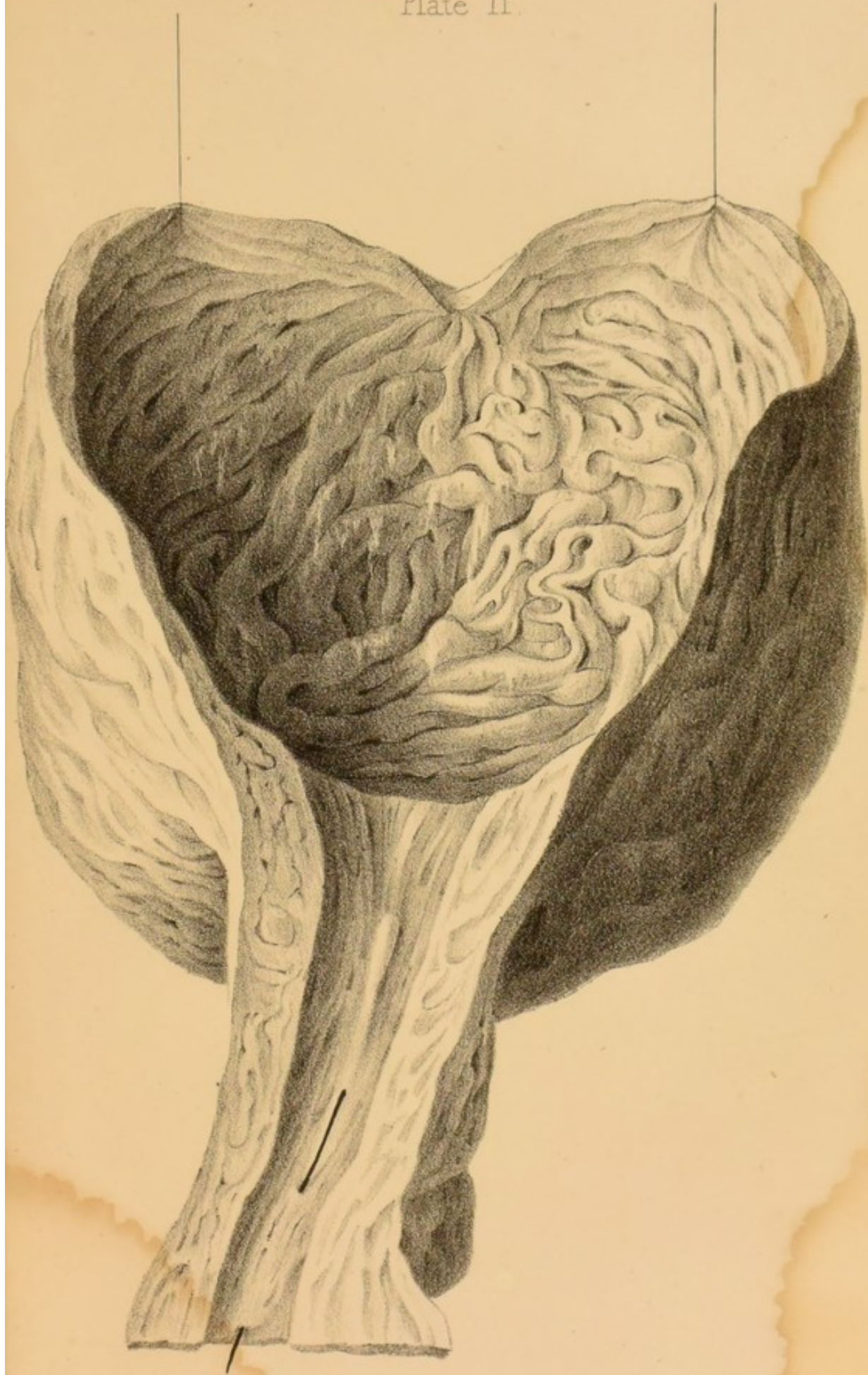




PLATE II.

THIS plate represents the bladder taken from a man who had suffered for some years from chronic inflammation of the mucous membrane of this viscus, produced by stricture. The muscular fibres of the bladder are in a state of hypertrophy, and the mucous membrane is, to a great extent, destroyed.

Plate II.



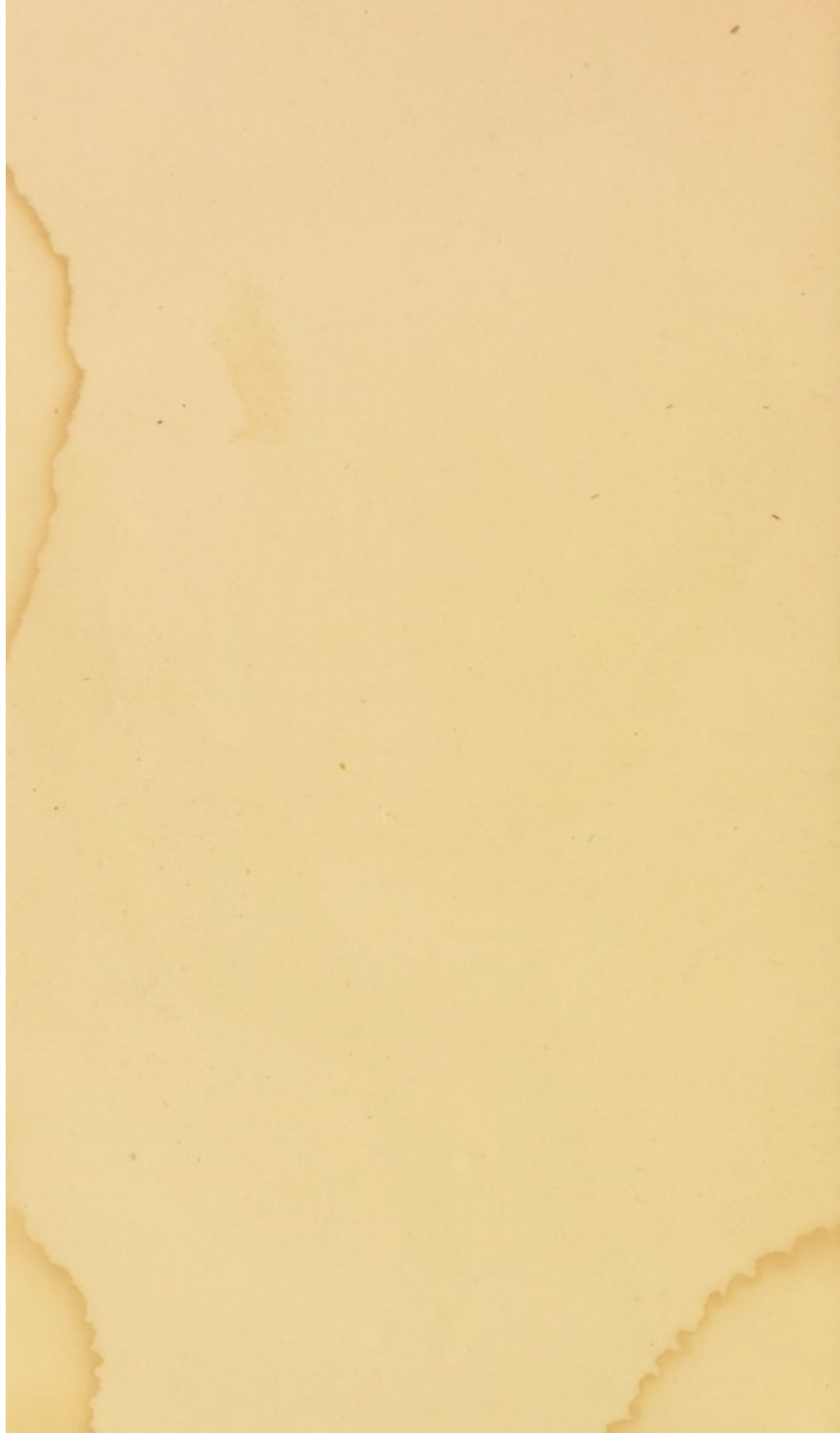
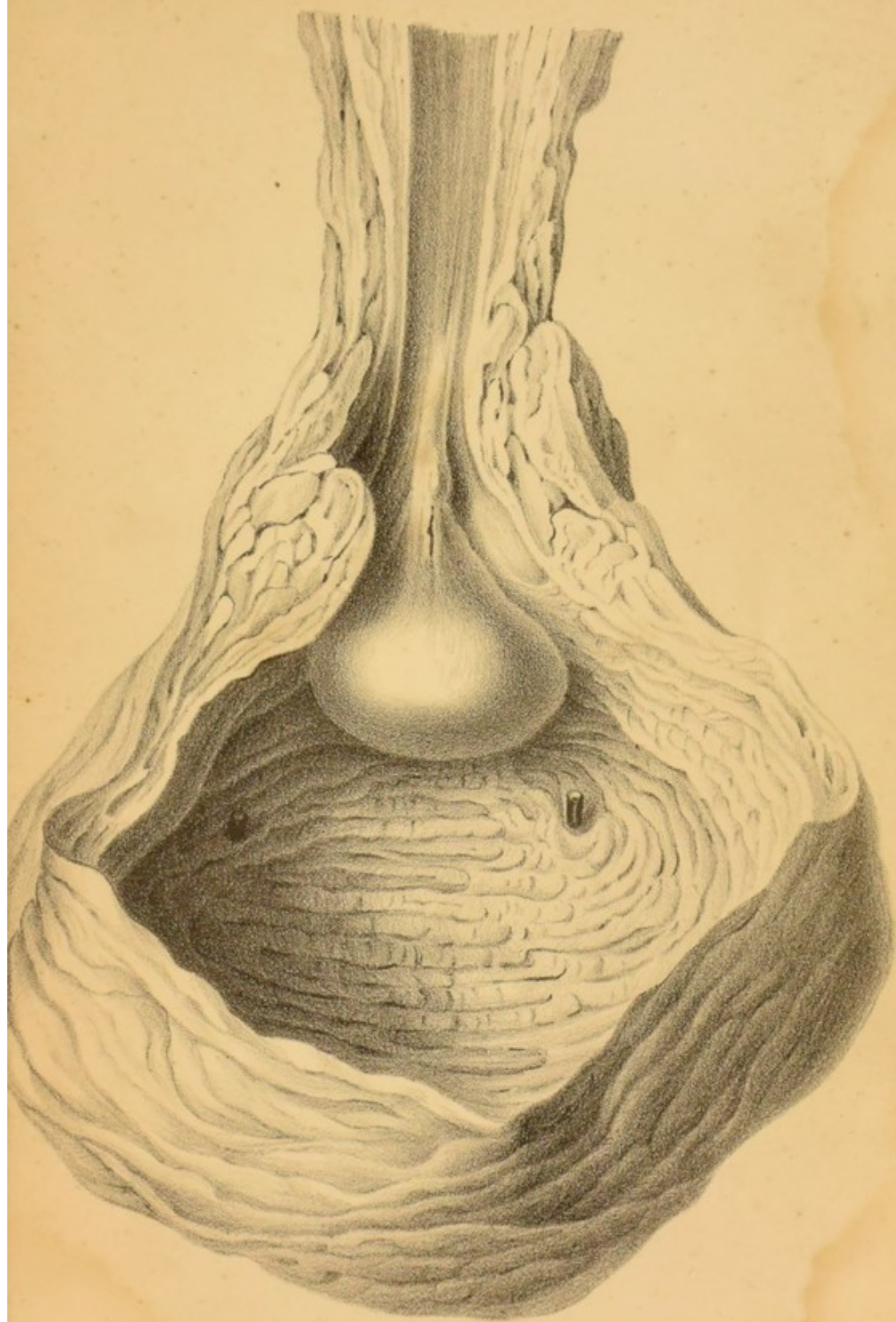
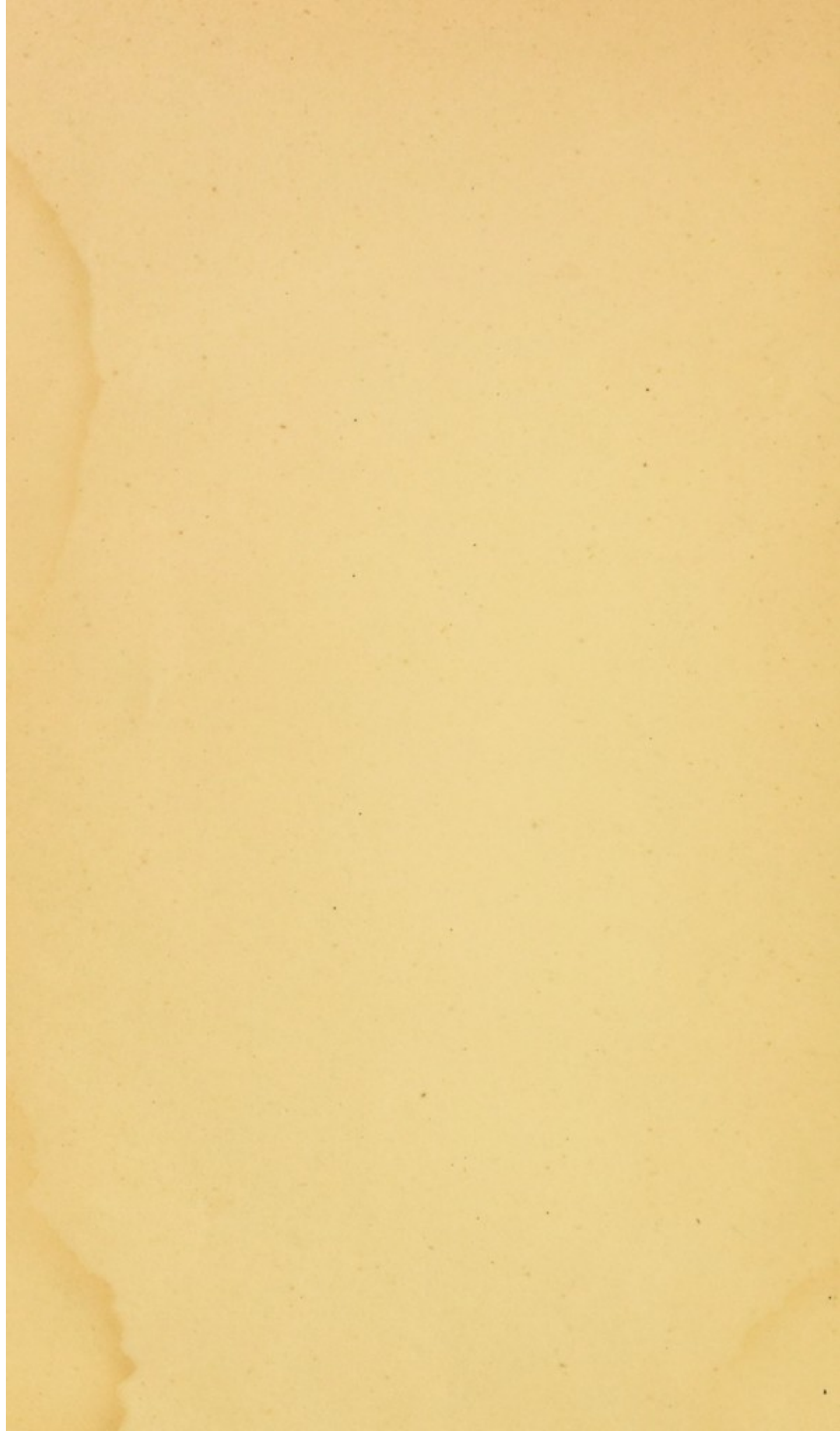


PLATE III.

THIS plate shows the enlargement of the middle lobe and its projection into the bladder. This specimen was taken from a gentleman sixty-three years of age, who had suffered from irritable bladder and difficulty in passing urine. These symptoms were relieved by the occasional introduction of the catheter. The patient died of apoplexy.



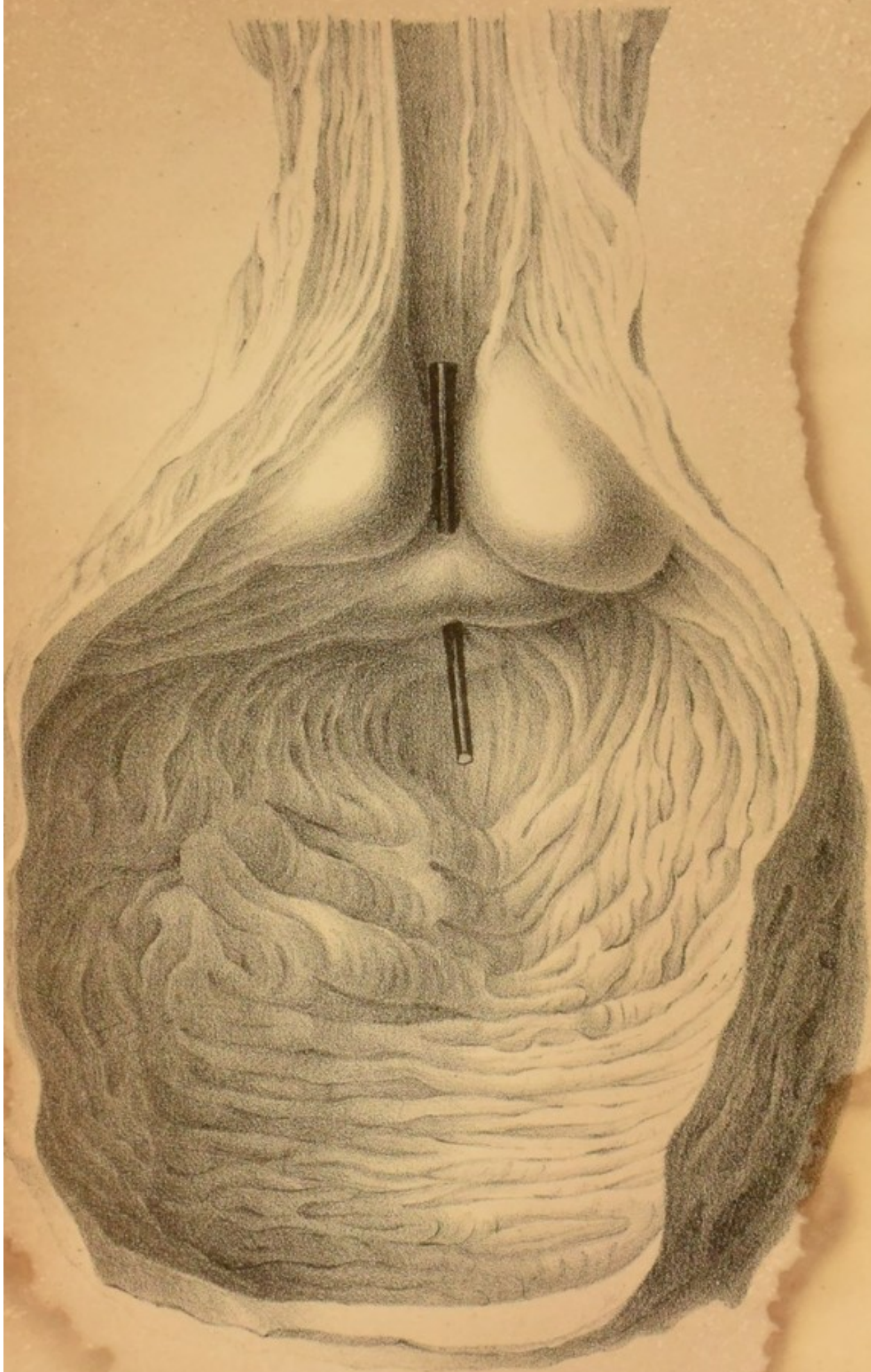


CHAPTER IV

The first of the three main divisions of the subject is the history of the subject. This is a very important part of the subject, and it is one which has attracted the attention of many writers. The second division is the theory of the subject, and the third is the practice of the subject. The history of the subject is a very interesting and important part of the subject, and it is one which has attracted the attention of many writers. The theory of the subject is a very important part of the subject, and it is one which has attracted the attention of many writers. The practice of the subject is a very important part of the subject, and it is one which has attracted the attention of many writers.

PLATE IV.

THIS plate shows enlargement of the lateral lobes, and incipient increase in size of the middle lobe. A bar or ridge is formed at the neck of the bladder, through which a false passage had been made by the introduction of the catheter. The bladder is increased in size, and its muscular fibres considerably thickened. The patient from whom this specimen was taken was near seventy years of age, and had suffered for some time before his death from vesical catarrh, the result of the prostatic enlargement.





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The author is a native of the State of New York, and was educated at the University of the State of New York, at Albany. He has been a member of the New York Historical Society, and has been a member of the American Historical Association. He has also been a member of the American Academy of Arts and Sciences, and of the American Philosophical Society. He has been a member of the American Society of Naturalists, and of the American Society of Ethnologists. He has also been a member of the American Society of Anthropology, and of the American Society of Linguists. He has been a member of the American Society of Musicologists, and of the American Society of Musicologists. He has also been a member of the American Society of Musicologists, and of the American Society of Musicologists.

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