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URINARY ORGANS

BY THE SAME AUTHOR.

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CLINICAL LECTURES

ON

DISEASES

OF THE

URINARY ORGANS

DELIVERED AT UNIVERSITY COLLEGE HOSPITAL

BY

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FOURTH EDITION

LONDON
J. & A. CHURCHILL, NEW BURLINGTON STREET
1876

PREFACE

TO

THE FIRST EDITION.

I THINK it right to say that these Lectures were never committed to writing by me. They were delivered in a colloquial style, after the arrangement of the subject had been well considered, and were reported verbatim by one of our best shorthand writers. The copy furnished by him was corrected, some of those tautologies which seem to be necessary in teaching removed, and then sent to the *Lancet*. But each Lecture still required more space than was available in the columns of a weekly journal, and I further reduced it, perhaps one-fourth. I now present, in one small volume, at the suggestion of, I may truly say, numerous correspondents, known and unknown to me, the corrected copy in full, unchanged in form, and therefore unshorn of the familiarities which the conversational style peculiar—and, I believe, appropriate—to the class-room demands. And I do this, also, because I prefer that these Lectures, originally short, should not suffer any abbreviation, and because I desire to offer, not merely to the members of my own clinical class, but to students at large, some of the fruit of a long and careful study in that field of practical medicine, in its widest sense, to which they relate.

35, WIMPOLE STREET, LONDON,
November, 1868.

PREFACE

TO

THE FOURTH EDITION.

I HAVE continued to give this course of Lectures every year, making such modifications and additions as our increasing knowledge has demanded. The present edition contains the course delivered by me at University College Hospital in the session of 1875–6, and comprises therefore all the most recent alterations, as well as several new Lectures not in the previous editions, making twenty-four in all, instead of twelve, as in the first edition. I have added one Lecture only not given in the wards, but at Birmingham, inasmuch as it is essentially clinical, being a summary of the preceding Lectures on calculus of the bladder. I have also appended brief, but, I think, complete practical rules for the clinical examination of the urine, which I originally arranged for the class, with drawings of the deposits, made by myself. My aim has been to produce in the smallest possible compass an epitome of practical knowledge concerning the nature and treatment of the diseases which form the subject of the work; and I venture to believe that my intention has been more fully realized in this volume than in any of its predecessors.

35, WIMPOLE STREET, LONDON,
February, 1876.

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DISEASES

OF

THE URINARY ORGANS.

LECTURE I.

INTRODUCTORY: THE DIAGNOSIS OF URINARY DISEASES.

GENTLEMEN,—I propose to give a course of lectures on the Surgical Diseases of the Urinary Organs, and my object will be to afford you that information which will be most useful at the bedside. I shall not have much to say about anatomy or physiology, since that would make the course much too long. In the systematic course of surgical lectures at the College it is impossible to communicate a knowledge of all those practical manœuvres, those little attainments and resources, in aid either of diagnosis or of treatment, which one arrives at by experience, and which are so valuable in practice hereafter. Nor is it possible that you should acquire all this at the bedside, since no hospital can furnish patients sufficient for the purpose; but you can learn a great deal by the conversational communications which are made here. It will be my aim to render available the result of experience which it has cost me years to acquire, and I shall do my best to furnish to you what of it is thus communicable during the few hours we may devote to the purpose during the session.

I have selected this course of clinical lectures on the urinary organs for two reasons.

First, because my wards always afford *groups* of these cases; we can always find there abundant material for consideration at the weekly clinical lecture.

Secondly, because I do not know any set of diseases that are so successfully dealt with if you understand what you are about, or any in which you may make such dangerous mistakes if you are not well acquainted with them. Neither do I know any diseases in which you can afford so much relief to suffering, none in which a skilled hand can do so much for the patient, and none in which you can gain more credit for yourselves. It is therefore exceedingly important that you should be thoroughly acquainted with them.

I hope, in this course of lectures, to carry you through the greater portion of the list of subjects named in Part I.

I. Diseases of the Urinary Passages.

a. Diseases essentially inflammatory.

Urethritis,
Prostatitis, } acute and chronic.
Cystitis,

b. Diseases essentially obstructive.

Stricture of the urethra.
Hypertrophy of the prostate.

c. Calculous Diseases.

Of the urethra.
Of the prostate.
Of the bladder.
Of the pelvis of the kidney.

d. Tumours—malignant and non-malignant.

Of the prostate.

Of the bladder.

II. Diseases affecting the Secreting Organs.

All organic changes in the kidney; also those altered conditions of the urine which depend on constitutional disease, such as Bright's disease and saccharine diabetes.

But before commencing, I shall ask you to consider for a moment the title I have affixed to this course—viz., "The Surgical Diseases of the Urinary Organs."

Now, you may inquire, "What are the surgical diseases of the urinary organs, and what are not?" To my mind it is very easy to tell you what are surgical diseases of those organs, but less easy to tell you what are not so. Look at the list before you, and see where the line should be drawn. Certainly the first division belongs wholly to that class—all diseases of the urinary *passages*, excluding the kidneys, which we will assume to be secreting organs. Undoubtedly all that part belongs to the surgeon. The physician, conventionally, claims the second; but since it is impossible to make a diagnosis of any of those diseases without well understanding the whole, and as the physician does not make a physical examination by means of an instrument, I am compelled to regard all affections of the urinary organs as naturally coming within the province of Surgery. This statement may not be universally received; but when we have considered the matter, we shall see that it is absolutely impossible to make a trustworthy diagnosis of urinary diseases without a practical familiarity with the use of the sound or catheter. I do not say that the physician is

incapable of doing this; but, conventionally, the necessary manipulations are not practised by him. And you can no more treat diseases of the urinary organs without the ability to use these instruments than you can treat diseases of the chest without understanding the use of the stethoscope, and without being practically familiar with the indications which it affords.

The first step in our course is naturally that relating to Diagnosis. I say almost nothing about the pathology and treatment of any one of these diseases to-day. The question before us now is diagnosis; and I need scarcely remind you that this is the most important thing in all diseases—to know accurately what you are about to treat: there is then very little difficulty as to the management. Many books can teach all that is known of one; no book can teach what you must know of the other. Diagnosis can only be accomplished by the application of certain rules after some practice. It is the first thing to learn and to use; it is the last thing to be perfectly acquired. Indeed no man, let him live as long as he may, will ever be a perfect diagnostician. He may approach perfection; but if he is a diligent student, as he ought always to be, he will improve his powers of diagnosis as long as he lives. That is the reason why age or experience gives value to an opinion. Long and intelligent observation and extensive experience enable a man to arrive at diagnosis with a greater certainty than the younger practitioner can possibly attain.

What is Diagnosis? It consists, first of all, in the acquisition of facts; and, secondly, in obtaining legitimate inferences from those facts.

Now the acquisition of facts is one of the most difficult

things in the world. No two persons ever agree in their statements descriptive of an occurrence to which they both have been witnesses. If I bring a case of disease before you here, and ask ten of you to take as many histories of it, I will undertake to say that each one will materially differ, and that I shall get ten histories, varying from each other in some important particulars. Each will be approximately true; none will be absolutely correct. You must then diligently learn to observe, and to do so well requires special qualities and much practice. Is it not a very striking illustration of what I have said, that if two witnesses relate precisely similar stories of any given event, the suspicion of collusion is always instantly suggested, and is, indeed, very naturally aroused? It has often struck me that the qualities which men of our profession require, and which we should endeavour to cultivate, are precisely such as are necessary to those who are engaged in the exercise of the legal profession; and the men who are really successful in either profession have much in common in intellectual character and attainment. In our profession, equally with that of the law, careful examination of the statement, acute and subtle cross-examination of the witness, and a keen pursuit of the simple fact are essential; and, finally, a calm judicial habit of weighing the facts when obtained. And in both professions the issues raised are equally weighty, and demand in either case the highest qualifications in the individual.

But next, I have not only to call your attention to the necessity for making a careful and accurate diagnosis, it is equally important that you should learn to make a rapid one. For it must be admitted that our proceedings differ from those of the law in this respect; for while—as we have

seen not so long ago—several months may be devoted to the critical investigation of a legal claim, and a considerable period of time must mostly be expended on the proof or disproof of any allegation, our decisions are required without delay. While the doctors are deliberating the patient is dying.

Hence the ability to make a diagnosis is not sufficient; the *Art of making a rapid diagnosis* must also be attained. Thus, when called to the bedside, your action must often depend on the first three or four minutes of your interview. It may be easy to go home, quietly think over the case, pull down the authorities, and say, "I think the patient has so-and-so." That will not always do: it may do in some cases, and it had better do, than that you should attempt to treat the case without having made up your mind as to the diagnosis. But that which will make you successful, that which distinguishes between the intelligent practitioner and him who is not so, is the ability to make a rapid as well as an accurate diagnosis of the case before him.

To this end, and what I have to say applies to all departments of our art, I advise you always to pursue a uniform method. Order and uniformity are essential elements in directing the necessary investigation; and after much thought and experiment, for my own private guidance as well as for yours, I have adopted the following system. Relative to the class of diseases we are studying, there are three methods of obtaining the facts required:—Firstly, by questions of the patient; secondly, by physical examination of the body; thirdly, by examination, chemical and otherwise, of the secretions.

First, by questions. There are four chief questions which I always employ, and always in the same order.

They ought, with the minor inquiries which branch out of them, to determine six out of seven cases which come to you. They relate to four signs and symptoms more or less met with in patients affected with complaint in any part of the urinary organs. Frequent micturition; painful micturition; deviation in the character of the urine itself from the healthy standard; the addition of blood to the urine.

The first question, then, which I invariably ask of any patient so affected is, "Have you any, and, if any, what frequency in passing water?" Then, as a branch of that question, springing out of it, I ask whether the frequency is more by day or by night, or influenced by movements, or by any particular circumstance? How the question applies I will tell you afterwards.

Then, secondly, I ask whether there is pain in passing urine, and whether before, during, or after micturition? Inquire also if pain is felt at other times, and if produced or aggravated by quick movements of the body. The locality of the pain is also to be precisely ascertained.

Then I ask, as a third question, "Is the character of the urine altered in appearance, or is there anything unusual in the stream itself? Is the urine turbid or clear?" Possibly the patient will tell you that it is turbid, but you find, on questioning further, that it was passed perfectly clear, and only became thick after cooling or standing. Also, as arising out of this, you may often ask, "Does it vary much in quantity?" noting of course the specific gravity. The healthy standard, both as regards quantity and density, however, must be allowed very extensible limits, and both, I need not tell you, are very important elements in regard of renal disease. Then, as regards the

stream itself, it may be small, forked, or twisted, or it may stop suddenly when flowing.

The fourth and last question is, whether blood has been passed in any way with the urine; whether the mixture is florid or brown, light or dark; whether the blood and urine are intimately mixed, or whether the blood is chiefly passed at the end or at the beginning of making water; or, lastly, whether it issues independently of micturition altogether.

These are the four questions; and let me remark, that the value of the answers you get will depend very much upon the way in which you put the questions. The patient is not always self-possessed, or he does not clearly understand the nature of the question you put. It is necessary to be very precise and very distinct in your questions if you wish to get accurate answers. Now you will say, how do I apply these questions to the list of diseases before you?

First question—Frequency of passing water.

There is no serious affection of the urinary organs, except one or two which I will name hereafter, in which you have not more or less frequency of passing water. Thus the following is an exception: A man may have stricture to a considerable extent; the stream may be rather narrow, and he may not for some years complain of frequency of passing water, although the symptom will appear sooner or later.

Now I wish you to observe that I have classified these diseases that we may deal with them more easily. At the head of our list there are the inflammatory diseases—inflammation of the urethra, of the prostate, and of the bladder. In all these you have frequency in passing water.

Not necessarily, however, in urethritis, until it reaches the distant part of the canal near the bladder; and this is the second instance of exception which I referred to just now. I do not propose to enter upon the subject of urethritis here, as you have frequent opportunities of studying it in the out-patients' room. I am now only referring to this symptom of frequency of passing water as existing more or less in all these three diseases at some time or another.

Firstly; in Hypertrophy of the Prostate you have it, and it is remarkable that it is more at night than in the day.

Secondly; in Chronic Prostatitis it is usually present to a small extent; in Cystitis it is, of course, a characteristic symptom. I name these together because they are so intimately connected, that the bladder can scarcely be affected without the prostate being more or less involved.

Thirdly; in Calculous diseases frequent micturition is prominently met with, and generally its degree is in proportion to the amount of movement permitted to the patient.

Fourthly; Tumours, malignant and non-malignant, are of course attended by the same symptom.

Fifthly; in Pyelitis, and in almost all organic changes of the kidney, in Bright's disease, and in Diabetes, there is frequency of making water. Whenever the natural characters of the urine are altered before it reaches the bladder, the secretion produces irritation. This fact is worth dwelling upon for a moment, as it is not uncommonly overlooked.

Thus, diluted or watery urine is often regarded as unirritating; on the contrary, it is not generally well retained by the bladder. The bladder is, as a rule, never so content as when it contains a urine of average, or more than average, specific gravity. Some persons who are nervous,

and particularly hysterical patients, will pass urine which is quite pale, almost like natural water, and the bladder is always more or less uncomfortable from it. Of course, in Diabetes, you have not only the character of the urine altered, but the quantity much increased, with frequent micturition as the necessary consequence. And I may remark that it is chiefly in renal affections that increase in quantity takes place; while, on the other hand, suppression of urine is always a malady of the kidneys.

The second question has reference to Pain.

The attainment of precise knowledge relative to the nature and seat of pain, will carry you far on your way towards a diagnosis.

In Prostatitis there is usually pain at the extremity of the penis, and felt at the end of passing water—less severe, but resembling somewhat that of stone; as the bladder contracts, when empty, on the tender prostate.

In Cystitis the pain is usually before micturition, because the inflamed mucous lining of the bladder will not bear much expansion, and is sensitive on being distended, as all mucous membranes are when inflamed [of which a sore throat is a familiar example]; and hence the organ frequently endeavours to get rid of its contents. The usual seat of pain is just above the pubes. When cystitis is acute, pain may be felt in the perineum also; but in chronic or subacute cystitis it is supra-pubic, and not at the end but at the beginning of making water, unless the prostate is affected, and then the tender prostate gives a little pain at the end, as I have just said.

In Stricture of the urethra there is often pain about the seat of the obstruction, an idea of which you may obtain by a simple experiment. If, when passing urine with a full

stream, you suddenly narrow the passage with your finger, so as to diminish the stream one half or more, you will experience an acute pain.

There may be pain with Hypertrophy of the prostate, inasmuch as this is frequently associated with chronic cystitis, when the pain is before making water, and not afterwards—differing in that respect from stone. The bladder wants to get rid of its contents, and can do so but slowly, on account of the enlarged prostate, which stands as a barrier in the way. During its first contractions, which expel but little urine, there is often severe pain above the pubes and deep in the perineum; but when a third or a half of the contents has issued, the patient is relieved. When the pain is sudden and very severe before the patient can pass urine, he speaks of it usually as "spasms." This term almost always implies that the bladder is distended and urgently demands relief: but the same pain may sometimes be caused in a bladder emptied of urine but containing a foreign body, whence involuntary expulsive efforts are made.

I shall not dwell upon Calculous disease of the urethra. The calculus is only a temporary lodger there, and as it can often be felt externally by the hand, there is rarely any difficulty about the diagnosis. Calculous disease of the prostate is also rare. I shall not complicate what I wish to be a simple matter by dwelling upon it, but call your attention to the commoner condition of Calculus in the bladder.

In Calculus of the Bladder the pain is quite distinct in its character: it is felt at the end of passing water, because, the bladder being emptied, the rough surface of the stone is left in contact with the mucous membrane, doubtless that covering the neck of the bladder, which is unquestionably

a sensitive spot. As soon as sufficient urine has trickled down into the bladder to separate the coats from the stone, relief is obtained. Then the pain is felt at the end of the penis, within an inch of it, about the base of the glans. Furthermore, the pain is increased by movement: in other complaints it is not necessarily so. Put a patient in a rough-going vehicle, or make him jump from a step, or perform any rapid movement, and instantly he feels severe pain, probably at the neck of the bladder, but also and chiefly at the end of the penis. In prostatitis, inasmuch as the neck of the bladder is involved, there is usually some pain at the end of the penis, which is a reason why chronic inflammation of the prostate is sometimes mistaken for stone.

With regard to calculus of the kidney, I have little to say here. Of course you have pain referred to the locality, right or left, not often to both kidneys; there is tenderness also, and much increase of pain on movement. It is usually on one side only, and perhaps more frequently on the left than on the right side, and it is often felt over the hip and towards the groin of the affected side, although the calculus is fixed, and there may be no reason to believe it will pass by the ureter. In affections of the kidney, too, the pain is sometimes felt only or chiefly about the bladder and urethra, a circumstance never to be forgotten.

One cannot, perhaps, say much about any characteristic pain in connection with tumours. They may be situated in any part of the bladder; may obstruct the urine more or less; and accordingly as they produce cystitis, and obstruct the flow of urine, pain will be experienced.

The third question is as to the characters of the urine itself.

Now, suppose your patient has told you that he has frequency in passing water, pain at the end of the penis and at the neck of the bladder, and that the pain and frequency are aggravated by movement. You may begin to say to yourself, "Perhaps the man has stone in the bladder, and I shall have to sound him." Two questions only have already put this probability in your way, and you interrogate him as to the character of the urine. See how this carries you a step further. We recommence our list as to this inquiry.

A preliminary remark, however, about examining urine. I do not propose to teach you here at present a systematic mode of doing this; because it is supposed not to be in my department, and you would only be repeating that which it will be your duty to learn elsewhere, and I hope you will do so thoroughly. But there is this hint which I may at once give with respect to it. Whenever you want a specimen from your patient to examine, do not tell him to send you a bottle of it passed in the usual way, or you will get a mixture of often doubtful value. What you require is the secretion of the kidneys, plus only anything there may be in the bladder; you do not want it complicated with anything which may come from the urethra. Let the man pass two or three tablespoonfuls through the urethra first, so as to sweep out whatever may be there, which may be thrown away, or be put into a separate bottle, after which you will get a pure specimen—at any rate one of which you will know the source. You will have the renal secretion, plus only whatever deposit may be produced in the bladder. Suppose the patient has gleet or chronic prostatitis: there will then be a quantity of muco-purulent matter in the urethra. If all this be carried into one

vessel with the urine, how will you determine the different products, and decide, by the eye or by the microscope, what has come from the urethra, what from the prostate, and what from the kidneys? You cannot do it; but if you get rid of the source of error by flushing the urethra, so to speak, by passing the first two or three tablespoonfuls into a wineglass, while all that follows is passed into a separate vessel, such as a tumbler, you will generally have a sample of urine that you can rely upon for examination. If I felt disposed to indulge you with gossip, I could tell you stories of the gravest blunders committed by not attending to that simple point. I can at all events tell you that I have more than once known a patient treated for pyelitis who had nothing but a profuse discharge from the urethra; how the urine had been sent twice a week for examination in a bottle scrupulously made clean for the purpose; and because a quantity of pus was found in it, the patient, who had some symptoms corroborating that view, was treated during some months for pyelitis; how another observer at length found out that the whole of the matter came from the urethra, so that when the urethra was flushed into the first glass all the matter was there, and that the remaining urine was clear and healthy; and, finally, that the "pyelitis" soon disappeared under local treatment of the urethra. I do not know whether any one else may tell you of that simple mode of determining this matter; and I will assume that in the future you will none of you make such a mistake as that I have mentioned. I only know too well how necessary it is to call attention to it, and how seldom it is done.*

* See further remarks on this subject at the close of the lecture on Hæmaturia and Renal Calculus.

Referring first to prostatitis, it is always associated more or less with shreds in the urine, which come from the prostatic part of the urethra; and if the urine is separated in the manner described, you will find that the whole of the thick matter will be in the first glass, while that remaining behind will be clear. How would it be with regard to calculus? You might have muco-pus in the first glass, but you would have more in the second from the bladder. It is not common that there is calculus in the bladder without the production of unhealthy mucus, and also of some pus from the lining membrane of the bladder itself. Occasionally, but rarely, I find a man with stone in the bladder having perfectly clear urine. Not commonly do I sound a man for stone who has clear urine, unless he has marked symptoms, because the presence of stone in the bladder almost always gives rise to a certain amount of cystitis, and there is deposit in consequence. If the patient passes shreds of thick matter in the first glass, and the urine left behind is clear, and has symptoms like those of stone, rely upon it it is a case of chronic prostatitis. In calculus of the bladder there is nothing to note about the nature of the stream, except that it stops suddenly sometimes; but this is by no means a common symptom.

The character of the urine in one of the forms of chronic cystitis is well known. There is at the bottom of the vessel a thick mucilaginous deposit, which does not issue in a stream, but falls out in a mass. In another and very common form of chronic cystitis, it is simply cloudy, without any of the dense deposit described. In acute cystitis the urine is cloudy, and there is a considerable deposit of pus.

In stricture of the urethra, unless chronic cystitis has

been set up, there is no deposit from the urine; but there are usually a few shreddy deposits in the first glass. Here the character of the stream is important. If, when the patient is passing urine, you see a very thin, small spluttering stream, or urine issuing only in drops, you will know that there is an obstruction, most likely stricture; because, although in hypertrophy of the prostate, you may have the stream much diminished, it will be a stream which falls downwards from the organ. In stricture, force may be brought to bear on the stream, so that, however small it may be, it is often fairly propelled; but in hypertrophy, in which the expelling apparatus is involved, the muscles cannot act, and, therefore, however large or small the stream, it generally falls more or less perpendicularly.

With regard to the débris of tumours found in the urine, the microscope sometimes, not often, throws light upon their nature. No doubt you may see cancer-cells in the urine, but it is difficult to identify them. I have seen such cells declared to exist by good observers in cases in which cancer was not present. Young pavement epithelium is easily mistaken for them.

Going upwards from the bladder, we may note pyelitis, more or less chronic—a disease in which the condition of the urine is only one symptom among many others which must be observed before arriving at a conclusion. In all cases you will ascertain with precision if albumen or sugar is present in the urine by the appropriate tests. But do not make the very common blunder of inferring organic disease of the kidneys, because you find albumen in the urine, the source of which is pus or blood, which may have issued from any part of the urinary passages. This subject will be fully discussed hereafter in the direc-

tions for the examination of the urine at the end of this volume.

The next question is, "Do you pass blood?" and this will bring you very near indeed to an opinion on most cases—not quite, because in any case it may be necessary to sound before the diagnosis is complete. In prostatitis there is often a little blood at the end of micturition, as in stone; in cystitis there is not necessarily blood, unless it is acute and far advanced; in stricture of the urethra there is not necessarily blood; and in hypertrophy of the prostate not necessarily. You may have it often only as the result of instruments. The inquiry respecting blood tells most in the question of stone. Just as in phthisis a large proportion of patients have hæmoptysis at some time or another; so in about the same proportion of cases—say four out of five—there is some blood observed at some time during the history of a vesical calculus.

I wish you to pay particular attention to these questions, because I shall assume acquaintance with them to underlie much of what I have to say hereafter. What it is necessary to add with regard to observation by the eye, by the hand, and by instruments will come under each particular subject hereafter, and I will only briefly allude to it to-day.

By the eye you observe mainly whether the bladder is distended or not, and you are assisted in ascertaining this by palpation and percussion. The lower part of the belly is often exceedingly prominent in cases of retention. You examine the perineum and scrotum also, with a view to extravasation of urine, perineal abscess, fistula, &c. The condition of the glands in the groin is occasionally a significant fact first noted by the eye. So also is the condition of the external meatus and parts adjacent.

By means of touch you attain a knowledge of the size and form of the prostate on introducing the finger into the rectum; or of tumours adjacent; of the presence of induration or fluctuation within reach of the finger; and of the degree of sensibility there. Also of the situation of an instrument introduced; the presence of false passages or of fistulous openings leading into the bowel. The size and situation of a calculus may be sometimes noted with advantage in this manner.

And now we come to the question of instruments. The instrument is to be regarded as a long finger, as an extension of tactile sensibility. The finger is not long enough to search the narrow passages, and we lengthen it therefore by means of an instrument. By a similar analogy we may augment our power of vision by means of the endoscope—whatever that may be worth, a matter we shall presently consider.

Suppose then such a case as that to which I have already referred, in which there are frequency of passing urine, pain at the end of micturition, pain on any considerable movement, thickening of the urine, blood passing occasionally, but more on movement—you regard it as highly probable that the man has stone. You cannot arrive at a certainty without instruments. You may have almost all these conditions produced by certain changes in the kidney and in renal calculus, and you cannot distinguish them unless you skilfully explore the bladder with a sound. When I claim great value for this instrument, quite understand that I am by no means desirous that in the case of every patient who comes to you and complains of some frequency in making water, or pain in the act, you should say, "Lie down, and let me pass an instrument." Perhaps the surgeon may be

apt to abuse a little his power of passing instruments: it should never be done unless it is absolutely necessary. I hold that an instrument, *per se*, is an evil—a very small one or a considerable one, according to the manner in which it is employed—and that it is never to be used unless there is good reason to believe that a greater evil is present which it may mitigate or cure. But when your patient has the symptoms named, you will be doing him an injury unless you resort to it. In cases of stricture the instrument is also necessary, for the purposes not only of diagnosis but of treatment. It is equally necessary in order to ascertain the condition of the bladder itself, as to the presence of tumour, the growth into it of hypertrophied prostate, whether it contains fluid or not in certain conditions, &c. Thus a patient may make water very frequently, exert all his force, be very certain that he has emptied the bladder, and yet be quite deceived. How can you determine his condition? There is a prominence above the pubes which you have no doubt is a distended bladder; but it is just possible that it may be a solid tumour. You cannot know whether the bladder is emptied unless you pass an instrument. Many a man has had an instrument introduced into the bladder immediately after he has passed as much water as he could, and a quart is found to have been left behind, although his own sensations led him to believe that he had expelled every drop. We shall see more of this when we come to the subject of retention of urine and hypertrophy of the prostate.

Lastly, I will take the opportunity of showing you that the eye may be assisted to a certain extent by what is called the endoscope, which is simply an instrument that we have long been in the habit of passing into various

cavities of the body—the ear, the vagina, the rectum—for the purpose of bringing reflected light to bear upon the interior of those cavities. For some years past this instrument has been employed for the urethra. It is five-and-twenty years (1875) since I first saw the endoscope so applied. This was in the hands of Mr. Avery, of the Charing Cross Hospital. As I was turning my attention somewhat to this subject, he asked me to see some of his patients, and a new instrument he was then making. He showed me a long tube, precisely similar to this which I hold in my hand, with certain arrangements enabling one to see deep portions of the urethra. He showed me cases of stricture, but I do not think he looked into the bladder. He paid a great deal of attention to the subject, and the instrument was brought by him to a certain state of perfection; unhappily, however, his death occurred shortly afterwards, and the thing was lost sight of here. Various attempts have been made with the same object, long before and since, but I do not know that there is anything on this table which is very much superior to what Mr. Avery showed. Within the last few years M. Desormeaux, of Paris, has paid great attention to the endoscope, and has perfected one of his own, consisting of a similar tube, but with different appliances. The various modes in which light is applied constitute the differences between the various kinds of endoscope. In all of them there is a tube of this description to pass into the cavity. Fifteen years ago I had an endoscope of M. Desormeaux's, and exhibited it in the hospital—the instrument which you see here. Dr. Cruise, of Dublin, has brought it to greater perfection, and has produced a better instrument than we heretofore possessed. This also is here, and you have often seen it in the wards, applied by

me both to the urethra and to the rectum. I may tell you at once, that if a man has a good and a tolerably practised hand, with a fair share of intelligence, I do not think he will gain a great deal by the endoscope; and if he has not, I think it will be of no use at all. There are some few cases in which he may find it of value; but do not expect that the endoscope is to work marvels in the diagnosis of surgical diseases of the urinary organs. In ninety-nine cases out of a hundred you can arrive at the necessary information without it. And it is not the easiest thing in the world to apply. As already remarked, a man should not be put unnecessarily to the pain and inconvenience of a sound or a catheter; but examination by the endoscope is a somewhat more irritating and tedious process. In certain exceptional cases, in which you are unable to arrive at a conclusion without it, you may perhaps employ it to some advantage. Now, here is a patient on whom I have never used it, and whose case will offer a certain test of its power. The man before you had an exceedingly bad stricture of the urethra, which I cut internally last Tuesday week. He is now perfectly well. He could not pass a drop of urine before the operation, but now he is able to pass it naturally; and you will agree with me that a great deal must have been done last Wednesday week to make that change. I cut through the strictures deeply, and now we shall see whether we can find the cicatrices. I shall use Desormeaux's endoscope, illuminated by Dr. Cruise's lamp.—You see we have now made a careful and prolonged examination. The urethra is of a more dusky red about the part which has been affected, but that is all which can be observed. Changes in the colour and texture of the mucous membrane of the urethra are those which are most

easily seen, and which it may be sometimes of importance to note. The orifice of a stricture may be sometimes seen, but the result is without practical utility.

Very little can be seen by it in the bladder, because more or less urine must always be present, and urine too which is usually cloudy, or containing blood. But the end of the instrument will often produce enough blood to obscure the tiny field of vision available, especially if tumours or other local diseases are present. There is no doubt that a calculus may be easily seen, or rather the small portion of it upon which the end of the sound impinges; but I have never gained anything by the sight. A calculus smaller than a pea may be easily found by delicate sounding, and an audible note elicited from it, more easily than you can see it through the endoscopic sound. I may mention that no one has yet been able by its means to identify the verumontanum, and if you cannot see the verumontanum, I think it is quite possible that minute pathological changes will often escape you.

Perhaps I ought to mention that a very simple endoscope has been designed by Mr. Warwick, which may be used with ordinary gaslight or with sunlight. It certainly seems, on comparison, to effect nearly as much as the larger and more elaborate instrument.

It is impossible to discuss now that large and important department of diagnosis which comprehends the various modes of examining the urine. It demands a separate lecture, to be given at the end of the course.

LECTURE II.

REMARKS ON THE STRUCTURE AND FUNCTIONS OF THE MALE URETHRA.

In view of a consideration of the more important affections of the urethra, with which I shall naturally commence, I desire to depart from my usual habit a little to-day, and to speak more at length on a topic which I always allude to slightly, but not otherwise, because it is not part of my plan to teach anatomy and physiology here. But I find it necessary to complain of what I will speak of as the "too mechanical method" of treating urethral diseases, which I think has been obtaining of late in some parts of the Continent, and perhaps in America. What I mean by that will appear as we proceed. I always protest against it in this course of lectures, but something more than this appears to me now to be desirable. I dislike to be polemical in this or any other subject, the practical side of which is so important; and I would infinitely rather for my own peace and comfort simply tell you what I think you ought to do in relation to various circumstances which come before you, and not also have to point out treatment pursued by others which I think you ought to avoid. However, I have the conviction that much of the treatment now in vogue is imperfect and less valuable than it might be, since it is founded on views of the urethra itself which are erroneous; or rather, I should say, it originates in a want of consideration which appears very widely to exist as to the nature and function of the urethra.

The treatment of urethral disease of which I complain has its origin in the notion that the urethra is a mere flexible tube, closed at or near its junction with the bladder by some kind of muscular apparatus, sphincteric or otherwise, through which fluids will pass indifferently in either direction. No idea, however, can be more erroneous, and treatment founded on it must be defective.

At the outset, then, let me say that it is absolutely essential that you should have a tolerably accurate knowledge of the nature and functions of this so-called tube.

I draw for you on this board the kind of diagram usually supposed to represent the bladder and male urethra. This diagram has something to answer for in producing the erroneous views I refer to. It represents the urethra as a tube, and as more or less open. (Fig. 1.)

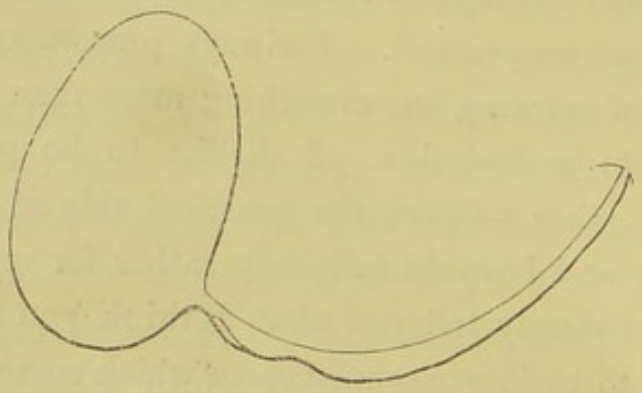

Fig. 1.—Anatomical diagram of bladder and urethra.

Let me give you an illustration of my meaning, and not an unimportant one. I believe I am correct in stating that almost every patient who presents himself for treatment of a urethral discharge, when advised to use an injection, gets some such advice as this, when the manner of doing it is explained, as it ought to be, in detail :—He is told to inject

a certain quantity of liquid into the passage by means of a syringe of some kind, and in doing so he is always admonished to make pressure on the line of the urethra, some four inches from the orifice, in order to prevent the fluid from passing beyond that point, and so perhaps enter or irritate the ducts which open into the prostatic portion, and occasion irritation of the neck of the bladder or a swelled testicle. This idea is very far from correct; and such advice simply demonstrates that the person giving it is not really acquainted with the structure or function of the part he is treating. Want of thought originally has produced, and the influence of ancient tradition has perpetuated, the error which vitiates much of our treatment in its various forms.

First, let me assure you that the urethra is not a tube at all, in any sense in which we employ that word. It is not like a gas-pipe, or an india-rubber tube, or even a flaccid tube of any membrane whatever.

It is rather *a continuous closed valve, capable of transmitting fluids and solids in one direction only, and transmitting nothing whatever in the opposite direction, except in obedience to applied force.* Its length in the male makes us think of it as a tube, but this is a mere accident of sex. An inch or less is amply long enough for its urinary function, as in the female; and all the length it possesses above that is quite useless *as a urethra,* and renders it liable to disease and accident—the price, and a heavy one, let me tell you, which the male pays for his specially distinguishing feature. In illustration of this, I have but to refer you to the difficulties and dangers associated with stricture, retention of urine, and calculus, which are comparatively almost unknown in the other sex. It is, then, in the male simply a long valvular chink, traversing soft and most delicate vascular and

nervous tissues, always firmly closed, and never opening except for a few seconds, during which fluids have to be transmitted from the body. Then, for a few seconds, it is distended more or less, and becomes a tube if you please, for this short time and this only, equalling, perhaps, at most three minutes in the twenty-four hours. All the rest of the time it is firmly closed, and not one drop of fluid can pass from the bladder. Of course, oozing of liquid which is generated in the walls of the tube, or which enters it by ducts, may escape, but always, inevitably, in the outward direction only.

Now, during these few seconds, when the valve may be said to occupy the form of a tube, I have next to observe that it is a tube of very varying diameter in its different parts; it is, in fact, very differently distensible at different places, being surrounded by different structures. This fact has long been known and generally recognised. I will show you illustrations of this from the works of Sir Everard Home and of Mr. Guthrie, who made casts of it in wax and other materials. This point is scarcely of less importance than the preceding one. The annexed diagram is reproduced from Sir E. Home's work.* (Fig. 2.)

Fig. 2.—Diagram of urethra from Sir E. Home, showing its extensibility.

Having thus far illustrated briefly, and necessarily some-

* Practical Observations. By Sir E. Home. Vol. I. London, 1805.

what imperfectly, the nature of this valvular passage, let us see how far the ideas which I want you to acquire relative to the urethra affect two important points in practice. First, that simple matter of making an injection into the urethra. You have to introduce a fluid for the purpose of therapeutic contact with the walls of this closed passage; you have to distend it, and some little force is necessary; not a single drop can enter, much less run down into it, unless the liquid is forced in by a piston, while the orifice of the urethra is carefully closed around the tube of the syringe introduced. The walls of the passage lying closely applied to each other become opened only by the pressure of the fluid driven in, and they are distended just so much and so far as the quantity employed determines. Thus you may safely reckon, as the result of my observation, that a syringe containing one fluid drachm is amply sufficient, and that it will distend the urethra for three and a half or four inches. A half-drachm syringe often suffices. Here is one of each size, and it is scarcely necessary to say that these small instruments are much more easily managed by a patient than larger and longer ones. But most patients, unless specially taught to use the syringe, never introduce any injection at all. Unless the orifice of the urethra is carefully closed at the time, the fluid simply leaves the end of the syringe and flows out by the external meatus; and in every case after the injection has been made, the moment the orifice is unclosed the fluid is rapidly expelled by the contractile force of the urethra, and no appreciable quantity remains within. So much, then, for any fear of its running down to the neck of the bladder. Of course, if an injection is too strong—in my opinion a very frequent occurrence—the anterior part of the urethra is inflamed, and extension

backwards may easily take place; but that is no part of our subject now. But let me further say that, so far from your being able, even with the power of the syringe, to send an injection into the prostatic part of the urethra, you cannot do so by any ordinary force, unless you can at the same time voluntarily relax the muscles which surround the membranous urethra, and so allow the fluid to pass—a thing perfectly possible with very little practice to accomplish. Thus it is that you cannot inject the bladder except by passing an instrument into its cavity. In fact, this valvular passage stoutly resists all intrusion from without, and admits no fluid except in obedience to pressure which the muscles are unable to resist.

I must just remark, in order to anticipate a possible objection to my statement relative to the valvular action of the urethra, and its power to transmit bodies in the outward direction only, that it is well known that certain foreign bodies have been able to pass inwards when introduced by the external meatus. I refer to two typical ones, both of which have been occasionally known to reach the bladder after being fairly lodged within the urethra. I refer to an ear of barley or of rye, both of which you will recollect are bearded, and also to a common hair-pin, which is wedge-shaped. Either of these bodies, if completely introduced, and also in such a manner that the beards or the points are directed outwards, will traverse the urethra in the direction inward. These, however, you will doubtless at once see are not in the least degree exceptions to my statement. It is an old schoolboy's paradox to put an ear of rye in his jacket-sleeve, when, with slight movements of his arm, although directed downwards, the ear soon finds its way upwards to his shoulder. If the arm was kept perfectly

motionless there would be no change of place in the ear of rye. So, when introduced within the urethra, the involuntary movements of the urethral muscles, designed to expel the intruder, act on the ends of the bearded corn, or on the ends of the hair-pin, and drive it on in the only direction it can travel—namely, inwards. I am not sure that it was necessary to mention this, but I have known the peculiar action of these bodies referred to as militating against the uniformity of the action of the urethra referred to, while in fact it does but illustrate its existence. If the urethra submitted tranquilly to the intrusion, and made no expulsive effort at all, the foreign bodies would not travel; as it is they must move, and can only do so in one direction. Of course it is due to this function of the urethra that gravel and small calculi are expelled in great number, and that the morbid excretions in gonorrhœa, &c., always issue externally, and never go backwards to the bladder.

The second point of importance in which the structural function of the urethra which I have described should affect our practice is associated with treatment of stricture of the urethra. I do but allude to this now, and shall reserve what I have to say on this head until a future lecture, when I shall enter fully on the subject.

LECTURE III.

ON STRICTURE OF THE URETHRA AND ITS NATURE: AND ON THE DIAGNOSIS OF URETHRAL CONTRACTIONS.

In commencing this course, I shall take to-day the subject of stricture; and I do so because, if not really one of the most common of these disorders, it is often supposed to be so. Among the many complaints of this class respecting which you may be consulted, perhaps none will be more talked of than urethral stricture. It does not follow, however, that stricture is really so common; in fact, it is much less so than many suppose. The word happens to have been popularized, and therefore, when a person experiences a little trouble in passing water, he is very apt to say that he has stricture. Certainly, in three out of four cases in which persons do so, I find there is nothing of the kind, but often merely some temporary cause of irritation.

Then it must be confessed that there is some confusion, even amongst the profession, as to the mode in which the word "stricture" should be employed. It is said—and formerly I said it myself, because I originally adopted the conventional classification—that there are three kinds of stricture—organic, inflammatory, and spasmodic stricture. Now, it would save some confusion if we employed this word for only one kind—namely, organic stricture: and this indeed is what I shall propose to do.

And what is organic stricture? It is a deposit of lymph round the canal of the urethra at some point, which, not

allowing the canal to open to the stream, narrows the current to that extent. There has usually been some chronic inflammation, most commonly in the bulbous part of the canal, but occurring in the anterior part also, and a deposit of lymph has taken place in the submucous and in the vascular tissues surrounding the urethra; this forms fibrous bands, which subsequently become rigid, while they more or less encircle the passage. We talk of the *contraction* of the canal; but this is due to a popular and not very correct notion of the matter, as we saw at our last lecture, although it answers well enough for all practical purposes. You will do well again to remember, in connection with the pathology and treatment of urethral diseases, that the urethra is not an open tube, except at the moment of its distension by an out-flowing current; it is always absolutely closed by muscular fibres, and only when it is habitually prevented from fully dilating to the stream of urine is it affected by stricture.

And this organic stricture is a permanent condition. Once acquired, it cannot be dissipated by any known means. It cannot be removed by absorption, although the contrary has often been affirmed. You may dilate it, you may cut through it, but there, more or less, the morbid elements must always remain. When a man once has organic stricture, he has it for ever. If any exceptions exist, the rarity is so extreme as practically not to invalidate the axiom laid down. Whatever treatment you employ, there is always a greater or less degree of rigidity in the urethral walls ever afterwards, and this increases with age. For all the fibrous tissues, as you know, become less extensible, as a rule, in advanced years than in youth; and this influence of age no doubt affects also those morbid tissues

which limit the extensibility of the urethra in stricture, and is one reason among others why it so generally becomes less dilatable as the patient advances in years.

Now touching "inflammatory stricture" and "spasmodic stricture;" what has been termed "inflammatory stricture" is merely a temporary local inflammation of some part of the canal, which is then narrowed for the time. The patient is unable, as long as that inflammation lasts, to pass water, or at best with difficulty. An inflammation with this result affects only the prostatic part of the urethra, which is not, as you know, the seat of organic stricture. If you consent to call this condition stricture, you may as well say that the throat is strictured when it is inflamed and the tonsils are swollen. We only speak of stricture of the œsophagus or gullet in reference to a condition which is organic, when by some deposit the passage is permanently narrowed, and we never speak of stricture there under any other circumstances.

So with regard to what is called spasm. The urethra may be narrowed to a certain extent by spasm—that is to say, the water may be prevented from passing outwards from the bladder, because there is some irregular action of the muscles around it. But the affection is only temporary; it does not necessarily imply any organic change; although sometimes its occurrence depends on the pre-existence of organic change, yet this spasm is not stricture of the canal.

I will tell you what spasmodic stricture often is. It is an exceedingly useful excuse for the failure of instruments. It is a "refuge for incompetence." When you cannot pass a catheter, when you find it exceedingly difficult to get anything in, and in fact wish to desist, it is a convenient thing, and has always been so recognised, for the operator

to say, "There is spasm." Indeed, I believe he often persuades himself that it does exist, although, in my opinion, it does not, or at least very rarely. "There is spasm," says he, "now in the muscles, and it will be prudent at present to desist from further attempts to pass an instrument." And no doubt when this is said it is so. Now, I do not think that you ought ever to fail in passing an instrument because there is spasm. Spasm may prevent the urine from going outwards; I do not know that it ever prevents the instrument from going in. In most cases it is failure of the hand, not spasm of the urethra. Still I cannot deny that it is a useful excuse—that it has a sort of foundation in fact, and may thus be often a better explanation for the patient than anything else, when the instrument does not pass. But when stricture here is spoken of in future, I shall refer only to organic stricture, in the sense already described. All the mechanical treatment which I shall have to speak of will have reference only to that kind of stricture. In "inflammatory stricture," of course, you have no occasion for instruments, unless retention of urine is present.

Now, what are the symptoms of stricture? First, of course, there is the smallness of the stream depending upon the narrowed state of the canal. Whatever the narrowing of the canal is, in that proportion there must be a narrowing of the stream. Still, it is not to be forgotten that the degree of narrowing varies much at different times in accordance with external circumstances, cold, errors in diet, and the like; one thing only is constant, the stream is always smaller than natural. Next, there is often some straining to pass water, corresponding to the obstruction of the passage; and the stream itself is flattened, twisted, or

divided. This is accompanied by pain at the seat of stricture, and sometimes also over the pubes, if there is any cystitis. Associated with these also, it is common to have a little discharge from the urethra; indeed a gleet is often the only thing which the patient notices at first, and the surgeon, finding that this is not readily cured, uses an instrument and discovers some degree of stricture. Frequency of making water, as I told you in the first lecture, is not always present in stricture, although it always is so when the case is severe and of long standing.

Supposing a patient to apply to you with all these symptoms, you will endeavour to see him pass water. He probably lays some stress on the fact that it is twisted or divided. Do not attribute much weight to this circumstance by itself, for a twisted stream often occurs when there is no stricture. It may be due to an alteration in the external meatus; for as the stream issues from the passage it may be modified by deviations from the natural shape or extensibility of the external meatus; thus, after repeated inflammation there, the lips of the meatus are sometimes slightly thickened, and permit only the exit of urine in a flattened and consequently twisted stream; and this is by no means an uncommon occurrence. But this being the only morbid change, however flattened the stream may be, the absolute bulk or volume of the stream is not diminished, and there is no stricture.

The question of diagnosis by physical examination next presents itself.

Let me at the outset observe that on almost all occasions of examining a patient for the first time with an instrument, one of tolerably full size should be selected, say not less than No. 8, 9, or 10 of the English scale. He may

perhaps remonstrate, and may very likely say, "Why should you employ so large an instrument?" Tell him that you do not propose necessarily to pass it, but mainly to learn what is the condition of the canal. For if you use a small instrument at first, it may pass through a stricture, if one exists, without detecting it; but if the large instrument goes on easily into the bladder, you have the satisfaction of telling your patient that he has no considerable stricture, and you must look further for the cause of the difficulty.

Again, let me warn you that, in passing the instrument through a healthy urethra, it is quite common to meet with circumstances which may mislead you. I have spoken to you of error on the part of the patient, and I am bound to say that the surgeon who is not much practised in these matters may also be deceived. What are the sources of fallacy to which he is exposed? How is it that he sometimes fancies there is stricture when there is not? There are some kinds of practice in which you may be hereafter placed, that do not afford the opportunity of often seeing this disease, and in such it is no great discredit to a man to think that he has found stricture when none exists. Not, of course, if he is a professed surgeon, to whom it would be a great discredit. But if he has very little to do with this kind of thing, he may encounter some difficulty with an instrument in the urethra, and he may suppose, but erroneously, that it is due to stricture. Now, I want to guard you all against this; for, though you may not all be operating surgeons, I want you not to leave any course of lectures which I may give, without knowing precisely what are the sources of fallacy, so that I may not hear of any of you hereafter making such a mistake as that to which I have referred.

First, then, observe that close to the meatus is a source of fallacy—I mean the lacuna magna. Next, at a point

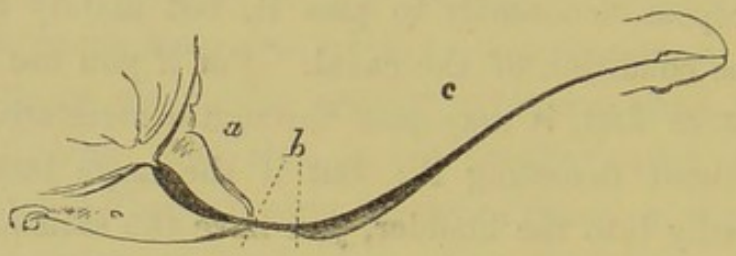

Fig. 3.—Diagram of urethra in natural condition, *a*, *b*, and *c* representing the prostatic, membranous, and spongy portions respectively.*

which is about five or six inches further on [a diagram referred to], the bulb joins the membranous portion, and the canal, from being wide or dilatable, becomes less so. Lastly, there is a source of difficulty at the neck of the bladder. Those are the three points at which persons may be mistaken in passing an instrument in the healthy urethra, and may form erroneous notions in consequence relative to the presence of stricture.

Now, bear in mind that the urethra is not a tube, but merely a sinuous passage with soft, delicate, and vascular walls lying in close contact with each other; so that nothing is easier, when traversing it, if you are out of the line, than to find some obstruction in the folds or lacunæ of the mucous membrane. Thus, as I have said, it is quite possible to get stopped at the very outset, which is embarrassing to a beginner, by engaging the point of the instrument in the lacuna magna. Whenever, then, you introduce an instrument, let your first thought be to keep

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* The urethra should have been shown here as it really is, a closed canal; the line in the bulbous and prostatic portions having been made by me merely a little thicker to mark (*diagrammatically*) position and the character of dilatability. This line has been somewhat exaggerated by the artist.

its point on the floor, so as to avoid that obstacle. You wish, of course, to pass it well for the patient. Perhaps he has had instruments passed before, and you desire to succeed at least as well as the preceding operator. Now, there is nothing which a patient appreciates so much as the easy passing of an instrument. It is a disagreeable operation, and if you pass it more easily than other persons, you will probably retain your patient as long as he requires assistance of that kind. If your instrument stops, by getting into the lacuna magna at the outset, he infers you to be a bungler, and perhaps will not come to you again.

Now you see represented in this diagram the bulb of the urethra. The canal is more distensible at this point, in front of *b*, and when it arrives at the deep perineal fascia, the canal is much less distensible. Practically, therefore, it is much wider in the bulbous portion than it is at the orifice, and when the instrument has reached that part it is apt to meet with obstruction. This is the place where most false passages are made; the instrument is driven out of the canal below the urethra, it being mainly at the floor that the tissues are so distensible. The section of the corpus spongiosum is wider below than above; the texture is soft and spongy. The urethra corresponds in distensibility to the soft structure outside, and although the instrument goes smoothly down to this point, it may not enter the membranous portion. Now, take care, at first, to have the point of the instrument so turned up as to avoid this lower part. Nothing is so good as a well-curved instrument to escape that obstacle. I am in the habit of making the following little experiment in the case of out-patients. I like to find a student who has never passed an instrument before, and to say to him, "Pass this bougie (a straight or

slightly curved one) into the canal." He passes it, and almost invariably, when he arrives at the membranous portion, stops. I then take the same instrument, give its

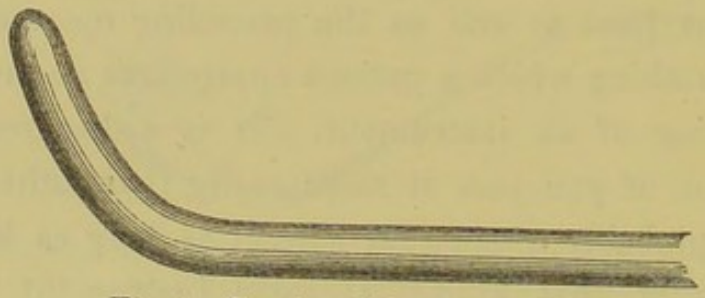

Fig. 4.—Bougie, with point turned up.

point this form (Fig. 4), and then he passes it immediately into the bladder. This is the form which is made prominent in the instrument called "coudée" by the French, and a most useful instrument it is. Sir B. Brodie recommended in his lectures the plan of giving a little upward turn to the point of a bougie for the same purpose, more than thirty years ago. As the instrument goes in, it keeps close to the roof, instead of engaging itself in the distensible part of the bulb.

The last obstacle is at the neck of the bladder, and so common is it, that you often hear of "stricture at the neck of the bladder"—a thing which never exists. There never was a stricture even in the prostatic portion. "Stricture at the neck of the bladder" was a household word some years ago, and even now you sometimes hear of it; but there is no such thing. It is simply because there is sometimes difficulty in passing the neck of the bladder that it came to be regarded as a locality of stricture. In this case also a well-curved instrument is the best thing to pass in. Let me recapitulate shortly the three sources of difficulty: First, the lacuna magna, which is avoided by keeping on the

floor of the canal; then the narrow membranous portion at the bulb, which is avoided by keeping the point of the instrument well up; and the same with regard to the neck of the bladder.

So much for the management of an instrument in the healthy urethra. We now have to learn how to make the physical diagnosis of stricture.

For this purpose there are two separate modes to be followed, as there are two different objects to be attained, each of which is quite distinct from the other:—

There is, first, a simple examination of the urethra, to be used only for the purpose of verifying the presence or absence of any material deviation from the natural dilatability of the urethra.

And there is, secondly, a more minute and exact examination, in order to determine the precise condition of the urethra when it is already known, or there is reason to believe, that long-standing and perhaps considerable obstruction exists.

Now I need hardly say that the first examination is one which is applicable to the vast majority of cases; and that the second is necessary only in a few and exceptional cases. A very simple examination suffices to determine the question which so frequently comes before us—"Do certain not very considerable derangements of the urinary function in any particular patient arise from organic obstruction, and therefore require instrumental interference; or are they due to some other condition, for which instruments are not merely useless but would probably be injurious?"

Now, in reference to this subject, I find a tendency at the present day to employ instruments too readily, and instru-

ments also which are liable to injure the urethra. This over-readiness to interfere with the urethra existed at the beginning of the present century. The mechanical school, as I shall take the liberty to term those who devise and largely employ more or less complex mechanical means for exploration, and for applying dilatation, cutting, or caustic to the unfortunate urethra, was then in the ascendant. I think I could amuse you for hours with the history of the surgical knick-knacks which have been produced by it. But our time is too valuable, and I will content myself with one illustration only of surgical practice in this country at the era I speak of.*

Following the period spoken of came the experience of mischief as its result, and a certain healthy reaction appears to have taken place. The practice of Sir Benjamin Brodie, who was subsequently so high an authority during his long career, was marked by caution and prudence, and his admirable teaching ensured a similar practice among others for some time. I may be allowed to say, perhaps, that my feeble voice has also been raised against the abuse of instruments from the first day that I ventured to pen a line on the subject, some two or three-and-twenty years ago. And now I perceive a growing disposition to return to the state of things I have referred to. I note an increased tendency to discover stricture, and especially to undertake a considerable amount of operative treatment for strictures of the slightest kind, and sometimes where, in my opinion, they do not exist. There seems now to be a school which

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* The lecturer then read some curious reported cases from a work of Sir E. Home, illustrating the extraordinary abuse of the bougie at that time. *See* Pract. Observations on the Treatment of Stricture. By Sir E. Home. Vol. III. 1821, Chapters X. and XI.

has determined for itself a very high standard of patency in what we hear called the "urethral tube," and which is accordingly said to have, or, if it hasn't, that it ought to have, a calibre of so many parts, and very large parts, of an inch, or millimetres, as the case may be. Instruments of astounding magnitude are produced, and if one of them cannot be drawn, with an ease which contents the operator, through the whole of the urethra, the unlucky patient is pronounced to be the subject of stricture; and probably he is submitted to an operation by no means devoid of risk.

Now I don't know that this fashion has as yet been adopted here, but I do know that it exists elsewhere, and I raise my earnest protest against it. I feel it a matter of duty on my part to say what I think about treatment which I am perfectly certain neither you nor I would for a moment entertain the propriety of in our own proper persons; that is, if we entertain a due respect for that delicate passage which an intelligent acquaintance with it will ensure. Let us for a moment revert to the natural form which the urethra takes when it is distended by some fluid material, and observe how unlike it is to the coarse simile of a tube of known uniform diameter. We have already seen that its natural capability for dilatation varies greatly at different points: being much limited at the junction of the membranous and spongy portions; limited again, but less so, and somewhat irregularly, in the anterior part; and again at or near the meatus. Let me assure you also that there are few structures more delicate than the male urethra. Formed of an internal membrane of great tenuity, surrounded by elastic and muscular fibres, interpenetrated everywhere with ducts, fine blood-vessels, and nerves; the whole surrounded in front of the prostate with one of the

most elaborate of vascular structures, known as erectile tissue; add to this the sensitiveness to pain of the internal membrane, equalling the conjunctiva in that quality, as any one may learn for himself by passing the softest instrument he can find. Lastly, and more important still, it possesses another form of sensibility, of a much graver kind, which even the last-named membrane does not possess: I mean a strong tendency to arouse, in the entire nervous system, a state of excitement, evidenced by the striking phenomena of rigors and subsequent fever and prostration, when slight mechanical injury has been done to any portion of it. Now let this picture of the urethra as it is, never be absent from your mind's eye when you put an instrument into it, and both you and your patient will profit. When, therefore, a young man consults you for certain troubles relative to which you desire to learn whether urethral obstruction be a cause or not, do not be tempted for an instant to adopt so unnecessary a course (to say the least) as the introduction of very large instruments, or instruments with huge bulbs at the end of them. But simply take a flexible English gum-elastic bougie, well curved towards the point, with a blunt end (since a tapering point, of course, will not mark distinctly the site of stricture), not larger, as a rule, than No. 10 or 11 of our scale, and pass it very gently and slowly into the bladder. If it goes easily—above all, if it is withdrawn without being held, and slides out with perfect facility, take my word for it he has no stricture, and, *quoad* obstruction, wants no use of instruments whatever.

I daresay I shall be told by some one, that there may be a urethra through which No. 11 can be made to pass, yet which is, nevertheless, the subject of some degree of stricture which it is necessary to treat. Well, I do not deny

the existence of that exceptional case. But such an example is very rare, and, further, no man who has the slightest delicacy of tactile sense in his fingers can fail to observe the difference between a No. 11 bougie sliding out with facility, and one which is grasped somewhat as it is withdrawn. This difference is always manifest in the two cases, and is, indeed, very notable. But supposing that the No. 11 stops at any point, and you have assured yourself that it is not one of the natural obstructions to the passage of an instrument through the urethra, of which I have already spoken fully, you will try a smaller instrument of the same kind until you have arrived at one which does pass through and inwards into the bladder. But you may also test your observation by passing a soft tapering French bougie—11 or 12 English size,—and if it is a *natural* obstacle which at first checked your blunt-pointed bougie, the former instrument will probably slip through without trouble.

Now, with reference to these bulbous-pointed flexible explorers, nothing is more easy, especially with an unpractised hand, than to deceive oneself with respect to the existence of stricture by means of them. If not drawn out accurately in the axis of the passage, you may feel a check, and readily find what you believe to be a stricture in the most healthy urethra. And that is precisely what I am so anxions to guard you against; for, in the hands of designing persons, these instruments may be turned to most unworthy purpose. For men outside the ranks of our profession, or holding a questionable position on its outskirts, these instruments are the very thing. That is an additional reason why we should be careful not to encourage their unnecessary use. I have used small bulbous instruments in metal for the diagnosis of narrow and confirmed stricture, on which it is desirable to

operate, for twenty years, but for slight stricture never; and I have protested against their use on the two grounds already named: first, that for such the instrument inflicts needless pain; secondly, that it is liable to deceive a young operator not too adroit or familiar with its use.

But now, in the second case—not that of the young man, but of the patient who has a confirmed stricture—the diagnosis has probably to be conducted with more attention to detail. I proceed as follows, making what may be called a "survey" of the passage. I commence by passing the soft, blunt-headed English gum-elastic bougie as far as it will go, and when this stops, as it may do within an inch or less of the orifice, I make a note of the distance, and next find what will pass with tolerable ease through the obstruction met with. Very likely a No. 4 or 5 (similar instrument to the preceding) will do so, and it may then be carried further to seek another check, which is not unfrequently met with at about five inches from the orifice. Through this, after a trial or two, a very small gum catheter—say No. 1 or 2—may probably be passed into the bladder, drawing off some urine, and so assuring you of its position. I know then that the patient has, at all events, a narrowing near the orifice and another at the distance named. I may verify this at once with a bulbous instrument if I choose; but as long as the anterior narrowing exists, it is as well to postpone more minute research until it is divided, as considerable narrowing at that part always requires to be. Such an one, indeed, is never advantageously treated by dilatation. This being done, the No. 11 blunt-ended bougie is passed, and we learn whether any contraction exists in the interval existing between it and the spot originally marked at five inches. If there is one, the

stopping of the bougie will indicate its situation. But if the bougie passes easily to the point just named, the canal is sufficiently open, and we have arrived at what, in ninety-nine cases out of a hundred, is the only remaining stricture; for it is rare indeed, where a narrow stricture exists at that distance from the meatus, that any other will be found beyond. This has next to be dealt with, and as we are speaking now of old and confirmed cases, there is little doubt that the best treatment will be internal urethotomy. How to accomplish that most perfectly will be discussed in my lecture on that subject.

A word or two about the bulbous exploring instrument. It should, in my opinion, be of polished metal mounted on a slender metal rod or shaft (Fig. 5). No other material

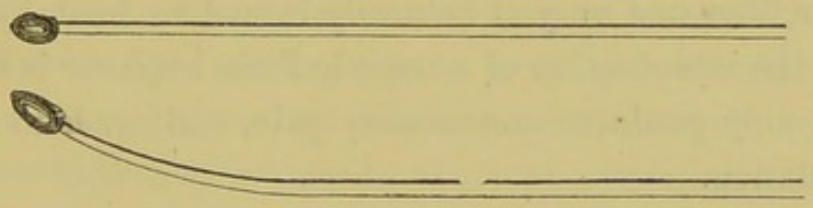

Fig. 5.—Straight and curved metal exploring bulbous instruments.

slides so easily and smoothly through the urethra; and the necessity for it is, after all, not great, so that to employ one which produces much irritation, passes roughly, or distends unnecessarily, is to pay too high a price for the small amount of information it may convey. I am free to say that, although I used the metal bulbous instruments in the earlier part of my career, I can now, with more experience, attain all that is necessary without them. It is said that they enable you to ascertain the length of a stricture. In reference to this, let me tell you, first, that considerable

narrowing almost never affects the urethra for any great distance. The passage is often partially implicated for half an inch behind and half an inch before the maximum point of narrowing—an important practical point in relation to operation; but the very narrow spot, which is what the exploring bulb indicates, is almost invariably short, within a quarter of an inch in extent. Secondly, you must take into consideration the fact that the mobility of the mucous lining of the urethra will deceive you if you are not aware of it. A very little pressure in front, on entering the stricture, or from behind, in withdrawing the exploring bulb, if it comes rather tightly through, changes the situation of the contracted portion considerably in relation to its distance from the external meatus.

I repeat, then, if you have to deal with a recent stricture, such an one as you naturally intend to treat by dilatation, the introduction of a large bulbous explorer is wholly useless, only produces unnecessary pain, and tends to excite inflammation.

But in view of any internal incisions for a confirmed or obstinate case, the important thing is simply to know where the narrowed points of the urethra are, and then it is not difficult to apply your cutting instrument properly to them.

The subject of treatment by dilatation will occupy our attention at the next lecture.

LECTURE IV.

THE TREATMENT OF STRICTURE OF THE URETHRA BY DILATATION, SIMPLE AND CONTINUOUS.

Having accomplished our diagnosis, we now come to the subject of Treatment.

Supposing a man has but one stricture, and that in the bulbous portion, or if he has two, that the anterior stricture is by no means very narrow or resisting; what are we to propose to do for him?

First and foremost, dilatation—dilatation always—dilatation without exception, whenever it will succeed. It is always to be tried first, because it is the simplest and easiest mode. If you find a man with a stricture ever so narrow or tight, by no means think of operating till you have tried whether dilatation will succeed.

What is dilatation? A mechanical process of stretching this organized lymph, which forms bands round the canal at the strictured point. It is often said to produce absorption of this tissue, which I shall not deny, but only say that there is not the smallest particle of proof to support the notion.

Now, we will suppose a case in which, as the result of your exploration of the urethra, you have been able to pass No. 3 bougie or catheter rather tightly through the stricture and into the bladder, in order to be perfectly sure that all has gone right; you will be able to say to the patient, "That is enough for to-day; come again in two or three days' time

for a larger instrument. Then on this second occasion I advise you not to commence with the largest instrument previously passed. Having passed, say, Nos. 2 and 3 on the first occasion, you should now take Nos. 2, 3, and 4; and on the third occasion, 3, 4, and 5; and so on; always beginning below the point you had attained on the previous occasion, making the smaller instrument a sort of *avant-coureur* for the larger one.

Further, never let the instrument remain in the urethra; withdraw it at once; leaving it there simply increases irritation, and does not augment in the slightest degree the dilating power. Thus you find that the longer you leave it the tighter it is held, and the more difficult and painful it is to withdraw. Not until it has remained in the stricture an hour or two does the stricture begin to relax, as we shall see by-and-by, in considering "Continuous Dilatation."

Now comes the question of the kind of instrument to be employed. The great principle which underlies all mechanical treatment of the urinary organs, whether for stricture or for hypertrophied prostate, for retention of the urine or for stone—the one great principle which must decide for us the question of the kind of instrument to be employed is this:

ALL INSTRUMENTS ARE EVILS, MORE OR LESS CONSIDERABLE, NEVER TO BE RESORTED TO UNLESS A GREATER EVIL BE PRESENT, WHICH THEIR EMPLOYMENT MAY PROBABLY REMEDY.

The passage of an instrument of any kind into the healthy urethra must *per se* be a source of irritation. Try it yourself; and I advise you to do it, if you wish to pass an instrument well; for I hold that no man should pass an instrument for another until he has passed one for himself. Of course the amount of irritation will depend in great

part on the manner in which it is passed, and on the kind of instrument employed.

Let us consider, to use a commercial simile, that in the case of your patient there is a "debit and a credit side" in all treatment. You intend, beyond all doubt, to effect some real good—that is, to the "credit side" of the account; but you cannot do it without producing some slight irritation in order to gain your end—that is an entry on the "debit side." Be careful, then, that you constantly bear in mind the latter fact, and make it your business to diminish that "debit" as much as possible. Do not pass an instrument unless there is some good reason, unless there is some evil, for the sake of curing which it is worth while to incur a little irritation. Acting upon this principle, you will choose such an instrument as you know by experience or otherwise to produce the least possible irritation.

And this leads me to the question of the difference between solid and flexible instruments. Here I feel that I am treading on delicate ground; and I will tell you why. First of all, no one has been a greater advocate than I was some years ago of solid instruments as against soft ones, influenced by the traditions of this place, which are entirely in favour of the former. I can give you the reason for that. The great master-spirit of this place, who has been dead some twenty years or more, the man who gave the tone to the place, and educated almost all the elder men here—I mean Liston—declared his preference for the solid instrument in very strong terms. It is (1867) just twenty-one years ago since I sat in this room and heard him deliver a lecture on that very subject. His powerful advocacy of the silver instrument, and the contempt he had for

others, were matters of notoriety. Starting, then, with such views, and regarding him—as every one does, to a certain extent, the man who teaches him well and fairly what he learns—for a certain time as an oracle, I was strongly in favour of the solid instrument as against the flexible.

But what is much more valuable than any oracle, whoever he may be, is a large personal experience; and this has taught me that, beyond all question, the flexible instrument is the best—if only you know how to use it—for the treatment of stricture, and for all maladies of the canal, whenever it is available. I am so certain of this, that I have no hesitation in saying that a great part of the success of any man who has much to do with this subject will depend upon his use of flexible instruments as against solid. No patient will ever allow a surgeon to pass for him a solid instrument if you have passed for him a flexible one as easily as you are bound to do. It gives him so much less pain, and produces so much less irritation. To continue my commercial simile,—it puts so much less on the "debit side" of your patient's case; you get so much more of advantage, and so much less of disadvantage. I confess, then, to a considerable change of opinion even since I published my first work on the subject; and I do this without the slightest shame or the slightest repugnance. I hold that the end of life in this world is not achieved without change in our opinions. You may rely upon it, with regard to any subject whatever, whether politics or religion, or our own proper profession, if we hold the same opinions at forty years of age as we did at twenty—and, perhaps, looking forward, I may say, if we hold the same opinions at sixty as we do at forty—we live to very little purpose. It is an error to look for a life-long "consistency" in

matters of opinion from men who think for themselves, in whatever department their teaching may be. You must expect them to progress, or they will be bad teachers—just as I hope you are progressing now. I have said this because I know that so much might be quoted from what I held fifteen years ago in contradiction to what I am now saying. If I did not state this you might ask me why, having said so much in favour of the silver instrument, do I now say so much in favour of the other. You have my reason: it is simply that I have learned better.

There are two kinds of flexible instruments, the English and the French. Inasmuch as the French instrument possesses more flexibility than the English, I often prefer it. Perhaps it is right that I should add a word or two to what I have said. I believe the flexible instruments are much better now than they were in Liston's time; and I think that, if we had had the good fortune to retain him so long (without taking credit for making a shrewd guess), he would have changed his opinion too. This is the kind of flexible instrument much used in his time. It is called a bougie; and properly, since it is simply a kind of wax-candle, and is, in my opinion, a very imperfect instrument. You can bend it into any form by warming, but it is a very inferior instrument to what is generally used now.

The gum-elastic or English flexible instrument is very valuable on account of one quality which it possesses, and which doesn ot belong to the French instrument—*i.e.*, it will preserve any curve, when cooled, which you choose to apply to it under the influence of heat. If I want a small curve, I take the instrument, put it in warm water, give it the curve required, then put it in cold water, and the curve is fixed or set.

The French instrument is exceedingly flexible; you may wind it round your finger without difficulty. And it has another valuable character—namely, its peculiar tapering point. Now a tapering point *per se* is often undesirable in the urethra, because it is very liable to get into some lacuna. It would be an advantage if you could ensure that it did not do this; but this liability is provided

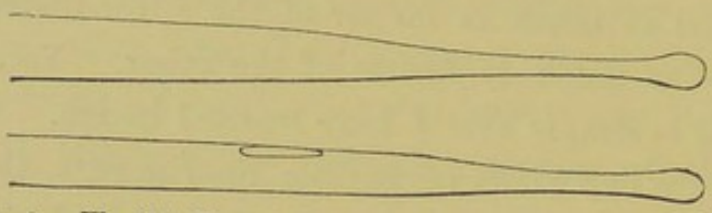

Fig. 6.—Flexible French bougie and catheter, with tapering and bulbous ends.

against now very ingeniously by means of a little bulb at the end (*see* Fig. 6). The long tapering extremity, guarded by the bulb, insinuates itself through the healthy urethra, or through one not greatly contracted, in a most certain and easy manner. Such an instrument as that may be passed by the patient himself without difficulty. Indeed, it may almost be said to be "surgery made too easy." The merest tyro can pass it in nine cases out of ten, although he might not manage the tenth. It is one of the many extraordinary instances of English conservatism that these instruments are found in so few hands. They are, however, at last being made here. For years it has been necessary to send to Paris for them; but a demand is arising now, and they are at length being manufactured in this country. If you will try the experiment on yourselves, you will find that this instrument traverses the urethra almost without your knowing it; and it requires no knowledge of the canal in order to use it.

Now it may appear to you very heterodox, but I advise you, in passing an instrument, to forget all about your anatomy. You are taught it over the way, and it is most important that you should know it; but, in passing an instrument, forget all about the different regions. Think nothing about the deep fascia, the membranous portion, or the compressor urethræ.* A solid instrument is especially dangerous in the hands of an anatomist; he will push it the way he thinks right, as if all urethras were exactly of the same form, and did not vary as much as noses do, or other features. This used to be the pretext for preferring the solid instrument; it was said, "You want to know exactly your anatomy, and pass the instrument accordingly." I pity the patient who has a solid instrument thrust into his body by a knowing man at anatomy. You want an instrument that you can use most delicately, holding it lightly between the finger and thumb, withdrawing it or changing its direction as soon as you are able to perceive an obstruction. Your hand is to be educated for the power of delicately perceiving the characters of the passage by means of the instrument within it; and rarely, if ever, are you to push a solid instrument in any given direction preconceived to be the right one. If you wish to combine the maximum amount of dilatation with the minimum amount of irrita-

* I am not surprised that exception has been taken by some writers to this passage. Notwithstanding I never felt the truth of it more strongly than I do to-day. No one ought to infer from it that I undervalue anatomy: it is the last thing I should desire to do. But the passing of an instrument well is not in any way an anatomical exercise. It is not an *à priori* proceeding conducted according to a knowledge of anatomical facts, but according to a deduction from large experience of the practice. Even healthy urethras differ considerably, but in exploring the passages, whether healthy or diseased, the hand is to be guided wholly by an intelligent appreciation of sensations communicated by the point of the instrument, and not by anatomical knowledge.

tion, this flexible instrument is unquestionably the one for you to use.

There is one other point to notice with reference to French and English instruments—I mean the gauges. The ordinary range of our numbers is from 1 to 12; although two or three higher numbers are occasionally used. Here is No. 12; and you generally consider, when you have reached that size, that you have completed the dilatation. In England, we cannot be said to have a uniform scale; all our measurements are very arbitrary. One maker has one scale, and another another; and the Scotch scale differs by one and a half from the English; so that the patient who takes No. 12 Scotch, takes only 10½ English. Our more exact neighbours over the Channel use the millimetre, and the number represents the precise size, so that when I have

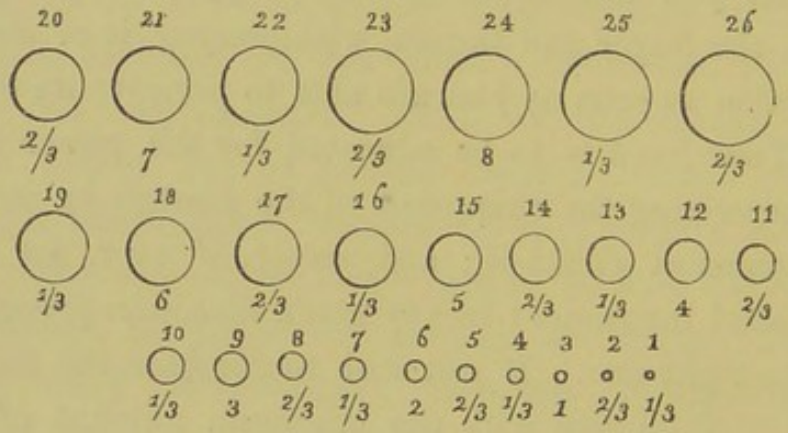

FIG. 7.—French or "Charrière" gauge.

named the size I have named the exact calibre or magnitude of the urethra. Instead of 1 to 12, the French have 1 to 30 (*see* Fig. 7). They begin lower, and go higher than we do, and the steps are more gradual. In this way irritation may be lessened. You may pass, for instance, a No. 4 English very easily, and a No. 5 with great difficulty, or not at all, and an intermediate one might be the proper

size. Their numbers 3 to 21 are about equal to our 1 to 12; showing you at once how much more gradual the range is. No. 1 is one millimetre in circumference; No. 2 two millimetres, and so on; so that the increase in size is uniform as well as gradual. If I have a patient who will take No. 21, I know that his urethra admits an instrument twenty-one millimetres in circumference, and, of course, seven in diameter. I advise you in this, as in other matters, to be cosmopolitan in your views, and to adopt improvements from all quarters.*

I have told you that simple dilatation consists in passing every two or three days a larger instrument, until you reach the highest. In many cases all goes on smoothly from the beginning to the end. Then you teach the patient to pass the instrument for himself, and he does so afterwards once a month, or once in six weeks, to maintain a sufficient calibre.

A patient who has not long been the subject of stricture may, as a rule, be successfully treated by simply passing these soft flexible instruments, gradually increasing their calibre until that of the healthy urethra is obtained. But these very qualities of softness and flexibility, which

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* Taking the sizes employed by the chief London instrument-makers as representing the "English scale," I have constructed a table, in which the sizes of the French ("Charrières") scale from 1 to 24 occupy the upper line, while the sizes of the "English scale" occupy the under line; so placed that the relation of the two scales may be seen to each other. Note that the numbers do not always coincide in situation—thus: the English 6 is between 11 and 12 of the French scale, but nearer to the 11 than to the 12, and so on.

Scale of Charrière.	1	2	3	4	5	6	7	8	9	10	11	12
English Scale.				1		2		3	4	5	6	

Scale of Charrière.	13	14	15	16	17	18	19	20	21	22	23	24
English Scale.	7		8		9	10		11	12		13	14

diminish so greatly the disagreeable sensation when passing, and the chance of injury to the patient, and which render these instruments so valuable, constitute them inefficient when you have a case in which the hardness and resistance of the stricture are too great for their somewhat feeble power of penetration. What is the next step? What substitute do you employ? Are you to relinquish the process of dilatation, and think of performing any operation? By no means. You will now resort to firmer and less flexible instruments; and there are few which are more efficient or easy to pass at this stage, than conical steel instruments, which are all the better when silver plated. The sizes which I should recommend you are not to be small—indeed, none smaller than the following, of which I don't know that the first is not too small for any but very careful hands.

The first, say No. 6 (English scale) at the point, gradually increasing to No. 8 at about two inches and a half from it, as represented here.

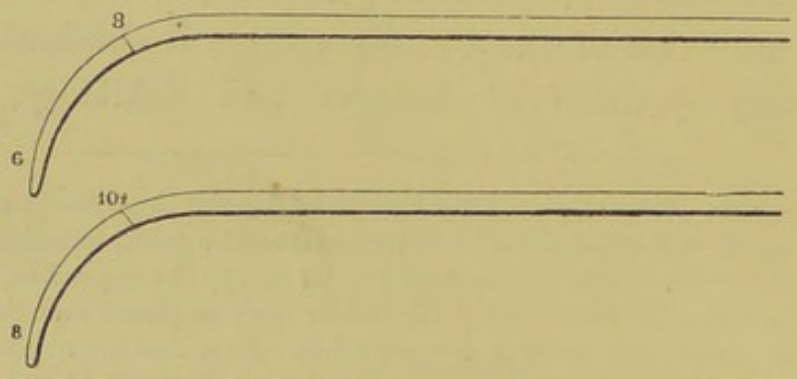


Fig. 8.

The next, No. 7 at the point, and No. 9 at the largest part.
The next, No. 8 „ „ No. 10 „ „
The next, No. 9 „ „ No. 11 „ „
The next, No. 10 „ „ No. 12 „ „
The next, No. 11 „ „ No. 13 „ „

These conical dilators—I scarcely like to call them "bougies," a term so inappropriate for metal instruments, and which certainly, if retained at all now that the thing itself, the wax candle of our forefathers, is obsolete, should denote only flexible instruments—may be passed with great ease, owing to their polish and weight; while they can scarcely be surpassed for efficiency in the later stages of dilatation. I recommended them equally twenty years ago, and have in no way changed my mind about them. You may, however, like something intermediate between the very flexible bougie and these metallic dilators; and many means for combining the flexibility of the former as to the point, and the stiffness of the latter as to the stem, have been contrived—such as gum elastic, flexible metal, &c. In France, a stiffer bougie is produced by constructing the ordinary black flexible one, with a centre core of soft lead wire, and it is a very useful instrument; but since this lead traverses the entire length, the terminal portion is rendered as firm as the shaft. Of late I have adopted a plan which I prefer to any of these, and for all sizes from No. 4 to No. 8 or 9 (English) it is perhaps better than any. I have had a short and very soft lead stylet made, to be introduced at pleasure into the interior of the French conical bougie, and terminating in a fine point, which stops short about four inches and a half from the end of the bougie. Here is a set of them: six in all. The following diagram will explain what I mean. A section shows the movable lead stylet in the interior, but is represented as extending too close to the end, which should be long and flexible. (Fig. 9.) Their maximum diameters are about $5\frac{1}{2}$, $6\frac{1}{4}$, 7, $7\frac{3}{4}$, $8\frac{1}{2}$, and $9\frac{1}{4}$ (English)—a series which may well intervene between the soft bougies and the metallic dilators.

Capability to penetrate easily is ensured by the complete flexibility of the point, and the increased firmness of all the rest of the instrument.

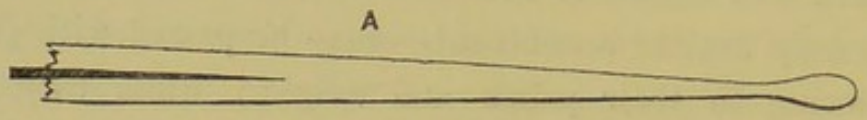


Fig. 9.—Flexible French bougie, with movable lead stylet.

Another useful mode of dilating the urethra is that in which the object is attained by tying-in a catheter; in other words, "Continuous dilatation." There is a patient upstairs who is now undergoing it successfully. You have tried, we will suppose, the simple dilatation, and have not made the amount of progress desired; or, perhaps, the patient's avocations may make it necessary to have more speedy relief. In either case you may say, "If you can give me ten or fourteen days in your room, not necessarily in bed, but on the sofa quietly at home, I can almost certainly dilate your stricture from the smallest number up to the highest,"—by "continuous dilatation." In "simple dilatation" the instrument is simply introduced, and at once withdrawn; in "continuous" you tie the instrument in, and allow it to remain for several days.

But there are certain rules which it is essential to observe in order to attain our object safely and easily.

I. The catheter is always, if possible, to be one of gum elastic, and of English make, which is superior for this purpose to the more flexible French, from its greater power to resist the destructive action of the urine. If no instrument but a small silver catheter could at first be introduced, of course it must remain for a day or two until it can be replaced by one of gum elastic.

II. In tying-in the catheter, take care that the end of it only just lies within the cavity of the bladder. An inch or two of catheter there is a source of irritation to the organ, acting indeed like a foreign body, as it is. There is no difficulty in accomplishing the object if, the patient being upright, urine is passed through the instrument. You will observe by drawing it out a little, while the urine flows, at what spot the stream stops; and then reintroducing the instrument a little, you will fasten it at the spot at which the stream again flows.

III. The catheter is always to be small enough to pass easily, so that even when first introduced it lies loosely in the canal.

These three conditions being granted, this is one of the safest and best modes of treating some strictures. There is a patient upstairs who has finished the process, and to-day the house surgeon tells me that he has passed No. 11 with ease. The man has been here only a fortnight, and has now not the slightest pain or frequency of making water. He says he is better than he has been for twenty years, and he came here in an exceedingly bad condition. Having been treated as an out-patient, and making no progress, I advised him to come in, and try continuous dilatation. We have still to keep him here a few days to observe whether the improvement is permanent or not.

I may here show you what I think the best manner of tying-in a catheter. By the old methods, which involved bandages round the body, groins and thighs, each movement of the body exerted some influence on the instrument, an extremely undesirable condition. The desideratum is to permit the freest movement of the body, without influencing, through the medium of the fastenings, the position of the

catheter. I think this is attained in the most efficient and simple manner by tying-in round the body of the penis itself with soft twine or "bobbin," and then to fasten it by a knot to the pubic hair on each side. (See Fig. 10.) Of course the patient is not permitted to indulge in much movement, and he requires very little in his chambers, or in a ward. But I have known those who have habituated themselves to the use of the catheter in this manner, follow their usual avocations for hours, scarcely inconvenienced by the presence of a catheter thus fastened in its place.

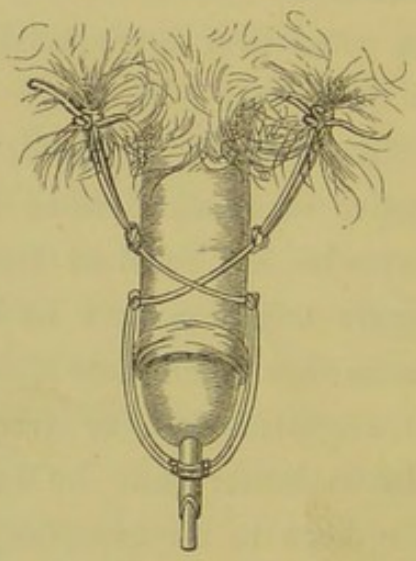


Fig. 10.—Mode of attaching the catheter.

I shall now only repeat in reference to this process, that three conditions are necessary to success: you must have a flexible instrument; the point must not be far in the bladder, and above all it must not fill the stricture, because, remember, it is not a mere mechanical process; you do not want, as in ordinary dilatation, to distend the stricture as you might a lady's glove, but you treat the stricture by ensuring the continued presence of a foreign body in the passage. If you leave only a No. 1 in for a sufficient length

of time, you will be able, when you take it out, to pass No. 10, without using the intermediate numbers. I believe I was the first person to demonstrate that curious fact; at all events I never heard of it, and knew nothing of it until I discovered it for myself. In practice you do not leave so small an instrument very long in the urethra, because the stream of urine would soon wash it out, and it is necessary to put in a larger one to fill the canal a little more.

If, when you change the instrument, you put in one quite as large as the stricture will admit, you produce pain and irritation, and infringe the principle I have laid down, so that the progress is less satisfactory. In continuous dilatation, as well as in simple dilatation, you adopt the plan which gives the least amount of pain and irritation to the patient, putting as little as possible to the debit side, and as much as possible to the credit. Well, then, having ceased to tie-in any longer, say at the end of six, eight, or ten days, according to the case, you will pass an instrument daily for two or three days. Then gradually increase the intervals of time, maintaining as much of the calibre gained as you fairly can. Most commonly you lose a number or two from the highest point attained by tying-in: thus, if No. 12 was so reached, you will probably maintain No. 9 or 10; an excellent calibre for a patient who commenced with No. 1, and that perhaps passed not without much difficulty.

It is quite common to observe that the patient has a little fever during the process, but it is rarely considerable. A single rigor, followed by heat and sweating, is not reason sufficient to suspend the process; indeed, it often happens after the tying-in has ceased altogether, and during the first or second day after, when the patient commences to pass

water without the instrument. When long-standing organic disease of the ureter and kidney exists, as the result of old and narrow stricture, then continuous dilatation may provoke severe and dangerous attacks; but this is a condition in which all mechanical interference is hazardous.

Supposing, however, that the treatment has been well supported, and that no such symptoms have appeared, the result of dilatation may nevertheless appear to be only temporary. As a rule, I have observed that the slower the process by which dilatation is accomplished through the continuous process, the more certainly and rapidly will the contraction reappear. On the contrary, if improvement is very rapidly attained, the result will be comparatively more lasting.

There are therefore some cases in which all the advantages gained by the process are speedily lost. Clearly, some other method than dilatation will be required for these. This subject, which embraces the operative proceedings to be applied to the treatment of stricture, I shall consider in the next two lectures.

LECTURE V.

ON THE TREATMENT OF CASES OF STRICTURE IN WHICH EXTREME DIFFICULTIES EXIST.

You may remember, gentlemen, that at the last lecture we considered the treatment of stricture by "ordinary dilatation" and by "continuous dilatation." You will see at once that this presupposed that an instrument had been passed *into the bladder*. It is, of course, assumed that in treating a case by means of dilatation, whether continuous or simple, the instrument has fairly passed through the stricture, otherwise the stricture is not dilated.

But all cases of stricture are not so easily disposed of. It often happens that at the first, second, or even third trial the instrument does not enter, or is not passed through the obstructed part; or it leaves the canal altogether and goes into a false passage. At all events, the instrument does not go through the stricture, and onwards, as it should do, into the bladder.

Here then is a condition of difficulty which opens a new subject for us to-day. We have now to deal with more difficult cases, those in which all your care and experience, if you have any, are needed. It was said by Liston, that of all operations in surgery, there were none so difficult, none which required so much patience and care, as the passing of a catheter through an obstinate and very narrow stricture. That statement is in his last edition of the "Practical Surgery" (p. 476), and you can scarcely have a higher authority for the fact there mentioned.

Now there is one word which is often used to describe stricture, to which I take a great objection, and I think the sooner it is expunged from the vocabulary of surgery the better. Such a stricture as that of which I now speak is often said to be "impermeable."

What is impermeable stricture? Why, first, it does not denote a quality necessarily inherent in the stricture at all, but rather the quality of the surgeon. For, you see, a stricture may be "impermeable" as regards A, but not "impermeable" as regards B, who may pass the instrument easily enough. But, secondly, it is a contradiction in terms. Stricture is a *narrowing* of the canal; it is not an obliteration of it. There must be an opening, and if there be an opening there must be room for an instrument; it cannot be "impermeable." It is only a question of the size of that instrument, and of skill or patience in the management of it. The stricture always admits urine, more or less in quantity, to pass through it, and I maintain the truth of the axiom first enunciated by Professor Syme, that whenever urine passes outwards through a stricture, an instrument ought with care and perseverance to be got in. I advise you to believe in that doctrine, not that it is true as regards yourselves at the present moment, for I will assume that you have not sufficient experience to be able to pass an instrument through a stricture in all cases. If you are able to do so, I can only say that you are quite out of place here, and need not come to learn. Without doubt it is exceedingly difficult to pass an instrument in some exceptional cases, but after a considerable amount of experience you will find that there are very few in which it cannot be accomplished. In the treatment of stricture, when you have really a difficult case before you, it makes

all the difference whether you act under a belief that it is your own fault if you do not succeed, or whether, on the other hand, you hold the dogma that there are a certain number of cases which are "impermeable" to all surgeons. The man who holds the latter belief will be quite certain in some cases not to succeed, whereas, probably, the man who believes that in all cases an instrument may be passed with time and patience, will be very likely to succeed in all, and at all events he will succeed better than the other.

"Impermeable" stricture is not heard of so much now as it was twenty years ago. It was fully believed in then, and a particular kind of operation might frequently be seen in the hospitals for it; but I will undertake to say that it is much less commonly done now. The operation consisted in passing a large instrument down to the stricture, and opening the urethra upon it from the perineum, and then carefully dissecting through the obstruction, or by it in some way, if the operator could, into the urethra beyond. It was very seldom that the true passage was followed, but somehow, by dint of cutting, a way was made for the instrument to go from the urethra before the stricture, to the urethra behind the stricture, and it was not a very successful proceeding. That was acknowledged in all books at that time as an operation for impermeable stricture, or as "perineal section."* I have had occasion to perform it three times only in my life; two were instances of traumatic stricture, and I believe the necessity for it to be

* I limit the employment of the term "perineal section" to the operation when *no guide has been passed* through the stricture. When a stricture is divided by incision through the perineum, upon a guide previously passed into the bladder, it is better, in order to distinguish this operation from the previous one, to speak of it as "External Urethrotomy," or as "Syme's" operation.

excessively rare. I have already given Professor Syme credit for having first enunciated that doctrine, and he always stoutly maintained it, to the great advantage of patients who suffer from severe stricture.

But you may have complete obliteration of the urethra, which, as before said, is not stricture. This is very rare; but it occasionally happens, and chiefly after injury in the perineum, as by the breaking of a vessel, or any wound there cutting into or across the urethra. If the opening remains pervious, and gives exit to all the urine, a cicatrix occurs involving the anterior opening of the divided urethra, which is then closed altogether, and so the canal is obliterated in front of the fistula.

I have now to consider the question, How are you to deal with a case in which real difficulty exists in passing an instrument into the bladder? Let a case be supposed in which attempts have been made, perhaps by several hands, and hitherto without success.

First let me point out in what the chief mechanical difficulties in such a case might consist.

There are four.

1. Extreme narrowness of the stricture.
2. The stricture may be tortuous.
3. It may be complicated with false passages.
4. The urethra behind the stricture may be irregularly dilated and reticulated.

Sources of difficulty of another kind, not mechanical, also exist, and are two in number, hereafter to be considered.

1. The stricture may be very resilient, and liable to become narrower, and to produce absolute retention on any instrumental contact; and

2. Any use of the instrument may produce in the patient an attack of rigors.

1. Let us consider, first, the mechanical causes of difficulty; of which the first is extreme narrowness.

In regard to this, the first thing you must do is to see the patient make water. The failures to pass the instrument may not necessarily have arisen from narrowing of the urethra, or from tortuosity: there may be a false passage in the canal. It may indeed be that there is no stricture at all. No greater mistakes are made than those which occur with patients who have little or no stricture, either from the surgeon not knowing well how to pass the instrument, or from there being a false passage into which it enters, so that it does not reach the bladder at all. You are first, then, to see the stream of water, perhaps on more than one occasion, so as to estimate it fairly, and you will judge by that what size of instrument is to be used. And always let the instrument correspond with the size of the stream which you see. It should correspond only in this way, however—it should be a little smaller. You know, of course, that when a current of water passes into a narrower passage than that in which it has been flowing, the stream is more rapid than before, and when the passage becomes larger it flows slowly again; so that the size of the stream as it flows from the orifice is not to be taken as the precise measure of the calibre of the narrowest part of the canal. You should, therefore, take an instrument somewhat smaller than the stream. There is a patient in No. 10 ward, whom some of you have seen, who does not pass a stream at all: the urine is only a succession of drops, and there can be no doubt in this instance that it is due to the first cause—namely, extreme narrowness of the stricture. How very

small, then, must be the instrument that is to be employed!

The first step to be taken with such a case, after having ascertained, as I assume to have been done, the situation of the stricture, is to introduce very gently the smallest English gum catheter without a stylet, and try to insinuate it through the obstruction. For this purpose I have endeavoured to obtain some exceedingly small instruments, much smaller than any hitherto made.* This tiny catheter which I show you, containing a slender steel thread rather than a stylet, may be used either with or without it. The value of this little instrument after its extreme tenuity, is its ability to transmit a drop of urine through its interior, and so assure you of its position when the bladder has been reached; an assurance, I need hardly tell you, of great importance. It is worth while making a careful and somewhat prolonged trial, and if you succeed, the instrument is to be tied-in at once, and the route secured. If I fail with it, I then try a silver catheter of the smallest size.

But there is one very important thing to be considered in connexion with small metal instruments—namely, that no more dangerous weapon can be introduced than a very small silver catheter, unless corresponding care, delicacy, and gentleness are exercised; indeed, it is impossible to be too careful in employing it. You see how easy it is with such an instrument as that which I hold in my hand to get into one of the lacunæ, or into any false passage, or to drive it through the soft walls of the urethra into the tissues outside: therefore it should always be used with

* Messrs. Weiss & Son have taken great pains to accomplish this for me, and have produced some slender, delicate instruments, much smaller than No. 1, which have been of great service.

the utmost lightness of hand. You must not hold this slender catheter tightly, resolving to get it through any obstruction; but it must be held so lightly that if it meets any undue resistance it will slip through the fingers directly —anything rather than wound the urethra. I certainly cannot advise you to try such an instrument until you have had some fair amount of practice with a larger one. In cases of very great difficulty, a small gum instrument is by no means always successful; but, as I have said, it should always be tried at first. I have been advocating gum elastic instruments as the rule; but if you have to deal with a very tight stricture, and fail to pass the flexible catheter after one or two trials, you must use a small silver instrument.

Now, one word upon the subject of using force. *Under no circumstances whatever should force be used in the introduction of an instrument through a stricture or into the bladder.* That is the invariable rule for myself, and my counsel to you. Years ago it was a matter of discussion how much force should be employed; more years ago still you heard of people using instruments with great violence. Now I am perfectly satisfied, and I believe all modern surgeons will tell you, that no force is to be employed. It is very difficult to say what one means by force; but what you are to understand is, that no kind of weight or pressure is to be put on the instrument which can by any possibility carry it out of the canal; and very little force will do that. The more difficult the stricture the less are you to dream of using force. You will remember that the urethra is possibly of full size up to the point of narrowing, and hence it may be very difficult to find the opening. If you use force, you will perhaps perforate the soft walls on either

side, and this done, you have increased your difficulties; because, if you make a false passage, the point of the instrument is much more likely to be caught in it than to pass through the strictured part.

2. A stricture may be more or less tortuous.

It does not necessarily follow the exact direction of the urethra. In other words, it may be a little on this side of the axis or on that, not necessarily in the middle. You may see this sometimes in a dead body; and you may infer it from experience on the living. When you have to deal either with a very narrow or with a tortuous stricture, there are two quite distinct systems of using an instrument, either of which you may employ. What I have to say then applies to the manipulation necessary in all cases of difficulty under the present and preceding heads; and I have reserved it, therefore, until now.

First, the little instrument employed, whatever its nature, may be applied by what may be called "groping;" that is, by carrying the point in any and every direction, with the utmost care of course, until by chance it has entered into the stricture, as you may feel by the sensation of the point being "held" or "grasped." For this purpose very slender solid instruments are made, of gum-elastic, of catgut, covered or not with gum, and of whalebone, since these can be produced of rather smaller size than the hollow instruments which I have just described. In order to add

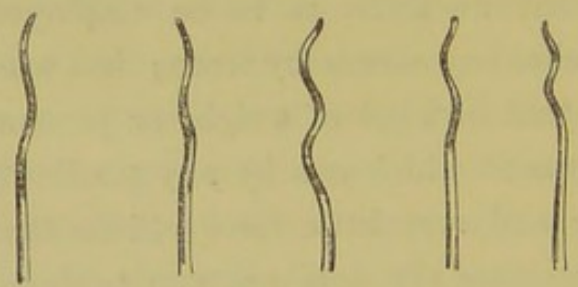


Fig. 11.—Small twisted bougies.

to the chance, as is supposed, of finding the orifice, there are some of the first-named material, the ends of which are formed somewhat into the shape of a corkscrew, or are otherwise made to deviate from a straight line. All these are of French design and workmanship; but none have the advantage of the channel, to demonstrate their presence in the bladder when they arrive there. (See Fig. 11.)

Now I advise you not to rely on mere "groping" to find the orifice; it is exceedingly dull, mechanical work to be constantly groping for a long time.

There is a method of search, however, conducted on a fixed principle, which I much prefer, and always employ. I advise you to adopt that, or any other you can devise, provided that it be a systematic one, and also an exhaustive manner of making the necessary exploration, and researches for the orifice of the stricture. Some of you have seen me apply it to a patient in the wards to-day. According to this manner, you proceed systematically and examine each side of the urethra in its turn. We will suppose the urethra to require examination on four sides—a roof, a floor, a right side, and a left side—you are to take your slender silver catheter, and slide its point delicately along each side successively from the orifice to the place of obstruction. If the orifice of the stricture is not *exactly* in the middle line—and we may fairly believe that it rarely is so—then there is one side of the passage which will more easily lead into the narrow way than another. These diagrams will show what I mean. (Fig. 12.)

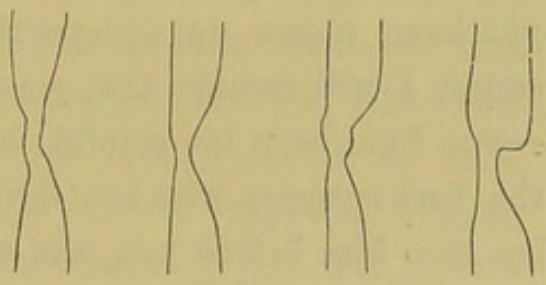


Fig. 12.—Diagrams of stricture.

If I go down on this side I shall probably not get into the stricture; but if I slide down gradually on the other, I shall probably get the instrument in, because you see there is less obstruction on that side. Begin, then, by the roof. The roof is the firmest part, the least likely to furnish obstruction in the way of ducts and lacunæ, and, by following it, will be most likely to carry the point in. The floor, on the contrary, is the softest, loosest, and most spongy part; and will be most likely to yield to the instrument, and give way. If your first effort does not succeed, take the right side; if that fails, take the left; if that does not do, try the floor. I know no other method so calculated to help you through a difficult stricture. If you are very careful, you may make the attempt in this manner for thirty or forty minutes without doing any damage; but if you find the patient suffering much, or if he bleeds rather freely, or if you are losing patience, give up the task, for you will probably make a false passage, and increase the difficulty considerably.

3. The existence of false passage leading out of the urethra is another serious obstacle to the introduction of instruments into the bladder.

Suppose that you have a case under your care, in which you have reason to believe that false passage exists. Of course I will assume that you have not made one yourself —you have been too careful for that—you are perhaps not the first surgeon who has seen the patient; some one else has seen him before you, and made a false passage. There is a curious instance in the ward upstairs, of a man who has made a false passage himself, confessedly, notoriously, because he has taken a large instrument and pushed it completely *into the bowel.* He has used a No. 9 or 10 bougie,

and treated himself for stricture. He is certainly an illustration of the old adage, that "he who treats himself has a fool for his patient." He has thrust the bougie out of the urethra through all the tissues between it and the rectum. When he was in the out-patient room he simply complained that when he passed the catheter into the bladder he brought out fæces. The truth is he never went into the bladder at all. I suspected the cause, laid him on his back, and verified it; and, as you know, he is now in my ward upstairs. I have made two prolonged attempts, and I carried a No. 1 silver catheter into the bladder to-day. You can easily conceive how difficult that false passage must make it to get the instrument in, since he really had also a very narrow stricture.

The principle which must guide your action here is to be very careful to avoid the side on which the false passage is. A false passage commences usually on the floor, and, no doubt for a reason already mentioned—viz., the fact of the structures below being looser and more delicate than those above.

When you examine a patient with a false passage, you may find the instrument passing to its very end, notwithstanding which no urine flows. Hence the false notion of stricture at the neck of the bladder. When the instrument has thus passed, put your finger into the rectum, and you will know instantly whether there is a false passage; for, if so, there are only the coats of the bowel, which are very thin, between your finger and the instrument, so that you feel it very distinctly; and very commonly you find that it is not in the middle line, but rather to the right or to the left. But if the instrument is in the right passage, you feel the whole thickness of the prostate, not always very considerable,

between it and your finger, still quite enough to show that you are in the right path. It is almost always in the bulbous portion that the instrument leaves the urethra and gets under the prostate. What you are to do then, is to withdraw the catheter two inches or so, then pass it on again, keeping as close along the upper part of the urethra as you can, ascertaining by means of the finger in the bowel that the instrument is not passing into the old route. It will be very likely to do so, because it is much more easy to get into a false passage than into the right one.

But when false passage exists, it sometimes constitutes the chief obstacle to the introduction of an instrument, for, as I have before hinted, the stricture itself may be only inconsiderable. The size of the stream will help to determine this point; and if, so far from being a mere thread, it has a volume equal to a No. 6 or 7 catheter, use a No. 5 silver one, so that you can guide it, and try each side of the urethra successively, until you discover which it is that enables you to clear the orifice of the false passage. Remember the result, and you have a key to the difficulty which will enable you to overcome it with ease on the next occasion.

I have now devoted as much time to this subject as I dare. I have only given you these general hints; you will arrive at the rest yourselves by practice. There is very often a case of false passage upstairs, and I wish you sometimes to verify the position of the catheter when it is in the false passage; to observe, by introducing into the rectum your finger, how very little tissue there is between it and the instrument. On the other hand, when it is properly passed, you feel the thickness of the prostate intervening.

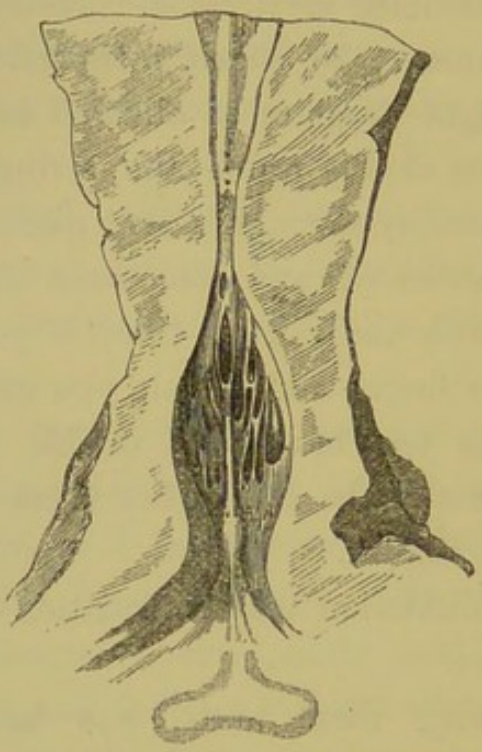
You can only appreciate this by the touch, and will learn very little more by talking of it.

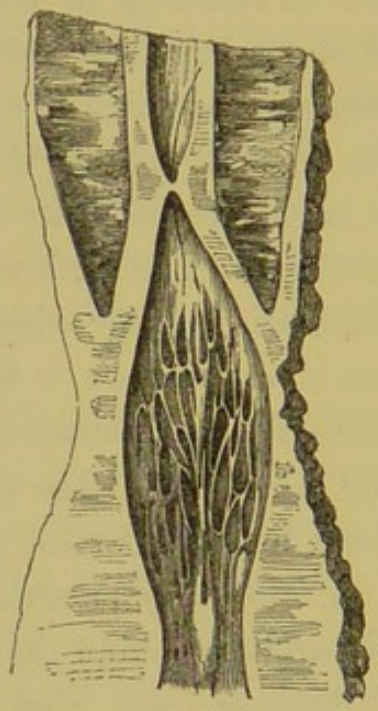
I may here observe that in using silver catheters of small size an injection of oil is sometimes serviceable. Instead of oiling the instrument, commence by slowly introducing from two or three to six or eight drachms of olive oil into the urethra, holding the meatus closely round the syringe. It is easy to insinuate that quantity through a very narrow stricture. The surfaces are lubricated, and sometimes the urethra is slightly distended with the oil, so that, if you can cleverly retain it with the finger and thumb, you may introduce the instrument when you have been unable in any other way. The plan is not to be tried when there is much bleeding, or the tissues are torn.

4. Difficulty presented by dilatation and reticulation of the urethra behind the stricture.

Suppose next that, following these hints, you have carried the instrument through the stricture; there is a sort of grasp felt on attempting to move the instrument, which is quite unmistakable. That is a sensation which you are always very content to have, because, feeling the catheter "held" by the stricture, you know you are through it. But that very "grasp," which you are so satisfied to feel, makes it less easy to manipulate the point of the catheter after it is through the stricture, and you may have a source of danger to encounter in the urethra beyond. Thus, the mucous membrane being sometimes reticulated from the presence of dilated lacunæ, it is easy to engage the point of the instrument in one of those, and make a false passage. Besides this, as the result of long continued fluid pressure and straining, all the urethra behind the stricture is occasionally much dilated, and the whole surface is so irregular,

that it requires care and an acquaintance with this condition to traverse it safely. Here, especially with a small instrument already grasped, you may require all the caution





FIGS. 13 and 14.—Sections of urethra, showing very narrow stricture, and dilated and reticulated membranous and prostatic portions behind it.

you can command in completing its safe course into the bladder. I show you two drawings taken from cases which exactly illustrate this condition. (Figs. 13 and 14.)

We had better here pursue the case one step further. Suppose you have got the catheter in at last, after much difficulty. By no means withdraw it. You will say: "I had trouble enough to get it in; and now I will tie it in at once." In these circumstances it is most desirable to do so, although it is a metal instrument; and you may keep it forty-eight or seventy-two hours before removing it. Do not then be in a hurry to remove it, if the patient is tolerably comfortable. You will be excessively disappointed

to be obliged to repeat your task; and it will be very disagreeable to the patient. Keep it in above three days, and then you will mostly be able to change it easily for a small gum-elastic instrument. You will then go on with "continuous" dilatation, as already described, increasing the size of the gum catheter from time to time. You will arrive perhaps at No. 10, and will rightly tell your patient that this is a great achievement, that now you will relieve him from the inlying catheter, and only pass one day by day. Nevertheless, in ten days or less perhaps, to your great disappointment, it may happen that the stricture will admit nothing larger than No. 2 or No. 3.

This brings us to the consideration of another kind of difficulty encountered in the treatment of stricture, one not of a mechanical kind, but consisting in a certain organic quality of the obstruction itself, which may be termed "resiliency," or strongly marked contractility. The more we attempt to dilate, in a typical case of this kind, the more obstinately close the stricture becomes.

Besides this, there is a second source of serious hindrance to treatment not unfrequently met with—namely, a constitutional disposition in the patient to experience severe rigors on attempts to treat the stricture by dilating instruments of any kind.

I. What is to be done in relation first to the case which has been here termed the "Resilient Stricture?"

I will just premise that I desire you to understand that you may have to deal with a very narrow stricture, and be able to dilate it, and the dilatation shall be fairly permanent. On the other hand, you may have a stricture which will admit even No. 5 or No. 6 catheter easily, yet the man will scarcely make a drop of water, and you cannot dilate

the stricture more that a number or two, do what you will. We had an instance of that in the ward the other day. A No. 6 instrument could be passed; but the man was unable to make water by his own efforts until I had operated, and then he was able to do so with ease and comfort.

Let me add, that the best mode of treating this form of the disease is a problem of very ancient date. These resilient strictures have been the plague of surgeons from time immemorial. If you go back to the old records of surgery—how far back?—some hundreds of years—you will find that these cases have exhausted the wits of surgeons to the present day. All kinds of things have been used in order to overcome the difficulty. I cannot tell you one-half of the matters of various kinds which have been put into the human urethra, for the purpose of curing it. I suppose the human stomach has been made to receive more abominable things than any other receptacle in or out of the human body. But if you consult the old surgical authors, or even some modern books, you will see that the urethra has been used nearly as roughly, and that is saying a good deal. Mercury of course, first; then verdigris, savin, the salts of all sorts of metals, everything that could irritate, or that could be imagined to be disagreeable, has been employed to cure these unfortunate strictures. At the present moment I need not tell you that some surgeons have employed nitrate of silver and caustic potash—not at all mild remedies, either of them. Now the whole question of chemical irritants, as applied to stricture, I shall dismiss with the following words: I believe them to be unnecessary, undesirable, and often injurious. Most modern surgeons, both in this country and abroad, have pronounced against the use of caustics and chemical irritants in the treatment

of stricture. I am bound to tell you they have still some advocates: what system has not? I shall not pursue that question further.

Then what have we left? Several other methods, all of which are mechanical in their nature: we may rupture, or over-extend, or cut these unyielding and contractile fibres, which constitute the stricture. Urethrotomy, as it is called—division of the strictured urethra by some form of knife—is, perhaps, all things considered, the most universally employed in such cases. Now there are two kinds of urethrotomy—external urethrotomy and internal urethrotomy: the external applied from the perineum; the internal by means of the knife, or some other instrument applied within the urethra.

Internal urethrotomy however is a large subject and shall be considered in a lecture by itself. Accordingly I will go on to speak of external urethrotomy and of the other mechanical applications alluded to.

External urethrotomy is usually known as Syme's operation. It is necessary always, in this proceeding first to pass a small grooved staff or director through the stricture, into the bladder; and then to cut down upon the perineum, in the median line, and divide the stricture completely by cutting freely into the groove of the staff. The staff has a "shoulder," where the stem, which is about No. 10 in size, suddenly becomes No. 2. This shoulder rests against the face or anterior limit of the stricture, and is a guide to the surgeon as to the part to be incised. The slender portion is grooved, and must be passed with great care into the bladder: a little channel should pass from the groove through the stem and handle, to permit a little urine to issue, and prove that the instrument is properly placed.

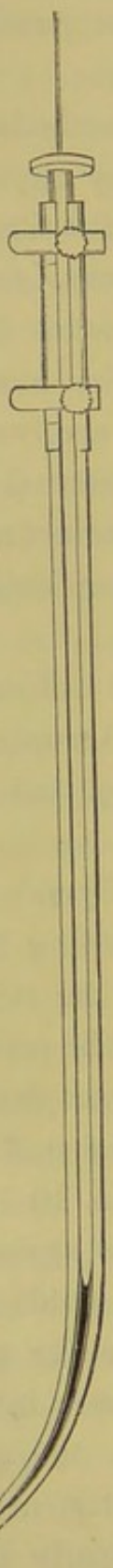


Fig. 15.—Perrève's dilator, from his Treatise. Paris, 1857.

This proceeding is seldom adopted now, although much done twelve or fifteen years ago; but other means have superseded it. Occasionally the operation is still performed, chiefly when there are old or large perineal fistulæ which require to be laid open. After doing it, a catheter is tied-in for forty-eight hours, and an instrument to maintain a good calibre must be passed from time to time afterwards.

It is essential to success in this operation, that the guide should be safely lodged in the bladder, that the whole of the narrowed portion of the urethra should be freely incised, and that during the healing process a full-sized bougie should be passed, to prevent undue contraction afterwards. The error, when there has been one, which I have observed to be most commonly made, is to cut too much backwards towards the bladder, and to leave some fibres of the stricture uncut in the anterior direction.

We next come to the mode by "rupture;" and here I will show you an instrument which bears the name of Mr. Holt, of the Westminster Hospital. He has brought the instrument into notice, and the mode of using it is his own. It was invented by M. Perrève, of Paris, about thirty years ago. (Fig. 15.) He used it mainly, but not altogether, for simple dilatation; Mr. Holt uses it otherwise. He carries it through the stricture, and

then, instead of passing at different times a succession of tubes of gradually increasing calibre, he takes the largest tube at once, and forces it down the urethra along the central guide, so as at one stroke to split everything that happens to obstruct the passage of the instrument. Mr. Holt does not tie in an instrument afterwards. When the operation was first introduced, I was strongly repelled by the violence of the proceeding; but I examined some of Mr. Holt's cases with him at the Westminster Hospital—now some ten years ago—and was surprised to find how few bad results followed. Hence I tried the plan, and used it occasionally for a urethra which has some two or three contracted points—a condition rarely met with—so as to deal with them all with certainty. Further experience has however shown that it is by no means without risk, and that the relief afforded by it is often of very brief duration, an objection of a very serious character against any proceeding which, if necessary at all, is so only in the most intractable examples of the disease. The impossibility also of applying the distending force to any portion of the urethra in particular, since the same amount of distension affects equally the whole when it is used, suggested to me some years ago a different method—namely, one which I have called "over-distending" the stricture. It is simply this. Here are two blades, as in the instrument used by Mr. Holt, but these two blades can be separated for a considerable interval at one point only, and as slowly or as quickly as you please. (Fig. 16.) I have not used it much of late years, but when I did use it, the power, whether applied rapidly or slowly, was exerted only on that part of the canal in which the stricture was situated. For there is this fact to be noted: I wish you to remember that the bulbous part of the

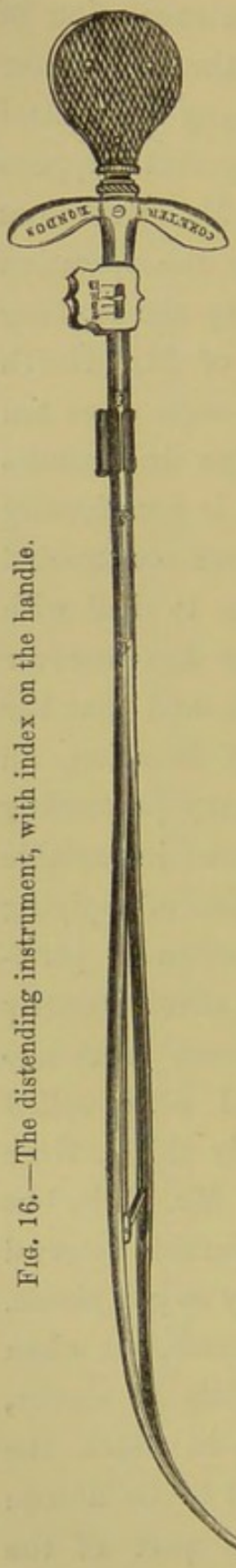


Fig. 16.—The distending instrument, with index on the handle.

urethra—the usual position of stricture—is also the most distensible part in the natural condition of the canal. Supposing the external meatus to be about No. 12 (English scale) in calibre, the bulbous urethra admits at least No. 20 or 24. Hence it follows that no kind of dilatation or operation which is limited in extent by the size of the external meatus, more than half restores the urethra which has a stricture at the bulb. It is on this account that I distend the contracted part to at least this, or even to a larger size, or rupture it if I please, by means of the instrument in question. I have used it many times, and it has been certainly attended with fair results. It may be useful for those who have a very strong objection to the knife on any ground. It is to be used only for strictures within the bulb. I have heard that it has been employed for those within three inches of the meatus: it is a mistake to use it for such, which, as I said before, ought to be cut. This operation requires more care than the other. Mr. Holt's operation needs no care after the instrument is once in place; it is extremely easy to use it. If the instrument is once introduced correctly, a single impulse of the hand forces the tube through; and it is certainly tempting on that account. I

am not at all certain, however, that it is an advantage to the patient that an operation should be so easily applicable by an inexperienced practitioner. The consequence has been, and not so very seldom, that it has been performed, owing to such inexperience, on patients for whom no operation of any kind was ever necessary. I think, too, that internal urethrotomy gives results which are more enduring than any other ; but it is infinitely more difficult to perform properly, and, without doubt, it requires, like most important surgical operations, a practised hand. I leave its consideration therefore to our next meeting, which we shall devote entirely to the subject.

LECTURE VI.

ON INTERNAL URETHROTOMY.

GENTLEMEN,—During the last few months many cases of stricture of the urethra have come under our notice, of which the most severe and obstinate have been admitted into the wards. I have employed for most of these cases the operation of internal urethrotomy, because throughout my experience I have found nothing so efficient, so safe, and so certain. I by no means say any kind of urethrotomy. Anything short of complete division of the hardened tissue is not efficient. Over-distend these strictures, or tease them with dilatation in any fashion, and they are rendered more than ever unmanageable, and you only provoke an attack of rigors, and sometimes prolonged constitutional disturbance of a severe kind.

For the operation of internal urethrotomy, we have numerous instruments and systems to choose from : their name is legion. Modification after modification has been made of the earlier forms of urethrotome, both by instrument makers and by surgeons, with the view of accomplishing more perfectly the original design, which is that of ability to divide easily, and more or less freely, the hardened tissue.

In treating this subject, let us first deal with the strictures situated at or near to the external meatus of the urethra.

The best instrument for the purpose of dividing these,

although a slender knife will answer very well, is perhaps the small bistourie cachée, which I hold in my hand (fig. 17). All that is necessary is to introduce the end of the instrument into the canal, about an inch or more,

Fig. 17.—A small bistourie cachée.

according to the extent of the narrowing, then to project the blade and draw it outwards, dividing the obstruction. Nothing can be more simple. By means of a screw, you can raise the blade to a small or to a large extent. It should be used so as to make a rather free incision, which is perfectly safe. This drawing, from a preparation, shows the condition in question. The strictures are laid open after examination, and present the appearance of much larger calibre than really existed during life. (See fig. 18.)

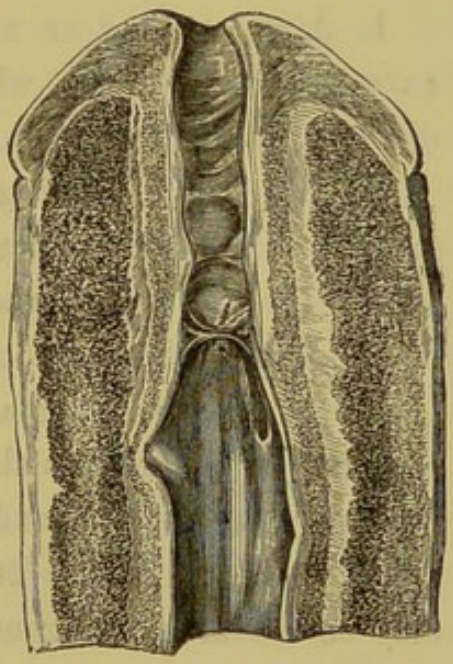


Fig. 18.—Strictures near to the orifice of the urethra.

For all strictures which are more deeply situated I prefer another proceeding, and having disposed of those in the meatus, I shall devote this lecture to the consideration of those which belong to the former category, and which, indeed, form the great bulk of the cases with which we have to do; and certainly those also which are of the greatest importance.

The instruments employed are, as I have already said, numerous and varied. And there are two distinct methods of making the incision necessary in order to divide the stricture. This fact enables us to group all these instruments in two separate classes.

I. The stricture may be cut from "before backwards," on a guide previously passed.

II. Or a blade may be introduced through and beyond the stricture, which is then cut from "behind forwards," in which case a guide is unnecessary.

Before considering these, I may state that the situation of a stricture is an important element in relation to the applicability of internal urethrotomy of any kind, and also as to its necessity as a mode of treatment. Thus :—

1. A stricture at or near the external meatus is always extremely undilatable, while at the same time it may be divided with the greatest ease, precision, and safety.

2. A stricture existing in any part of the anterior three or four inches of the urethra partakes, but in a somewhat less degree, of the intractable quality named, and may be cut with almost as much facility and safety as those in the previous class. As a rule, it may be said, the nearer a stricture is situated to the orifice of the urethra, the more necessary it is to cut, and the safer it is to do so.

3. Strictures in the bulbous part of the urethra, which may be considered as generally ranging between four inches and five inches and a half from the external meatus, are less liable to be unmanageable by dilatation than those of the preceding classes. But when necessary to cut them, it is easy and quite safe to do so as a rule, slightly less so than those in the preceding class; the difference being due, no doubt, to the larger amount of erectile tissue there as

compared with the anterior part of the urethra. Bleeding, therefore, may be more considerable, and other risks, such as they are, more liable to be encountered.

I show you urethrotomes in great variety here, chiefly of French make, the operation having been largely practised in France long before it was employed here. Modifications innumerable of what were originally simple, perhaps we may say rude, instruments, have been made during the present century in that country, and more recently elsewhere. Most of those known by the names of Leroy d'Etiolles, Civiale, Amussat, Reybard, Ricord, Trélat, Sédillot, Maisonneuve, Stafford, and others, are before you; there is one also, a recent one, of Dr. Otis, which, like Reybard's, distends the passage at the same time that the incision is made.

I select two as types of the two different systems described of using a cutting instrument—the urethrotome of Maisonneuve and that of Civiale. I select the former instrument because it is not only a type of one which cuts from before backwards, but because it has been more largely and generally employed of late years on the Continent perhaps than any other. The instrument of Civiale I have selected because it is the typical one of the other system—viz., that of dividing the stricture from behind forwards.

The urethrotome of Maisonneuve consists of a slender guide or conductor in steel, the size and nearly the form of a No. 1 or 2 catheter, but grooved throughout its course. This is first introduced through the stricture into the bladder. Along this groove slides a blade of triangular form, the base of the triangle being attached to a long steel wire stylet, while the two other sides of the triangle project considerably. This blade can be pushed, by means of a handle attached to the wire, through the whole course

of the urethra. (See fig. 19.) The apex of the triangle, which is the salient part, is blunt, and the lower side of the triangle only is sharp and will cut. In the act of passing the blade, the healthy part of the urethra is protected from incision by the blunting of the apex (like the button of a foil in fencing), while the sharp side divides certain of the hardened tissues which it meets.

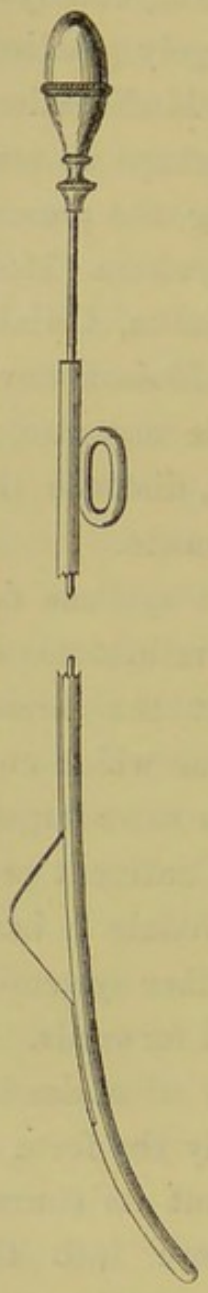


Fig. 19.—The urethortome of Maisonneuve.

Now, my objection to this instrument is simple and distinct, and I do not hesitate to say is fatal to it in respect of its efficiency for a case of confirmed and indurated stricture, such, indeed, as constitutes that form of the disease which most requires treatment by incision. It is an axiom accepted by most, if not by all, who have carefully observed the results of urethrotomy by any method, that if an incision of stricture is required at all, it is essential that the whole of the obstructing fibres should be divided. No one laid more stress on this doctrine than Syme of Edinburgh, after he had had a considerable experience of his method by external division. The cases of relapse after that operation, he had no doubt were chiefly those in which he had cut insufficiently and left a few fibres undivided. The justice of this observation was verified repeatedly by myself then, and also since in my own practice, with internal urethrotomy. Now, what happens with Maisonneuve's instru-

ment? The blunt apex, which enables the blade to pass without injuring the healthy urethra, fails to cut the most elastic or yielding fibres of the stricture, which, by reason of their yielding character, permit the blade to pass through by stretching them. The blade incises, no doubt, the strongly marked and hardest portion of the stricture, but all the obstructing tissue is not divided, especially that for some distance before and behind the maximum point of narrowing, and these uncut fibres will at no distant period of time show their presence and reproduce contraction. Further, by no manner of using the instrument can you control or regulate its power. It is a mechanical apparatus or machine, which just accomplishes a certain amount of action and no more. This alone is for me a serious ground of objection to any instrument.

Now, suppose for an instant that it were possible for you to have the stricture before you open to your eyes and hands; you certainly would take a little scalpel and employ it for each case according to its needs, intelligently dividing the obstructing fibres as much as is necessary, and no more. But with a very little practice it is perfectly easy to do this without seeing the stricture—that is, to apply a little scalpel, dividing where you wish and not elsewhere, just as you divide the constricting fibres at the ring of a hernial sac. And I need scarcely say that this intelligent action of yours will produce something better than the work of a machine which any ignorant person can employ just as well as you. The difference in the two cases resembles that which exists between the music of an organ produced by a handle, and the music which results from the facile hand of a skilful performer.

It is a question of no mean importance which arises from

the comparison of incision made by machinery and incision made by the intelligent hand. That is the real question in urethrotomy as presented in these two systems. And the instrument I now show you, which I always use, and have operated with so many times in the wards here, is the type of the method which affords the opportunity of making the incision according to the operator's will and judgment. It is nothing more than a little knife with a long handle, and is used precisely as we use a scalpel anywhere else. Just as we should use a small knife in tenotomy, without the sense of vision, where it is not necessary, but guided by the sense of touch, so do I advise you to cut in urethrotomy. I carry the parallel one step further, and remind you, that just as it is essential in tenotomy to divide completely the tendon, and also any little minor band of constricting tissue which opposes the perfectly free play of the joint, so is it essential to make the same complete division also in urethrotomy. The ultimate success in either operation depends on attention to these particulars.

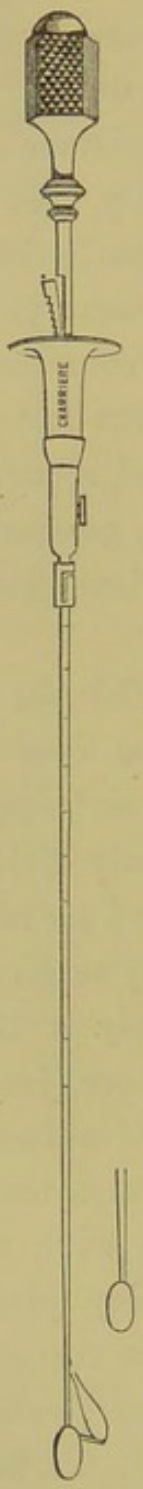


Fig. 20.—The urethrotome of Civiale.

The instrument which I hold in my hand, and to which I have been referring, is the urethrotome of Civiale, made much smaller, as I prefer it to be, than is customary in Paris. The shaft of mine is about the size of No. 3, English scale, with an oblong bulb at the end not larger than No. 5 or No. 6. Within this is a little blade which, by a clever contrivance, the

operator can make to issue at will, as much or as little as he desires, and which he can also sheath instantly at his pleasure. The bulbous end gives him the power of exploring the urethra at the time of the operation, and of determining precisely where and what he ought to divide. (Fig. 20.)

The bulb is to be introduced, say fully half or three-quarters of an inch beyond the maximum point of narrowing felt, the blade is then to be projected there, and drawn steadily through the whole of the constricted portion outwards towards the meatus, in which direction the incision is sure to be certain and complete.

Now I at once anticipate an objection which I expect you all to raise. I expect you instantly to exclaim, "Why, if an instrument so large as No. 6 can be passed through the stricture, should there be any occasion to cut at all? Surely it is for small strictures, through which only the finest instruments can be passed, that an operation is necessary, and for such this instrument of Civiale is obviously unfitted by its size!" Such criticism is quite natural at the first glance, and from those who have not learned by considerable experience certain important facts about confirmed stricture.

I reply, first, that the *narrowness* of a stricture alone, however extreme, does by no means render a cutting operation *always* necessary. Some of the narrowest strictures I have ever seen have been very successfully and rapidly treated by simple dilatation.

Secondly, the quality which makes incision of a stricture necessary is, as I have previously shown, "resiliency"—that property which leads it to contract again rapidly after any dilatation. This quality affects strictures which will admit

No. 5, No. 6, or No. 7 quite as frequently as narrower contractions.

Thirdly, supposing it is necessary to cut a stricture which is narrow and only admits No. ½ or No. 1, there is *never any difficulty in dilating it temporarily* up to No. 6 for the purpose of admitting the instrument I recommend.

All you have to do is to keep the patient in his room from three to five days with a small soft gum catheter tied in, which produces scarcely any inconvenience; and thus by "continuous dilatation" you can always bring the most resilient stricture to the required size for the operation. Having arrived at No. 6, you are enabled to perform the operation in the best possible circumstances. And the few quiet days spent in preparation are advantageous rather than otherwise; the result furthermore being that you can now make an incision in the manner I have described, directed by your intelligence and adapted to the particular case.

For safety to the patient and excellence in result, both in regard of his present and future condition, I greatly prefer the operation I have described to any other method I have ever seen.

I will now briefly detail the stages of the proceeding:

First: The situation of the stricture or strictures is, of course, previously ascertained by the necessary examination; that is, their distance from the external meatus.

Secondly: It has been ensured, either by tying-in a catheter or otherwise, that at the time fixed for the operation the stricture is sufficiently patent to admit the bulb of the urethrotome to pass through it. The stricture should just admit about No. 6 (English scale). Having given

the patient some ether, I withdraw the inlying catheter, which in almost every case has been necessarily present for a few days, and at once pass carefully the bulb of the urethrotome through the stricture, which usually requires a little gentle pressure and management; after which the little bulb is felt free and movable in the urethra on the further side. In this situation, and at least half an inch beyond, or on the bladder-side of the stricture, you make the blade project to the requisite extent by means of the simple mechanism in the handle which I show you, and directing the edge to the floor of the urethra, you press it firmly there, and draw it boldly outwards, as if you would make an incision say an inch and a half or two inches in length, so as to divide all the thickened tissues which constitute the stricture. You feel them sometimes offering much resistance. Take my word for it, you need not fear freedom of incision. I never saw any serious harm produced by it, although I have seen less success resulting than I desired where I have not sufficiently divided the stricture, as may have been the case in some of my earlier experiences, and have so left a fibre or two uncut. But I have never had occasion to regret a free and complete division.

Next you introduce a No. 13 plated sound, not conical, which should go quite easily into the bladder, and not be in the least degree "held" in withdrawing it: keep along the upper portion of the canal, and the point of the instrument will not get into the incision. If it is "grasped" or "held" in any degree, a small portion remains undivided, and should be at once cut; the same urethrotome, or another with a larger bulb, being introduced for the purpose. After which the No. 13 should pass with perfect facility. Then take a No. 11 or 12 well-curved gum catheter, and pass it

into the bladder, tying it there in order to retain it forty-eight hours. It is best to introduce it well curved or upon a stylet to avoid the wound, which otherwise the point of the instrument might get into, occasioning you some embarrassment. Of course the stylet is withdrawn immediately afterwards.

Now, in all the operations I have done, more than two hundred in number, I have rarely seen any bleeding worth naming—sometimes only a few drops appear; once and once only it was severe, although it ceased ultimately, and all went on well; this was in a case I have recently met with. On two occasions some extravasation of urine occurred when the catheter became displaced, but not nearly so bad as I have seen following "rupture," and once only an abscess has followed; and you yourselves can also form a judgment, to some extent, of these questions, since you must have seen at least twenty cases of this operation in the wards during the last twelve months. Sometimes there may be a considerable amount of fever, but very seldom, and, still more rarely, cystitis; much depends, I need not say, on the way in which the thing is done. Twice only has it been followed by fatal results. The first death occurred in the case of a man in one of my wards here, for whom I performed the operation as a last resource, and the autopsy showed such an advanced stage of disorganization in the ureters and kidneys, that I am not surprised at the result. The second case, in private, was a very remarkable one, in which death took place from embolism of the heart and great vessels within ten days after the operation, no very obvious sign of local disturbance elsewhere having manifested itself. If anything has surprised me, it is the extreme safety of the operation, for my earliest

belief about it was that it was by no means free from risk, and I hesitated to employ it except in very urgent cases. Now, with my present experience, I never hesitate on the score of danger, for there is almost absolutely none; of course I speak only of that kind of urethrotomy which I employ, and have described in this and alluded to in the preceding lecture.

It is not uncommon sometimes to have an attack of fever after the withdrawal of the inlying catheter forty-eight hours after the operation. The first time the patient passes his urine, a drop perhaps enters what remains of the incision, and he has a rigor in an hour or two's time, and that is all. To avoid this as much as possible I always adopt the following plan:—When removing the catheter, forty-eight hours after the operation, I withdraw all the urine, order the patient a hot hip-bath for fifteen minutes, and send him back to bed to be well covered up, with instructions not to pass water until he feels a manifest desire. This will probably not occur until six hours after the instrument was withdrawn. He then stands up, makes a full stream, is generally very much astonished at its volume and the ease with which it flows, and goes back to bed as before for the day. Following these precautions, you may hope he will escape the rigor; but if not, you know, at all events, that there is no risk, and no ground for anxiety. Sometimes, but this is quite exceptional, the fever is somewhat more severe and prolonged.

The subsequent treatment may be briefly sketched. On the fourth or fifth day after the operation, pass a conical French bougie with a large bulb, so as not by any means to open the little wound. If the point is felt in the slightest degree to encounter an obstruction, withdraw it, and pass a

well-curved gum-elastic or metal instrument, which is not conical; the former, however, usually suffices. Again, in three or four days; and No. 12 or 13 mostly pass with considerable ease. After this once a week, and the patient will pass the instruments himself at increasing intervals, ultimately arriving at, say, once a month.

This operation gives, I believe, more lasting results than any other. You have seen me perform it for cases which have experienced every other known treatment, and in which the stricture has returned as badly as ever. For most of these I think it is the best treatment known. I do not claim for it the power to remove organic contraction. Such a result is impossible. The treatment has yet to be devised which will remove absolutely, and for ever, the occurrence of recontraction in a patient once the victim of an organic stricture.

Briefly let me, at the close of this subject, remind you that, in view of any operation, and indeed in all cases of impeded micturition, attention to the general health often aids in a considerable degree to mitigate the local troubles. Do not overlook the state of the digestion. If this is unsatisfactory, if the bowels are unduly constipated, the troubles of the bladder and urethra will be much increased; and frequently it happens that a mild mercurial, followed by a dose of Glauber's salts, or of Friedrichshall water, in the morning, gently unloads the liver and bowels, and greatly relieves the most distressing symptoms. Then take care of what your patient eats, and more especially let his alcoholic drinks be in moderate quantity, and of the mildest kind.

There is only one other word I have to say: do not be partisans of any single method. You hear one surgeon say, "I always follow such and such a method: there is

nothing like it." Or another, that he always adopts the proceeding of M. Civiale; and a third that of M. Maisonneuve, and so on. There has been great fertility in inventions of this description, especially in Paris, and you may see from several of them very excellent results. Do not confine your selection to any one method, whether I or any one else recommend it; but have every resource at your disposal. If you have much to do with stricture, or with such complaints, I can only tell you you will want all the resources within your reach. Consider them carefully, and select for each individual case that method which appears in your judgment to be best adapted for it.

LECTURE VII.

HYPERTROPHY OF THE PROSTATE AND ITS CONSEQUENCES.

GENTLEMEN,—We may pass from the subject of stricture to another very important complaint, and one of common occurrence—viz., hypertrophy of the prostate. It is one which affects a large number of elderly people, and thus the practitioner is almost certain to come in contact with it pretty frequently. Hence the necessity for our studying these cases closely, and the more so because we do not see them very often in the beds here, most of them being treated as out-patients.

I shall commence with two or three important generalizations for you in relation to impeded or frequent micturition.

Impeded or frequent micturition in an otherwise healthy young man, say from eighteen to twenty-five years of age, is more likely to be due to some inflammatory action affecting either the urethra or bladder, than to any other cause.

Impeded or frequent micturition in a middle-aged man, say from twenty-five to fifty-five, may be due to the same cause, but is also likely to be due to stricture of the urethra (*inter alia*).

Impeded or frequent micturition in an elderly man, say at and after fifty-six years, is very often due to hypertrophy of the prostate, and consequent inability to empty the bladder by his own efforts.

You will very rarely find much impediment to micturition produced by stricture before twenty-five years; you will

never find it due to hypertrophied prostate before fifty-five years.

Now I wish to guard you against confounding this last-named condition, hypertrophy of the prostate, with enlargement of the organ from any other cause. The enlargement, which we call hypertrophy, is quite "*sui generis*." No other organ of the body is similarly affected. It has no relation to, or affinity with, inflammatory deposits, such as we may observe in the swollen tonsil, or in lymphatic glands. The increase in bulk is due to a new formation of gland-tissue, either throughout the organ or in isolated portions. I know nothing analogous with it, except the so-called fibroid tumours of the uterus, which consist mainly of an augmented production of the constituent elements of that organ. So that the new product in the prostate is not a new formation like cancer or epithelioma, and is, in fact, not a "morbid" growth at all, although it induces diseased conditions of the bladder as a result of the mechanical obstruction occasioned by its presence. I make these remarks because I so often observe confusion of ideas respecting hypertrophied prostate. Few people appear to know that there is nothing whatever of relation between it and the enlargement resulting from inflammatory deposit, the latter being essentially a phenomenon occurring in the first half of human life, while, as I have already said, the former belongs solely to the latter third.

It was formerly stated, on the high authority of Sir Benjamin Brodie, that "when the hair becomes grey and scanty . . . . . the prostate gland usually, I might perhaps say invariably, becomes increased in size;" and that is the impression which a large portion of the profession has generally entertained. It was certainly that which was

commonly received when I first began to make some special researches in reference to this matter, now some ten or twelve years ago (1868). I was then at the pains to examine after death all the bodies of male patients over fifty-five years of age who died in the Marylebone Infirmary; and afterwards, in Greenwich Hospital, the inquiry was pursued by Dr. Messer and myself. I took care to dissect each prostate very carefully, and discovered that, so far from the presence of prostatic enlargement being the rule, this condition was quite exceptional. I examined about two hundred cases—not picked cases, but all who died consecutively within a certain period, and I found that about one in three exhibited after death some enlargement of the prostate. But do not suppose that anything like a large proportion of those manifested symptoms; for only about one in seven, not more, had any symptoms of the complaint, and these were slight. So that you see it is not to more than one in (let us say) twelve or fifteen men who live beyond fifty-five years of age to whom you can expect to be called to afford any relief for this affection. That, no doubt, is a large number. If you suppose that one man in every fifteen approaching sixty years of age has symptoms of enlarged prostate, you will see at once how often, if you have anything like a large practice, you may be called to attend to these cases.

We will now consider one or two anatomical points connected with enlarged prostate. This organ is, as you know, composed of two lobes and a median portion. Now, the part affected with hypertrophy very much influences the results in relation to the function of micturition. It is not necessary that there should be much enlargement of the prostate in order to produce very severe symptoms. On

the other hand, you may have a very large prostate, and may have almost no symptoms. Almost the largest I ever saw, as big as a small cocoa-nut, produced very little obstruction to the flow of the urine. Thus, if the median portion of the prostate is only slightly enlarged, there may be retention. Let this figure [diagram, see fig. 21] represent the

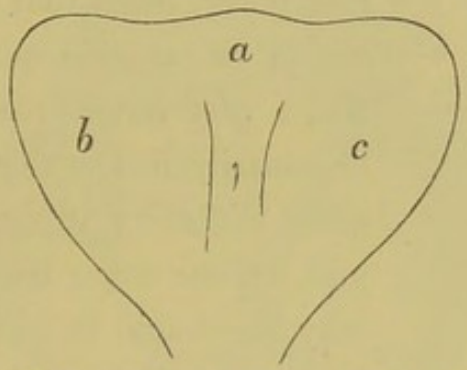


Fig. 21.—Diagram of prostate. *a*, median portion; *b* and *c*, right and left lobes.

two lobes, and the median portion. If there is a small nipple-like projection at the median portion just filling the internal orifice of the urethra, that may be quite sufficient to prevent every drop of urine passing by the natural efforts. Sometimes a considerable eminence arises here, shown in the diagram fig. 22. The same thing is represented in profile by a vertical section in the diagram fig. 23. Sometimes there is a considerable enlarge-

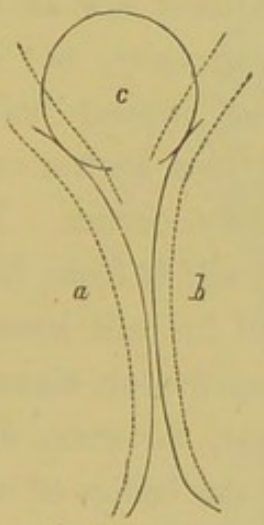


Fig. 22.—Diagram representing a tumour filling neck of the bladder. The line which the catheter may take on either side of it.

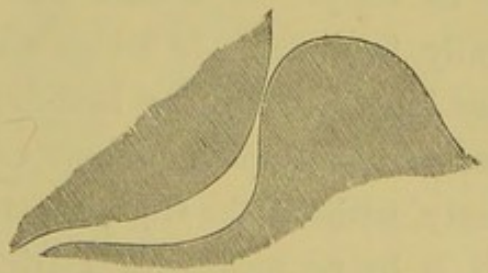


Fig. 23.—Profile view of prostatic enlargement.

ment on one side, so that the passage is circuitous; and you will sometimes find the catheter carried to the right or left, according as the prostate may be large on one side or the other (fig. 24). I show you several examples: these are depicted at figs. 25 and 26. You will remember, then, that if you have occasion to examine a patient, and you find a very large prostate, it does not necessarily follow that he should have great difficulty in passing his water; and, on the other hand, although you may be unable to find appreciable enlargement by rectal examination or otherwise, you may not therefore conclude that all his troubles—and they may be considerable—are not due to this complaint.

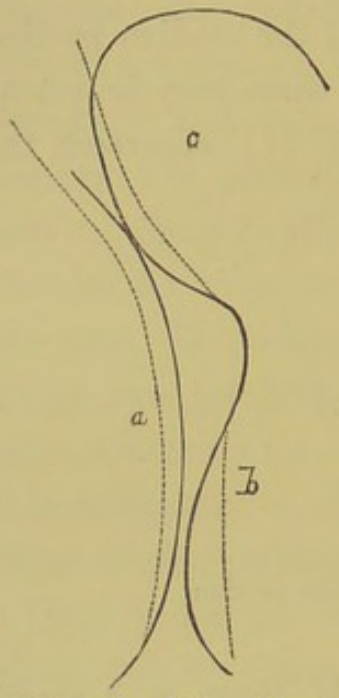


FIG. 24.—Both lateral lobes enlarged; the left lobe, *b*, blending with tumour of the median portion, *c*, and deflecting the urethra considerably.

I will now say a word as to the age of the patients. I never saw an enlarged prostate (I mean, of course, hypertrophy, not enlargement from inflammation and other causes) before the age of fifty-four; and if I have not seen such a case, you may say that it never or very rarely occurs. The usual time at which it begins to show itself is from fifty-seven to sixty. If a man has it at all he will have it generally by sixty. If he gets over sixty-five or seventy, he may have it, but in a less degree; that, however, does not commonly happen. I have examined the bodies of men at ninety, without the slightest enlargement. You see, then, that it is by no means necessarily connected with advanced age. The man who escapes it at sixty-five will be likely to escape it altogether, or nearly so.

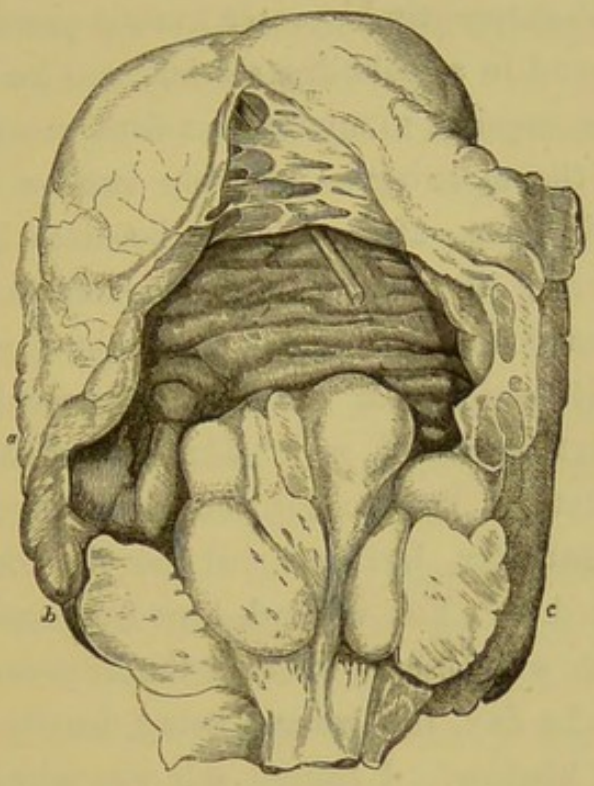


Fig. 25.—Section of bladder and prostate; the former hypertrophied, the latter forming prominent tumours within the bladder.

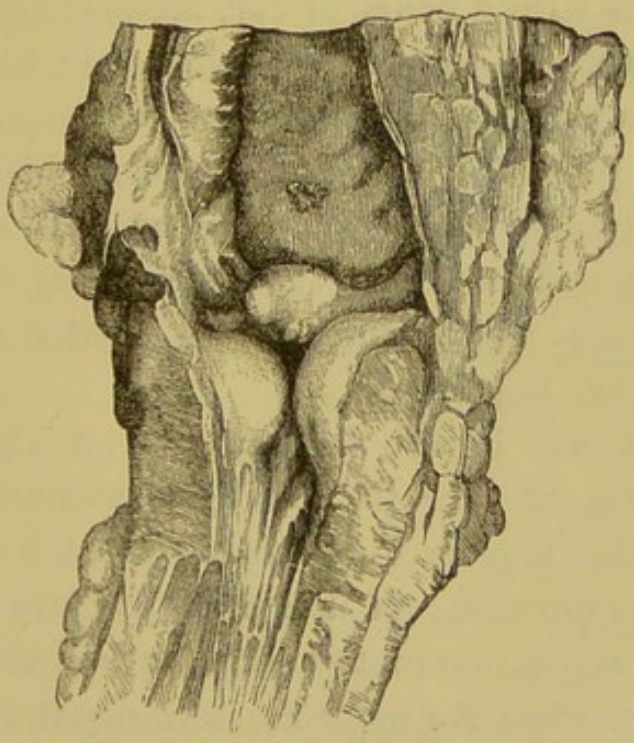


Fig. 26.—Section of bladder and prostate, showing marked but not great enlargement of lateral lobes and median portion.

I speak next of the symptoms. An elderly man comes to you and says that recently his water has not passed so easily; that it has issued in a dribbling stream, and he cannot propel it; that he requires to micturate a little more frequently, especially in the morning — probably two or three times while he is dressing, after which it becomes less troublesome; but during the night it is rather more so than during the day. Then if he does not say much about pain—which, of course, will excite your suspicion of calculus, or some other complaint—you will say, "This is probably a case of enlarged prostate." You do not necessarily proceed at once to pass the catheter, but you will ask the four questions already referred to. You will ask how frequently he makes water, and you will observe whether the frequency is greater at night than by day, the reverse being usually the rule in stone in the bladder. I cannot tell you why, but it very often happens that patients with hypertrophied prostate pass as large a quantity of urine during the eight hours of night as during the sixteen hours of day, hence the very troublesome disturbance to sleep of which they complain. Under this head you will also inquire whether the water ever passes without the patient's knowledge, or without his willing it. In many advanced cases, you will find that some urine passes during a violent effort, such as coughing, or when he is unconscious at night, during sleep. If so, it is probably a case of rather long standing.

Next, you will inquire for pain, and if any, whether before, during, or after the passing of water. If before, and the patient is relieved by making water, it is probably hypertrophied prostate. If it is after, you may expect calculus, which comes into contact with the mucous membrane of the bladder when the water has been expelled; whereas,

if he has a distended bladder, as he is likely to have with enlarged prostate, the pain will occur during distension, and becomes less as the urine passes off.

Then you inquire about the character of the secretion, whether it is clear or cloudy. In most cases, at the commencement, it is clear. In a great number of cases of prostatic enlargement, although the bladder has not been emptied for months or a year or two, the water is still clear. On the other hand, if it is an advanced case, the water will certainly be cloudy. And while you are talking of that you will also ask about the stream. You will generally find that it is a dribbling stream, different from the stream in cases of stricture. In stricture the stream is often propelled exceedingly well, although it is no larger than a thread; and so long as there is a stream, the patient can act upon it by will, so as to make it stronger; whereas, strain as he may, in prostatic enlargement, he often cannot influence the stream, except for the worse. It may happen, from the median portion of the prostate being forced by straining into the passage, that the patient voids urine less well the more he strains. Generally speaking, the expelling apparatus at the neck of the bladder is involved in the enlarged prostate, and ceases to act; so that with all his straining he cannot make much difference, and the stream is not propelled with any force. You may ask the patient to let you see him pass water, if he can, for that will help you materially.

Then you ask the fourth question: "Do you pass blood?" Usually, in the early stages, the reply will be in the negative, although a little may appear after much exercise, so far suggesting stone; but this is by no means usual.

Then you complete your diagnosis by mechanical means,

and for this purpose you will first use a catheter. You should invariably make the patient pass water before you begin, because your object is not merely to ascertain whether enlarged prostate exists, but, what is much more important, what the effect of it is, how far it is a barrier to the exit of urine from the bladder. The important fact for him and for you, is not the exact size, condition, or shape of the prostate, but to what extent is it a barrier to the exit of urine. And it is the quantity of urine left behind which will determine future treatment. But he often objects to the use of the instrument, thinking that with the frequency of his calls to pass water, that the catheter cannot be necessary.

Now, with regard to the employment of the instrument for patients with the symptoms described, whatever they may think, you are not to forget that undue frequency of passing water, and still more the passing of it involuntarily, indicate the necessity for the catheter.

First, in relation to frequency: it is not uncommon for the practitioner to be misled by the fact which is coupled with it, that the daily quantity of urine passed is quite equal, if not more than equal, to the healthy average. I have often heard this assigned as a sufficient reason for not using a catheter in these cases. It is urged with a certain show of plausibility, that "a sufficient quantity being passed every day, how can there be habitually retained urine in the bladder?" A moment's thought will prove that the question of habitual inability to empty the bladder is not in the slightest degree affected by the quantity of urine passed, which indicates solely the activity or the reverse of the excretory function. The reservoir—*i.e.*, the bladder, may be always half filled, or more, with urine, whenever

the act of micturition ceases; but it none the less serves to receive and to transmit the daily two or three pints. The reservoir is diminished in capacity, pro tanto, and frequent micturition is the necessary consequence; that is all. In short, the amplitude of the quantity passed daily is not to be regarded as the slightest evidence in relation to the inquiry, "Is the bladder emptied or not by its own natural efforts?"

Again, in relation to involuntary micturition, so often miscalled "incontinence;" it is really remarkable how common are the errors, not merely of patients, but of practitioners, on this point. They are apt to be misled by the fact that the patient insists, "I do not make too little water; I am making water too frequently, and too much of it, and I am sure my bladder must be empty. Tell me how to retain my water, and I shall be much obliged to you. Don't think of drawing it off." It is surprising how that sometimes influences the practitioner. Nevertheless, these are the very circumstances in which you should pass the catheter and ascertain the fact.

Always bear this in mind (and I wish, figuratively speaking, to render that sentence in the largest capitals), that INVOLUNTARY MICTURITION INDICATES RETENTION, AND NOT INCONTINENCE.

There are a few exceptions to the rule, but very few. Most of the mistakes that are made on this point arise from the use, or, as I shall show you, the abuse, of the word "incontinence," which means, of course, that the bladder is empty; and certainly, when the bladder cannot hold its contents, its condition is rightly described by the word incontinence. Now, that happens only in very uncommon but well-defined circumstances, such as in some

cases of cerebral or cerebro-spinal paralysis, and in rare injuries to the neck of the bladder; and in these the urine runs off as fast it comes from the ureters, the bladder having ceased to act as a reservoir. You see this one external physical sign is the same in these cases and in those in which the bladder is distended with urine; that is, there is urine dribbling off by the urethra. But mark how totally different are the two conditions in question: in one the bladder is full, in the other the bladder is empty. Whenever, then, you meet with this involuntary flow of urine miscalled "incontinence," do not confound it with the condition in which the bladder is empty. Rely upon it the bladder is full, and the only way of relieving the patient is by the use of the catheter. I lay great stress upon this, because I have seen lives sacrificed to a forgetfulness of this point. I have made post-mortem examinations of persons who have died from the effects of retention undiscovered during life, and misunderstood because the urine constantly passed off, as it was supposed, "so freely."

Now we know that our views of things, and our consequent acts, are very much determined by the manner in which we use and apply words respecting them, and it is impossible to be too clear and defined in all our language, especially in that which relates to pathological conditions and surgical practice. I cannot express to you how strong my sense is of the importance of this matter; hence I have made it my constant business to point out the common misuse of terms in connection with this subject.

First, then, the term incontinence, which means the bladder is empty, or "cannot contain," should never be employed by you to denote the phenomenon that the patient's urine flows involuntarily; for, as we have seen, in

that condition the bladder is generally full. It is better to speak of it as "involuntary micturition," without reference to the cause, and when this is found to be distended bladder, to use the term "overflow." Then, remembering always my maxim, that "involuntary micturition indicates mostly retention, not incontinence," you will never make the fatal blunder I have spoken of, and which I assert to be so common. This, too, assimilates our usage very nearly to that of French surgeons. The French, with their more logical use of language, speak of the bladder as "engorged" and "overflowing," but never as "incontinent," except to denote that rare condition in which the bladder is always perfectly empty. I have, therefore, long been in the habit of denoting a bladder which is full, but allows surplus urine to run off little by little against the will of the patient, as an "engorged" bladder, and the phenomenon thus described as "overflow;" and I hope you will do so too.

This brings us, by the way, to another misapplication of terms. In this country, the condition of the organ just alluded to is often called "paralysis" of the bladder, and the unfortunate word leads to mistakes in practice. The bladder is rarely paralyzed. I know nothing of it except as an effect of spinal or cerebral changes. The bladder is never by itself the subject of paralysis, meaning, of course, an affection of the nerves, either central or peripheral. It may be unable to expel its contents, because there is mechanical obstruction, as enlarged prostate, stricture, or impacted stone, or because the muscles have lost their power of contracting from long over-distension: but this latter is "atony." This inability is in neither case due to impaired nervous supply—a subject to be considered at some subsequent meeting. [*Vide* Lecture XXII.]

After this digression, which its importance must excuse, we shall now consider the physical diagnosis.

I advise you for this purpose to use a gum catheter, well curved, and certainly not a small one, the best variety being the French coudée, about fourteen or fifteen of that scale.

Pass it in a downward direction for the first half of its course, gradually descending to the horizontal line as it is about to enter the bladder. If you use an English gum catheter, take one about No. 8 or 9, and of course without a stylet. In passing it, keep the shaft well back in the groin, so as to maintain the curve. As soon as you have arrived at the bladder, carefully empty it, and note the quantity withdrawn. It may vary greatly, from an ounce up to almost anything you please. I have drawn off six pints, but that is a very large amount. You may find commonly from six to twenty ounces. To this urine, which you have removed by instrument, and which the patient could not pass by his own efforts, I apply the term "residual urine," and shall thus speak of it hereafter.

Next, while the patient lies on his back, you may place your finger in the rectum, and examine the size of the prostate, whether it is very tender, and whether the enlargement is more on the right or the left side. Of course you do this as gently as you can. The finger should be covered with grease and very slowly introduced; or you may produce considerable and unnecessary pain. The best position for the patient is lying on the back, because you can press the other hand above the pubes, and gentle pressure there brings the bladder and prostate near the finger, and you can ascertain whether the bladder is distended or not. These are the points of diagnosis which

it is desirable to ascertain, and beyond these it is not usual or desirable to carry your inquiry.

We shall now come to the treatment. The *medicinal* treatment of hypertrophied prostate may be dismissed in a few words. There is nothing to be done for it—that is, you cannot diminish the hypertrophy. There is often temporary enlargement from congestion; and that you can do something for. But true hypertrophy cannot be diminished by any known means. Numerous agents have been employed, both internally and as local applications; among the latter iodine especially. And, notwithstanding all that has been claimed for such agents in certain quarters, I assure you with regret, but with the most certain confidence, that neither iodine nor mercury does anything but mischief, however employed. Besides these, other remedies, as hemlock, hydrochlorate of ammonia, liquor potassæ, &c., have been tried. Nevertheless, I have simply to say that, for the present, we know no means of combating the enlargement itself.

But much may be done by way of palliation to the results of the complaint; and much of this treatment is mechanical. This will consist first in relieving partial retention by the catheter. There are two causes which I shall ask you to consider in the production of this retention of a certain portion of urine which no efforts on the part of the patient enable him to pass. The first is, as you know, the obstruction of the enlarged prostate itself at the neck of the bladder. But there is, moreover, an inability of the muscular coats of the bladder to contract and expel its contents, and it happens thus. In order to overcome an obstacle to the outflow of urine, the muscular fibres are greatly increased, and hypertrophy of the vesical coat

results to a very large extent, just as the walls of the heart thicken when obstruction exists in one of its main outlets. The thickened bladder is much less distensible than the bladder of normal character, and the organ is equally disqualified for retaining much urine or for expelling it entirely; so that the cavity of the bladder is diminished, and its function as a reservoir is impaired, in part by the protrusion of enlarged prostate into the interior, and in part by the rigidity of the coats, as above explained. It is in such cases that the habitual use of the catheter is necessary. Often, as long as the patient lives, he will withdraw more or less of the urine, sometimes all of it, by the catheter. And such a patient may continue to do this for many years, and remain actively engaged in the business of life. And it is by no means certain, if he is well taken care of, that his days are much if at all shortened as a consequence. One thing is essential, as in all instances where a daily catheterism is necessary—namely, that the instrument employed and the mode of using it, should be those which effect the object with the minimum of trouble and irritation. The more frequently it is necessary to introduce the catheter, the more essential it is that the easiest manner of doing it should be ascertained and followed.

I have reserved, then, for this place what I have to say about the instrument itself. The reason for preferring, as a rule, the gum catheter for this purpose is as follows:—Different curves are required for different patients, and the English gum catheter will, in my opinion, bear advantageous comparison with any other instrument, English or foreign, for the general and varied purposes of practice. The French catheter, which is admirable for softness and

elasticity, has not the quality which the English one possesses, of assuming and retaining any form you desire to give it—a quality, perhaps, not so often rendered available as it might be, but which to my mind is of immense service. The instrument-maker generally curves the catheter pretty much in this way (see Fig. 27) : the point straight and not well curved—the worst form in which you can put a

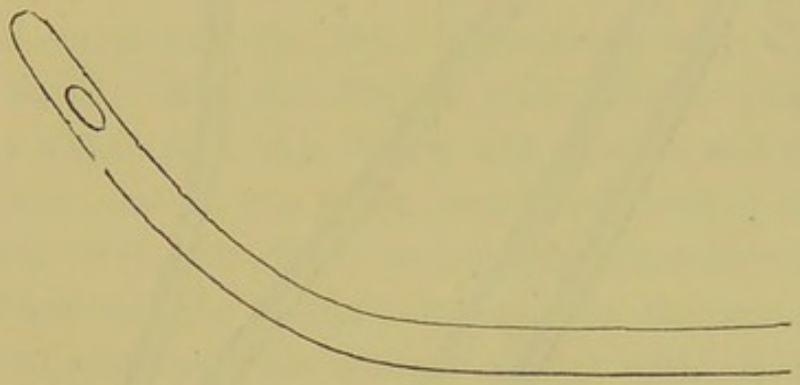


Fig. 27.

catheter for use. For prostatic enlargement, you require a catheter well curved *to its very point.* You should keep the instrument on an over-curved stylet for a month or so before employing it; and you will then find it easily assume the proper form, when you will pass it, as I need not say, without a stylet. If you require a stiff instrument, a silver catheter should be selected as the rule; not a gum catheter with a stylet in it. To return : you want the point, of course, to be carried over the obstruction formed by the enlarged prostate; and as the heat of the urethra always relaxes the curve, whatever it may be, by the time it arrives at the neck of the bladder, the ordinary gum catheter, as you have it from the maker, becomes nearly straight, and will not pass over the enlargement. Now, when you have a catheter which has been well over-curved

for a month or two, you remove the stylet and turn back the shaft, so as to undo the extreme curve and produce an ordinary one. And what happens when you pass it? In spite of the heat of the urethra, the catheter has a tendency

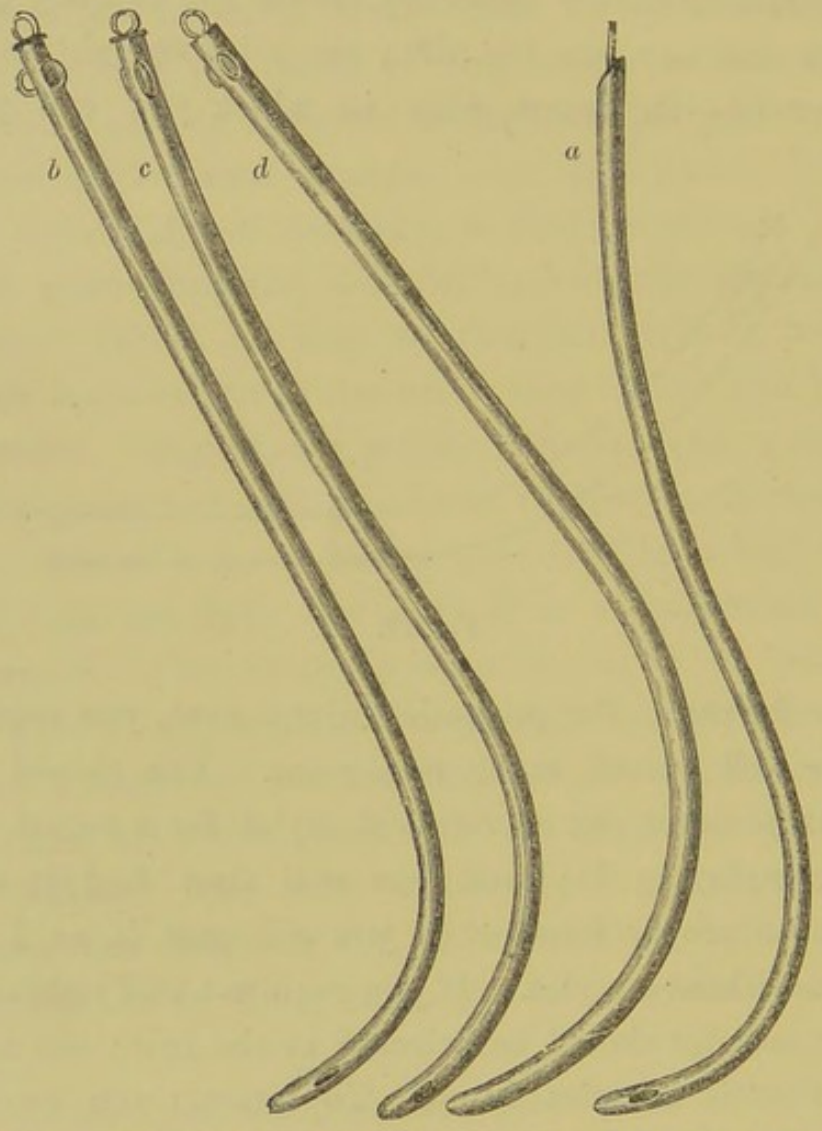


Fig. 28.—*a*, Gum catheter mounted on a stylet of the proper curve for use; *b*, *c*, *d*, silver prostatic catheters of different curves.

to curve more, instead of less, as it passes down the passage. And this is precisely the difference between success and non-success. That little manœuvre I regard as of extreme value. It is very simple: I repeat, keep the catheter over-curved—not for stricture, but for enlarged prostate: then

turn back the shaft immediately before using. The curve gradually increases as it goes onwards, and it passes over the enlargement into the bladder. This is so simple that it seems scarcely worth making so much of; but I can only tell you that I know nothing of its kind that exceeds it in value.

Then there is another thing; you may want a special curve for a particular case. We have silver catheters with various curves (see Fig. 28). Here are several which are very useful. But the English gum catheter possesses a quality which, as I have before told you, is not found in any other; put it into warm water and bend it into any form you like; then dip it immediately into cold water, and it will maintain the required form. But the best form so produced may easily be spoiled by your mode of using it. Of course the curve must not be altered while the instrument is passing through the anterior part of the canal, for it is at the posterior part that this form is required; the shaft of the catheter must be kept closely back in the groin, and the penis brought round the curve, so as to preserve the latter until it reaches the deep urethra, when, by well depressing the shaft, the point will rise over any obstruction into the bladder.

There is one form, however, of the French catheter which renders it a very useful instrument for prostatic enlargement. I refer to the straight, very flexible catheter, the point of which only is just a little turned up, thus termed "coudée," or elbowed; and its utility has been already insisted on in Lecture III., page 38. This instrument is introduced (the patient standing) with the point towards him and the shaft in a nearly vertical direction, say for about two-thirds of the length of the urethra, and is then

brought down to the horizontal line, or a little below it, as it makes an entry into the bladder, and it usually rides over any obstruction with extreme facility (see Fig. 29). Sometimes two bends, or "elbows," are given to the instrument, then called "bicoudée," an addition rarely necessary.

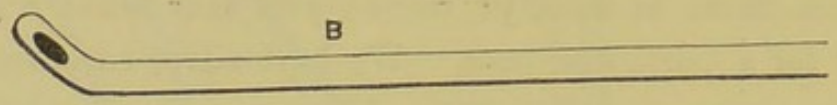


Fig. 29.

The general treatment is not to be disregarded; and here I shall defer a good deal of what I might otherwise say until I come to speak of chronic cystitis, which will occupy a subsequent lecture. Cystitis is associated with so many diseases of the urinary organs, that I may as well refer to the treatment under that head, instead of taking it separately, and recapitulating it in connection with each disease. But, as far as the general treatment of prostatic enlargement goes, the main thing is to prevent local congestion. You must tell the patient above all things to avoid anything like chills affecting the pelvic region, sitting on cold seats, exposure to cold; too much excitement, sexual or otherwise; long journeys, riding in jolting carriages,—all of which generally tend to aggravate the patient's symptoms; since the prostate very readily becomes temporarily inflamed and swollen from these causes, and most of the troubles which the patient experiences depend upon that condition.

One other point has relation to the action of the bowels. You may make a man with enlarged prostate very comfortable if you keep the bowels in gentle action. If he has constipation, and scybalæ lodge in the rectum, their

presence is often the source of great discomfort. Sometimes a simple enema of warm water gives instant relief; but, if necessary, the daily gentle action of the bowels must be provided for by means of mild laxatives, such as senna, manna, bitartrate of potash, sulphur, or by Friedrichshalle water or sulphate of soda; anything which will act mildly, quickly, and without irritation, will keep him in a very different condition from that which is associated with habitual constipation. On the other hand, drastic purgatives produce great discomfort, and are to be avoided.

I will devote the few minutes that remain to those cases of prostatic enlargement in which the difficulty of passing the catheter is considerable, and there is retention of urine. You may have a patient in whom prostatic enlargement has made itself manifest rather suddenly; the prostate has become rapidly congested or inflamed; he cannot make water, and he is in great distress in consequence. It is not a question how long a time is to elapse before the catheter is to be passed; you should relieve him at once. You find there is a distended bladder, evidenced by dulness of percussion above the pubes. Possibly, before you others may have tried, and you may be called to pass the catheter in circumstances of some danger to life. Now, in the first place, you should be careful with regard to position. I advise you to pass the instrument with the patient in the lying position first, if the bladder is very large; if it is not very large, perhaps it is as well, or better, to pass it standing. You can empty the bladder better in the standing position; but if you find that the bladder is very large, make the patient lie down before you draw off the water. I have known great mischief arise from drawing off a large quantity of water from a patient when in a standing posi-

tion. I have even known death occur suddenly from this cause. If I had time, I could tell you of a case in which a charge of manslaughter was brought against a surgeon in a court of justice in relation to such an occurrence. The circumstances were all well known to me, for I was there to defend a brother practitioner, who was unjustly charged. In that case a catheter had been passed in the upright position, and the patient fell dead from syncope when six pints of urine had passed; just as a patient with ascites might do if you tapped the abdomen in the same position. No doubt it was an error, but nothing could be more monstrous than to make it the ground of a criminal action. It is a very instructive case, and I mention it to show that in cases where the bladder is large, especially in old men, you may have fatal syncope, arising in the way I have described. I always take care, if I find the bladder is very large, to pass the catheter when the patient is lying down. It is advisable also, in these circumstances, to draw off only part of the urine; and after a quart or so has passed, wait a little before you empty the bladder.

To return, if you fail to pass a gum-elastic instrument, by all means use a silver one, especially if false passages have been made. The silver prostatic catheter is sometimes essential; that is, one which is much longer and has a larger curve than the ordinary instrument. They are generally made longer than most cases require. Indeed, the common silver catheter, about No. 10, or, at most, one which is only two inches longer, suffices for the majority of cases. Sometimes, although very rarely, the fourteen-inch catheter is necessary. Occasionally, when all others fail, a silver catheter with a short beak, like the sound, or lithotrite, will pass easily. And always remember that any-

thing like obstruction felt at the end of the instrument can only denote that you are out of your path. No force should be employed. It is not a narrow passage; it may be a little close, perhaps, when you reach the prostate; but if you find any obstruction, you should withdraw and seek the route in another direction, to the right or to the left. In these circumstances, also, let me repeat, never use force under any pretext whatever.

It may be said, "Why have you not mentioned hot baths and opium?" In cases of retention from prostatic enlargement, there is a serious objection to the expectant method; you must take into account the future condition of the bladder. If the bladder is permitted to remain over-distended, say for a day or two, there is some risk that it will not readily contract again. In the case of an old man's bladder, thoroughly distended by long retention, it is very likely not to recover its powers. Although the patient has made water fairly up to the time of retention, if you leave him too long with opium, hot baths, and treatment of that kind, the bladder is getting larger all the time, and you will very likely have more trouble with it afterwards than if you had relieved him with the instrument at once.

Again, if you have had a great deal of trouble in passing the catheter, I suppose you must leave the instrument in; but it is not the most desirable course in these cases. Rather withdraw it, and use it again; because the prostate will be irritated, perhaps injured by an inlying catheter. Unlike stricture, which is often well treated by an inlying catheter, the prostate is always more or less irritated by it; but less harm accrues from a flexible than from a silver instrument. Better still if you can pass a vulcanized indiarubber catheter, which is the only one which lies harmlessly in the urethra

in a case of prostatic enlargement. It may sometimes be insinuated by a series of short, quick pushes, thus [illustrating the method] ; or, failing in that manner, by mounting it on a stylet of any curve which may be desired, and subsequently withdrawing the stylet. It is not difficult to keep it in its place if properly tied-in, using the suprapubic hair for the purpose, as you have so often seen (see Fig. 10, p. 60) ; and the instrument has the merit of rarely becoming encrusted with phosphates, while its flexibility enables the patient to move about his room. A short metal tube within the stem renders it more secure ; or better still, the upper five inches may be stiffened by coating it with collodion, and it can then be easily secured by tying-in. Some have been made with "wings" at the vesical extremity in order to retain it in place, but these mostly irritate the urethra and increase the difficulty in passing it. In short, the vulcanized catheter is sometimes of great service.

Subsequently, as the canal recovers, should the bladder not regain its tone, and it is therefore necessary to use the catheter two or three times in the twenty-four hours, you will probably in the course of time teach the patient to relieve himself; and he will often, with a little tuition, succeed remarkably well. With respect to the frequency with which he should be advised to do this, it will depend mainly upon the amount of urine left in the bladder after a natural effort of micturition. The patient's own feelings will aid in answering the question ; but if you find him, after having passed water, retaining say six ounces, a catheter passed every night and morning will probably be sufficient. The bladder must be emptied, or the urine will in time decompose, become irritating, and chronic cystitis will

result. If ten or twelve ounces are left behind after making water, the bladder should be relieved, as a rule, three times a day. If the patient makes no water by his own effort, he should be relieved four or five times, or even more—certainly not less, as a rule, than three or four times in the twenty-four hours.

You often find (and this is a matter of considerable importance) that although up to the time of the attack, and before the first necessity for the use of the catheter, the water has been perfectly clear, yet, after you begin to use the catheter habitually, the patient gets more or less cystitis, and is feverish and unwell. That stage has very often to be passed by those persons who having long experienced difficulty, suddenly change from their usual mode of micturition to the artificial one. It requires some judgment to say when that change should be made; but as soon as you find it necessary to pass the catheter regularly, the patient will occasionally show some change in his general condition; and you should be aware of this, and watch the results. Sir Benjamin Brodie was the first to point out, in his valuable lectures on the Urinary Organs, that sometimes patients gradually succumb to a low or feverish condition after beginning to use the instrument. The remedy, or rather the preventive method, is this:—Do not empty the bladder on each occasion of using the catheter at first. If the patient has been in the habit, perhaps, of retaining at least a pint of urine after he has made water, it is a great change for him to have the bladder quite empty two or three times a day; and it is thus that the organ becomes irritable, the urine charged with pus, and then he loses his appetite, becomes feverish, and is sometimes in danger of losing his life. The rule under such circumstances is to

proceed cautiously. Instead of drawing off a pint, draw off half a pint; leave some behind, and so make a compromise between the condition of the bladder and the usually absolute rule that it should be emptied. Draw off half or only two-thirds of a pint; you will thus relieve him a little, and so gradually, in the course of a week or two, you may accomplish the entire emptying of the bladder, and all will go on smoothly and well. Notwithstanding all your care, now and then you will find a case in which during this process the tongue grows slowly more red, dry, and contracted; the powers of life gradually fail; the senses become impaired, and the patient sinks. You will always find in such cases, if an autopsy is made, old-standing pyelitis, with dilatation and injury to the renal structure, and you will know that in no circumstances could the patient have long survived.

LECTURE VIII.

RETENTION OF URINE.

GENTLEMEN,—Retention of urine is the principal subject for to-day; and if we at all realize what is the condition of a patient who suffers from retention, with the acute and constant pain which it involves, we shall feel how important it is to relieve him, not only as easily, but at as early a period as possible. And there are very few cases in which you will meet with more gratitude if your treatment is skilful and prompt. For not merely are the patient's physical sufferings extreme—and I suppose every man who has been so situated as to be unable to relieve a distended bladder, even for a short time, has had some glimpse, though only a faint one, of the distress occasioned by inability to pass water for several hours, or even days—not only, I say, is the pain intense, but there is extreme anxiety of mind also. He fears that the bladder may burst (a circumstance, however, of exceeding rarity), and he always looks forward with gloomy forebodings to the consequence of not obtaining relief.

Now, while retention of urine is very common in the hospital, it is not so in private practice. The circumstances of exposure, the more hazardous callings which men have who form hospital patients, determine this difference; therefore, when met with among the higher classes, it is always a very grave matter, and in all circumstances, wherever encountered, will demand all your care and skill.

Then, again, if you are successful, the relief which you afford is instantaneous. It is not like the questionable result of a dose of medicine, which a sceptical patient may persist in attributing solely to our great ally—the curative power of nature. There can be no uncertainty as to the result of your treatment if, after twenty-four hours of agony, relief follows your dexterous use of the catheter, and the two or three pints which the patient was unable to void are withdrawn by your hand. He tells you that he is in "heaven"—a common expression with such patients—and he never will doubt for a moment that you were the author of his "translation."

Retention comes before us in three typical forms, each requiring a different species of treatment. There may be some instances which cannot absolutely be so classed, and some the characters of which belong equally to two forms; still, for convenience, it is well to adopt this classification.

First of all, you may have retention occurring in a young and healthy man who has no stricture; next, it may occur in an older man who is the subject of confirmed organic stricture; and, lastly, it may occur in a man who is neither young nor hale, and who has no stricture, but has an enlarged prostate. Of the last I have nothing to say; we have already discussed that subject, and the mode of relieving retention in connection with hypertrophied prostate. But I shall ask your attention to the two other conditions—namely, retention from inflammatory swelling, and retention arising from organic stricture.

With regard to the first kind, you will probably learn a history something like the following:—Within a month or six weeks the patient, who is generally a young man, has had gonorrhœa. He has obtained considerable relief from

treatment, and has in consequence allowed himself some relaxation of the regimen to which he has been lately submitting. Thus, perhaps, he has indulged a little in the use of alcoholic stimulants, has taken some unusual amount of exercise, a game of cricket or the like, and, after being over-heated, has been sitting on a cold stone or damp grass; or, lastly, he may have indulged in some strong emotional excitement. Under those circumstances, what has been called "inflammatory stricture" may be produced. Now let me say, repeating myself slightly, that that condition has no right to the name of stricture. An inflammation affects the prostatic region of the urethra, and involves therefore the neck of the bladder; a region in which you know stricture is never found. The result of this soon is, some fulness or swelling of the prostate, as may be ascertained by rectal examination, a condition not in the least resembling stricture—that is, it is not a circumscribed narrowing at a particular part of the passage, but a tumefaction of the gland, which prevents the expulsive apparatus of the bladder acting and discharging its contents. That is usually the real condition in what is called inflammatory or spasmodic retention.

This condition of the prostate resembles that which affects the tonsils, and which we call inflammatory sore throat. Both complaints consist in the enlargement of glands which more or less surround narrow passages, and which thus interfere with the functions of those passages; both occur rapidly, and may be produced by external cold.

Now, what are the early signs of inflammatory retention? First, there is usually some cessation of the gonorrhœal discharge. Just as in the case of orchitis, where the urethral inflammation is supposed to subside and to attack

one of the testes, the inflammation of the prostate is similarly associated with diminished discharge, and if you examine by the rectum, a tender and swollen condition of the prostate will be discovered. Then the stream of urine grows smaller and smaller, and in a very short time the patient loses altogether the power to relieve himself. He is feverish, very restless, and suffers severe pain about the lower part of the abdomen and in the perineum. Those who are the subjects of stricture may have become in some measure accustomed to the difficulty, but when an active young fellow is thus attacked for the first time, he is in a state of extreme distress.

Now, as to the treatment of such a case. The patient desires ardently to be relieved immediately, and declares he cannot endure his sufferings. You see him bent nearly double in order to relieve the pressure of the abdominal muscles on the bladder, and he is even breathing shortly and quickly to avoid their action there. The old treatment in such cases—the classical treatment of thirty years ago—was bleeding from the arm or perineum, repeated hot baths, and large doses of opium, so as to enable the patient to bear the pain and dispense with the catheter. The reason assigned was, that in an inflamed state of the canal, you might do more harm than good with a catheter, and that it was therefore better to mitigate pain by the means described. I have told you that I dissent from that treatment altogether, although it is still employed to some extent. For, first, you must not only regard the present emergency but also the after-consequences; and if you allow a young man to remain thirty-six or forty-eight hours with an unrelieved bladder, because you fear to use an instrument, permanent mischief may be done. I have seen patients who for years have been

unable to empty the bladder after treatment of this kind. Extreme and continued distension of that organ sometimes destroys or permanently diminishes its contractile power, and produces a condition which is properly termed "atony of the bladder." Therefore, if you pass the catheter, even at the risk of doing a little mischief to the urethra, I am disposed to think you would be wise in incurring that little risk rather than expose the patient to the other danger. But then it ought to be done without such risk.

For my own part, I always take a small flexible catheter —one not above No. 6 (English scale), as a large one gives in these circumstances unnecessary pain—which has been tolerably well curved in the way I have before described, since it has to enter over a swollen prostate. Or, you may use a French one with a bulbous end, or with the end "coudée." In this manner there is generally no difficulty in relieving the patient, who is exceedingly grateful for what you have done; whereas if you put him through the long process, and he relieves himself ultimately, he thanks you for little, comparatively speaking, and he runs the risk to which I have referred. But in the event of the flexible catheter not passing, you should try a silver catheter of the same size.

I believe one of the first persons to denounce the old plan of bleeding and hot bathing was Mr. Guthrie. If you turn to the racy writings of that experienced and practical surgeon, you will find an anecdote in connection with this subject. He relates the account of a visit which he paid to a patient in the circumstances of retention I have described, and the reason, in strong and graphic language, why he then gave up for ever the bath and bleeding practice, and passed the catheter at once for such cases in future.

So much for the inflammatory condition of the prostate producing obstruction to micturition. I need not refer at any length to spasmodic retention, which rarely happens. At the same time it may be as well to say that no doubt where an inflamed condition of the urethra exists, spasm of the muscles may co-exist; but the precise share which each takes in contributing to the result will not influence the treatment.

Now I come to the second form of retention—viz., that depending upon organic stricture. Here we generally have to do with an older man, because it is rare to find a young one suffering from confirmed organic stricture. As a rule, to which there are exceptions, such a patient mostly has stricture ten or twelve years before he gets complete retention. First of all you have to ascertain that the cause is certainly stricture. You will probably find that he suffers less acutely than the patient just described, although his condition is a painful one; for the progress of the case has been more gradual, and the derangement has not necessarily been brought on by any great or sudden imprudence. He has been passing water with difficulty for weeks or months, and at length some slight thing perhaps has produced almost absolute retention; the "last ounce," so to speak, "has broken the camel's back." Or it may not be absolute retention as before; there may be some dribbling, indeed the patient may have been relieving himself in that inefficient way for days, but the bladder is greatly distended, and to all intents and purposes it is a case of urgent retention. You find probably also that the patient is accustomed to instruments. Now, what you have to do is to take an instrument of middle size, and pass it down to the seat of obstruction, to see where it is. You will probably

find it four or five inches from the external meatus. You should then take the finest gum catheter and endeavour to insinuate it into the bladder, and if you are sufficiently fortunate to do that, you should tie it in at once, so that you may have no further trouble with it. But that is not a very difficult case of retention. Supposing you do not get the gum catheter in, I should then recommend a small silver one, either No. 1, or smaller, and use it in the manner I described to you in Lecture V. Notwithstanding all your care and skill, and those, perhaps, of your friends whom you may have called in, the instrument is still not passed. There may have been false passages (they are easy to make), and there may be such difficulty that it is almost impossible for any one to pass a catheter after your failure.

We then come to the question: what is to be done next? No doubt for some of these cases much may be effected by opium and hot baths. Suppose the water is dribbling off, and you shrink from the last resource—that is, puncturing the bladder, or other operation to relieve the retention of the urine,—a safe middle course may still exist for some of these cases. The patient up to this time may have been exposed to cold; let him have the benefit of a warm bed and hot baths, with large doses of opium,—and you must be very liberal with opium if you use it at all,—so as materially to mitigate the involuntary straining, which he can no more help than he can help breathing, and which is utterly unsuccessful as regards the contents of the bladder, often making matters rather worse than better. The result may be that the water will dribble off more freely than before, and you may find, after two or three days, that it will come in a larger stream, and that then you can pass the instrument without much difficulty. The patient may

often be saved an operation thus, if there are grounds for declining to perform it. On the whole, however, I do not advise waiting very long; still it is better that the patient should be temporized with in that way than that he should be damaged by an unsafe hand, either with knife or catheter. Most men, indeed, are quite sufficiently confident in their powers to rely on instrumental methods when they find that a patient cannot make water. Still, if you are convinced that you are not doing any good with the catheter —still more that you are doing mischief—you can in most of these cases successfully employ opium or an inhalation of ether, with hot baths and fomentations, that is, as regards the immediate and urgent condition.

But we will assume that you have done all that you can do in this way, and that the question of relief by some other means must be met. The bladder is increasing in size, notwithstanding your treatment. You examine the supra-pubic region carefully, and find a tense and perhaps large tumour there, reaching to the umbilicus, or nearly so, more like a uterus than a bladder. In some old cases of stricture there is not necessarily large supra-pubic dulness, for the bladder is thickened and contracted. Introducing the finger into the rectum, you find there also a swelling, produced by the distended bladder, and you then seek to obtain the sensation of fluctuation. If, placing my hand above the pubes, I feel a distinct wave communicated to my other index finger in the bowel, I know that to be a point at which the trocar can be inserted with safety. Also, if I find a well-marked rounded tumour over the pubes which is dull on percussion, the bowel around it clear and distinct, I have reason to believe that an operation over the pubes would be successful.

Again, the question arises: why not attempt to relieve the bladder by an operation on the urethra itself from the perineum, so as, if possible, to cure the stricture, and at the same time relieve the bladder? Might it not be wise in this manner, as it were, to kill two birds with one stone, and not be content with merely puncturing the bladder by the rectum or above the pubes?

At this point let me revert to the different practice and different experience of surgeons in relation to this matter. Let me give you the experience of Mr. Liston. He once said, from this chair, that during the whole of his connection with the Royal Infirmary of Edinburgh, and subsequently with this hospital up to the time at which he spoke —namely, three or four years before his death—he had never punctured a bladder for retention of urine. On the other hand, there are men living in this town who have punctured a bladder fifty times or more. Mr. Liston meant to imply that a good surgeon ought rarely to find it necessary to resort to any other means than the catheter in circumstances of retention. But do not suppose for a moment that the gentleman I spoke of who has punctured a bladder fifty times, does so because he fails to pass the catheter under those circumstances, but because he thinks it wiser to puncture the bladder than to persevere too much with the catheter. Then, again, both Liston and Guthrie occasionally performed the perineal operation just spoken of. From the perineum the urethra *may* be reached behind the stricture. Now, without entering into a long discussion on the subject, I may say that this mode has lost favour of late years. It is no easy thing to find the urethra behind the stricture; and a man may make an awkward wound in the

perineum, and never hit the urethra at all. Then it does not follow that it should be desirable to divide the obstruction at all, so far as its cure is concerned; for the stricture, when the time comes to treat it, may be amenable to dilatation. The reason why puncturing through the rectum has been done so often by Mr. Cock, of Guy's Hospital, is because he conceived it to be an excellent kind of treatment. He says: "Let us withdraw the urine from the urethra altogether for a few days, and the urethra will recover itself, so that we may be able to cure the stricture with ease." And that is often true. He punctures the bladder by the rectum under the circumstances I have mentioned; and this is his instrument for doing it. In this way, the water not passing by the urethra at all, the urethra is lying fallow, so to speak; and in a short time the instrument can be passed —say No. 2, or 3, or 4 catheter, although before you could not pass No. 1. This, then, is a species of treatment of stricture which Mr. Cock has introduced; and, at all events, he has proved how easily and safely this operation may be performed: he has, in fact, familiarized us with a proceeding which before was often supposed to be a very grave and serious affair.

My own experience of puncture of the bladder for retention of urine, is, for prostatic enlargement twice, and for retention from stricture, four times: this is during a period of more than twenty years. One of the former was a suprapubic puncture, all the others were by the rectum; on all other occasions I have succeeded by means of the catheter. I should add, that two of the rectal punctures were on the same individual, once in 1859 and again in 1870, he particularly requesting me to operate on the latter occasion as I had done on the first, because the relief was so speedy and

complete. Otherwise I have no doubt I should have succeeded with the catheter. He is living now and in fair health. No doubt it is the simplest and safest operation in most cases when the bladder has to be opened. On the other hand, a very considerable enlargement of the prostate makes the supra-pubic operation necessary. In the one case in which I did it the prostate filled the pelvis: it was the largest I ever saw: the bladder had long been emptied only by a fourteen-inch catheter, and that with difficulty.

Following a suggestion made many years ago, I once punctured through the pubic symphysis—a method I shall not further allude to—and failed to find urine.* I punctured immediately after by rectum and gave relief, the patient recovering.

There is still a more recent method, which it is quite possible may sometimes be advantageous. I refer to the aspirator of Dr. Dieulafoy, which I have never thus employed, although I have, and with the best result, in removing the fluid of empyema. Others have used it and report the ease, safety, and success of the proceeding. For the bladder you would use a very fine trocar above the pubes, and you would not hurt the peritoneum if you punctured it, for I have removed tympanitis in peritonitis with the same instrument, and having adapted the exhausting syringe to it, the urine might be safely removed. Of course it would

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* It may be as well to state what was the probable cause of the failure. A puncture through the symphysis, which is solid bone in an elderly man, blunts the trocar so much that when the point arrives at the soft tissues and bladder on the other side, it will not penetrate but pushes them away. At least this is what happened in three experiments I made on the dead body, for the purpose of observing the result.

be necessary to make a fresh puncture when the next relief was required, supposing that the bladder had not been able to act for itself by that time. Here is the instrument which you have seen me employ several times for the purpose of evacuating large chronic abscesses. The slight puncture required for such a slender trocar is not to be feared, and may be frequently repeated.

If, then, you have failed to pass the catheter, and the symptoms are urgent, you have the proceeding already named before you: puncturing by the rectum, or above the pubes (see Fig. 30). By carrying into the bowel your

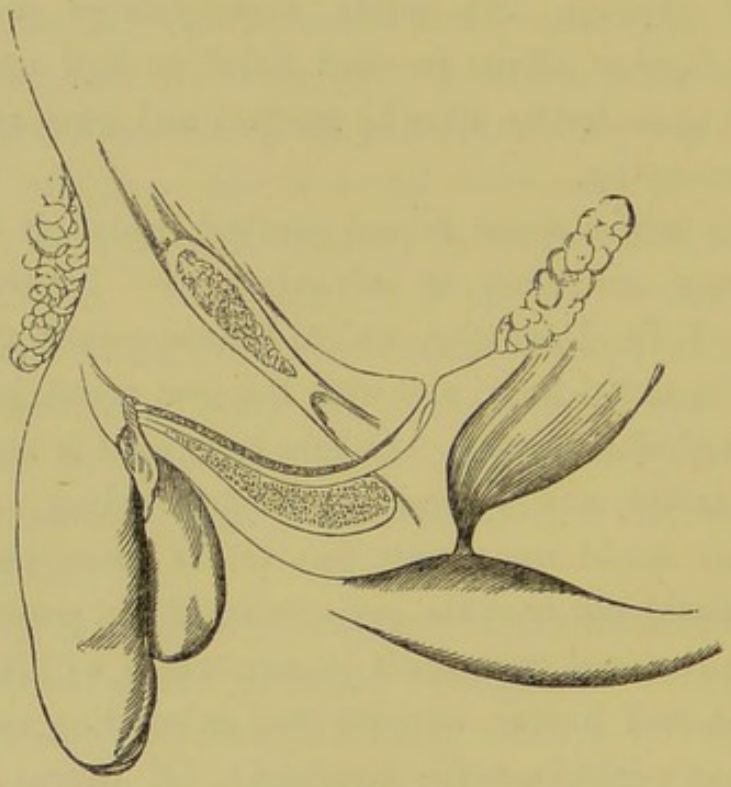

Fig. 30.—A section of the pelvis showing bladder and rectum.

finger—a reasonably long finger—you arrive at a point just behind the prostate. The other hand is placed above the pubes, that the wave of fluid, by its pressure, may be distinctly felt by the finger in the rectum. You are then quite

certain of what you are going to do. Along this finger, kept firmly in place, your trocar is slipped, and then boldly, but carefully, pushed into the bladder. This is always an anxious moment, because, if you have not hit the bladder, it is a serious matter to have thrust this long instrument into the centre of the body, and to find no urine escaping. The best position for the patient is sitting on the edge of a bed, his back supported by pillows behind, the legs apart, each on a chair; an assistant by him placing one hand on either side above the pubes, so as to steady the bladder, and press it down towards the rectum. It is well to remember, that if the canula slips out subsequently, you will not be able to get it into the same opening again. The muscular fibres of the bladder instantly close, and you have to make another puncture—not a matter of much consequence, but better avoided.

For the supra-pubic operation you divide the structures in the middle line until you reach the linea alba. Then carefully making your way deeper, you will soon discover fluctuation; and, having the bladder steadied as before, you will thrust the trocar slightly downwards. In this case you retain the silver canula for two or three days; but you may soon substitute a gum instrument. Now, supposing there is a probability that your patient may require this artificial relief by tube for some time, you will, of course, prefer the situation above the pubes, because it is much more easy to wear the tube there than it is in the rectum, where it interferes with the functions of the bowel, and is otherwise much in the way. I have known patients who have passed all the urine through a tube above the pubes from ten to fifteen years, and who lead active and comfortable lives in

consequence, the natural passage being completely obstructed. One of them, who had suffered greatly before, and was now in perfect comfort, told me that "he did not know whether this mode of passing water was not preferable to the original one!" That, however, I conceive, is quite a matter of taste.

This subject is still further considered, and especially in relation to the relief of patients suffering severely from prostatic retention, in Lecture XIX.

LECTURE IX.

EXTRAVASATION OF URINE AND URINARY FISTULÆ.

Before commencing the subject of urinary fistulæ, I shall briefly allude to a condition closely related to retention, just considered—viz., extravasation of urine. And it is related in this way:—Suppose that from bad treatment, neglect, or otherwise, the patient suffering with retention from stricture has had no relief, and that when you are called in there is no question of puncturing the bladder, for the urethra has been already opened by natural means, so to speak: that is, Nature has herself done something towards a cure; clumsily and roughly it is true, but she has made an effort nevertheless to preserve life. And, undoubtedly, although it is true that many subjects of stricture or retention, who without surgical aid must therefore certainly lose their lives, there are a few saved by extravasation of urine taking place. What then happens is, that a portion of the urethra gives way behind the stricture, perhaps during some violent act of straining, and through the rent so made, a quantity of urine is driven with great force into the cellullar interspaces. You know of course where the fluid must go, from the anatomical disposition of the fascia—viz., into the scrotum, up into the groin above Poupart's ligament, rising upwards over the belly. Occurring, as it usually does, in the bulbous part of the urethra, where the walls of the canal are weak, the urine cannot pass backwards behind the scrotum, or the back part of the perineum; neither can

it get into the thighs, because it is checked by Poupart's ligament. I have seen it rise as high as the chest, and I have made incisions to evacuate it, in a severe case of extravasation, as high as this point. Once the accident has taken place, it follows that at every action of the bladder more fluid is driven in with force, so that the cellular interspaces are separated, and the fluid gradually finds its way upwards.

Generally, you ought to know at once, by the appearance of the patient, what has happened, although it is possible sometimes to confound the condition I speak of with ordinary inflammatory œdema of the scrotum, for it may commence very gradually and insidiously. In ordinary cases, you see a hard perineum, a large red tense scrotum, the penis swollen, and a red blush perhaps rising over the pubes. In order to ascertain the true state of things, you must ask for the antecedents, and you will probably learn that there was great difficulty in passing urine, followed by rather sudden relief. When a man has had retention for some days, and extravasation suddenly takes place, instant relief is experienced—the frightful want to make water disappears as soon as the fluid finds its way into the scrotum; but he soon feels new pains, not necessarily very severe, and what is worse, constitutional symptoms rapidly set in. The poisonous fluid quickly destroys the cellular tissue, so that sloughing soon begins. After forty-eight hours or so, gangrenous discolorations appear, and the urine may find its way into the corpus cavernosum, when a dark spot appears on the glans, showing that the structure of the penis itself is infiltrated.

Without describing further this condition, which you must have seen for yourselves, and which may be seen now

to some extent in a patient in the ward upstairs, let me say, do not in such a case be afraid of the knife. You have no occasion for a catheter; the urine has found its way into the cellular tissue, and you must let it out as freely as possible. On each side of the perineum and scrotum make a deep incision. You need not limit the incision to two or even three inches, because you are really cutting into urine, not into flesh. The structure is so enormously distended, that there is but little flesh to divide; and although the incision may appear very deep and long, when the water has run out, it will be comparatively small. The incisions generally bleed rather freely. One may soon lose a pint of blood from three or four incisions. The urine runs out also, and as the distension goes off, the vessels are enabled to contract better; but if you see any little vessel spouting, tie it at once. An incision should be made on each side of the penis, because if it is made in the middle line, there is not sufficient communication for the incisions on the one side to relieve the other. Do not be extravagant in these incisions; still it is better to err on the side of freedom than to be too niggardly in the use of the knife. The next day, if the case has done well, you will find the scrotum much reduced in size, and the parts altogether much less swollen and inflamed. You have now a direct communication through the cellular tissue from the bladder, and, with that rent behind the stricture, as a rule, you will be safer in letting the catheter alone, and permitting the water to drain off. What happens? Why, just what happens after puncturing the bladder. When the water flows off by another passage, the urethra begins to improve, and in three or four days you will probably have no difficulty in passing No. 3 or 4 catheter. With these patients, bad as they are, prostrated

as they are when you see them, if the case has not gone too far, and too much gangrene has not taken place, very striking and rapid recoveries often follow. The whole scrotum may slough away, and the testicles may be seen uncovered in the wound, and yet all may heal up soundly and well.

This leads us to the next subject. After the exit of the urine by these artificial channels, some of them fail to heal, and remain patent, and thus form what we term urinary fistulæ. Now this day week there were in my ward three cases illustrating this condition, and rather exceptionally obstinate ones. One was caused by extravasation of urine, and the other two by the more usual and common cause—stricture of the urethra.

We have spoken of extravasation; but how does stricture give rise to a fistula? Thus: in some patients, when a stricture has existed some time, and has had no treatment, or bad treatment, it is not uncommon for chronic abscess to form, say in the perineum, between the urethra and the surface. In time this opens externally, and a few days afterwards a little urine finds its way through it, and passes at each time of making water. If no relief is afforded to the patient, another forms; and so several sinuses may arise, and other openings in various and surrounding parts, all giving exit to the urine. These fistulæ may take place in a great number of situations, such as in the penis, in the scrotum, in the perineum, in the groin, and in the rectum; but the two latter situations are very rare.

We will consider the first four by themselves, because fistulæ which open into the rectum require a different treatment altogether. Then, respecting their specific cha-

racters, I shall make three classes, examples of which may be found in any of the localities named.

First: Fistulæ may consist of simple openings or channels between the urethra and the external surface.

Secondly, they may be surrounded with inflammatory induration, which is an obstacle to their healing.

Lastly, they may be complicated with loss of substance from sloughing so that even a portion of the urethra itself may have been destroyed; and these are the most difficult cases to deal with. Hence these fistulæ classify themselves naturally as simple, indurated, and fistulæ with loss of substance.

I. I will deal briefly with the "simple urinary fistula." Whatever part of the canal it is connected with, it almost always heals, if the stricture with which it is associated is dilated. Dilate the stricture, and in nine cases out of ten the fistula will heal. Patients, especially in private practice, are often extremely anxious about the result of an opening in the perineum or elsewhere through which the urine passes; and it is right that you should assure them for the most part, if the stricture is thoroughly dilated, the unnatural passage will heal of itself. But there is another point to be considered in connection with this—viz., the quantity of urine passed by the fistula, compared with the quantity passed by the natural passage. Of course the gravity of the affection depends very much on the relative proportions passed by the two ways. Usually about three-fourths of the water will pass by the right way, and one-fourth or one-fifth by the wrong passage. If a large quantity—say three-fourths—passes by the unnatural opening, then probably a considerable amount of stricture is present. Nevertheless, as the stricture is dilated, you will

see that the proportion of urine passing through the fistula will gradually decrease until it ceases altogether, and the part soundly heals; but this latter result is achieved only on the condition that the stricture is thoroughly dilated.

II. We come to fistulæ which are associated with much inflammation and induration in the perineum. These may be multiple; in which case you may find five or six openings. I have known a man with a dozen, so that instead of the urine being discharged by one stream, it flows as from a watering-pot. Even this condition, however, very much improves as the stricture is dilated, and may get quite well; but this is not always the case. Then there are some instances looking much less formidable, like those upstairs, with perhaps only two or three openings, through which the greater part of the water has passed for a long while. You recollect that we fully dilated the stricture in each case; but still no improvement as regards the flow of urine through the fistulæ took place. A No. 12 catheter was passed; but the patients did not get well. The condition of the perineum improved very much; but still more than one-half the urine obstinately held its erratic course through the perineal openings. Now, what is commonly done in such circumstances? Usually operative proceedings of some kind are resorted to: or, if these have been postponed or rejected, a rather tedious process has been employed. The principle laid down—and I have myself applied it successfully—is, that it is necessary to take care that the external openings of the fistulæ should be very free, and to ensure this condition, either by means of the knife, or by potassa fusa, or by some other means; so that the urine may not be detained in its way from the urethra to the external surface, causing fresh induration or

thickening. Next, you are recommended to excite adhesive inflammation in the track of the fistula by a hot wire, or by touching it with cantharides or a strong solution of nitrate of silver. No doubt this treatment sometimes succeeds; but it is at best a tedious process. Then it was sometimes attempted to cure such fistulæ by tying-in a gum catheter for weeks, or even for months, with the view of transmitting the urine from the bladder to the surface without contact with the urethra and fistulæ. But this plan generally fails; and for this reason: that urine always finds its way by the side of the catheter, along the urethra, and so into the fistulæ by the force of capillary attraction; and thus the object supposed to be thus attainable never was and never could be so accomplished. The practical surgeon soon discovers that tying-in an instrument never ensures the transit of all the urine through it; some will always pass by the side and defeat his purpose. I have, therefore, adopted the plan of teaching the patient to pass the catheter himself; and that is by far the most rapid and the most certain method. With regard to the two cases upstairs, ten or fifteen years ago I should have applied potassa fusa or the galvanic cautery, or something of that kind; but the fistulæ have soundly healed, through ensuring, by using the catheter every time the urine is to be passed, that the current should cease altogether to pass through the fistulous passages. You will first teach the man to pass a No. 7 or 8 gum catheter himself—an easy matter enough. He then agrees to pass it every time he requires micturition, night and day. On no occasion is he to permit the urine to flow spontaneously—say during five or six weeks—not even when he goes to stool: and this is avoided by always using the catheter immediately before. That plan has been

followed in each one of the three cases in question, without difficulty and with perfect success; for each man has a sound perineum, and has now relinquished the use of the instrument.

III. We arrive at the third form of fistula, that in which there is loss of substance. This class must be dismissed rather briefly, because its full consideration would involve a tedious detail of many different surgical procedures. Where you have this loss of substance, a plastic operation of some kind is generally required, to fill up the gap which exists. When the opening is small, you may contract it very materially by the heated wire or galvanic cautery, or by any mode which tends to produce a contraction of the tissues. You know that cicatrices which result from burns contract considerably, and you avail yourself of that action in this instance. Most commonly, however, if the soft parts have been largely destroyed, some plastic operation is required for the cure. Thus, on passing a silver catheter, when a portion of the urethra has sloughed away, you may see perhaps a quarter, or a third, or even half of an inch of the catheter exposed in the wound. The successful treatment of such cases demands much care and nice management. They do not often come under our notice, and less often do they get completely cured.

I have had in the hospital but three or four such cases, but these, by means of plastic operations, have been entirely restored. Some of you saw one last winter—a man who had just between the angle of the penis and the scrotum an opening, showing at least a third of an inch of the catheter, the whole of the floor of the urethra having sloughed away. The operation in that case was one of the most successful I ever saw. The first operation completed it, with the ex-

ception of an opening not larger than a pin-hole. What was done was to pare the edges all round, then to raise a flap of skin from the scrotum below, which was brought up to cover in completely the wound, the margins being carefully attached by a number of little sutures. That fistula healed perfectly. And why did it heal? Here is the important point: there was one condition necessary, without which it would have failed. A week or two before this operation, I made the patient learn to pass the catheter habitually, so as to draw off every drop of urine; and finding him thoroughly expert at it, I performed the operation; and for a month he never allowed a single drop of water to pass otherwise than by the catheter. Had I tied the catheter in, it would not have been sufficient, because the water, as I have told you, always finds its way by the side sooner or later. Luckily, he performed his part of the compact to the letter for the stated term, so there was no reason why the wound should not heal there as well as anywhere else. The little tiny opening which remained was perfectly closed with the heated wire, and the urethra can now perform all its functions perfectly well. You know there is another very important function connected with this canal, besides that of micturition. I do not know what you may think that function worth, but it is one which may involve very important considerations in cases where the transmission of a great family name or title or estates depends on it. Whether this be so or no, there is no doubt that every man conceives that to be an important function for himself, whatever others think of it for him; and it could not in this case have been performed unless that opening had been closed.

Now, in order to go into the whole subject, I should

want a lecture or two to tell you of the different kinds of operations which are performed in different spots. I have taken the case described as a typical one. It is one of the most difficult to close. The penis is liable to differences in form: the patient may be troubled with erections, which may damage any operation, and there is very little flesh to deal with. In the perineum you have two or three inches of depth, so that you can cut flaps of any size and thickness.

A word or two about urinary fistula opening into the rectum. You remember that I made an exception in reference to fistula coming from the urethra into the rectum. There is a case upstairs in which it occurred from the patient himself thrusting a bougie from his urethra into the rectum. More commonly it occurs from prostatic abscess. In these cases, at each act of micturition, urine passes into the rectum—often a very troublesome, even distressing circumstance. The bowel becomes excoriated, and the patient is obliged very frequently to go to stool. I shall say very few words about it, because each case must be treated on its own merits. I will give you the result of my own experience, and that is all I can do. I do not know that there are any published records respecting these cases. They are very few in number, but they are very important when they do occur. I cured one case by position. It was the case of a young officer whom I saw in private practice (I have not met with a precisely similar one in the hospital, and therefore refer to it), who passed three or four tablespoonfuls of urine into the bowels at each act of micturition, after having had some abscesses there which I did not see. It occurred to me, after some wholly inadequate treatment by other means, to tell him to lie down on his face and make water in that position, never allowing a drop of urine

to pass in any other way. In a few weeks he was quite cured—very fortunately for him and for me too. If you ever meet with such a case the plan is worth trying. I have had two other such cases since, but the plan has not succeeded. In the instance to which I refer, it occurred to me that the force of gravity would carry all the proper way, and it did so. None passed into the rectum, and at the end of six weeks the patient was well. I saw him some years afterwards, and he was soundly cured. I take it that I should now have made that man pass the catheter into his bladder and draw off every drop of water; and I have no doubt it would have been successful. Unless there is a loss of substance, that usually does cure the patient; but if there is a loss of substance, and worse still, if the opening is from the bladder into the rectum direct, then nothing is left but to examine the place thoroughly in the first instance. Put the patient on his back, as for lithotomy, and introduce a duck-bill vaginal speculum, which you must have seen me do, so as to get a good light thrown upon it. If the fistulous opening is sufficiently large to require a plastic operation, I should not hesitate to perform the same operation that is done for openings between the bladder and vagina—that is, to pare the edges, and stitch them together with silver sutures,—only it is more difficult, as there is less room in the rectum for manipulating than in the vagina. In the vagina there is plenty of space for the work, but I have done it also in the male in one case. I found it possible to do, though difficult; and I believe that is the best plan when these cases occur with loss of substance. If the opening, however, is very small, it may be greatly diminished in size, if not closed, by applications of the galvanic cautery, as I have repeatedly done.

Such a condition sometimes happens after the operation of lithotomy. A lad was here not long ago—many of you remember him—who had been cut in the country some years before with success, except that the rectum had been opened; a fistula had existed ever since, and he was sent up for me to close it if possible. I placed him in the lithotomy position, under chloroform; emptied the bladder by a catheter; and with the vaginal speculum above mentioned we could all see an opening in the upper and left part of the bowel which admitted a number nine silver catheter. Having ready prepared a large double wire connected with a powerful battery, the wire was first shaped and placed within the fistulous canal, and then, the current being turned on, the sides were freely touched with the heated wire. This proceeding was repeated about once a week or ten days, the quantity of urine passed by rectum steadily diminishing. I never, however, could altogether close the track, although I reduced the rectal urine to a trifle, and so made the patient quite comfortable. He no longer wetted the bed against his will at night, which forms one of the most troublesome features in these unfortunate cases.

LECTURE X.

ON STONE IN THE BLADDER.

GENTLEMEN,—I wish to give you to-day a sketch in outline, embracing all the principal points, if I can, of a very large and important subject—viz., stone in the bladder of the adult male. I shall say little about stone in children, and nothing, at the present time, about stone in women.

First of all, in what classes of cases is stone most common? Contrary to what is stated in books on the subject, it is most common in individuals from fifty to seventy. In books you will find it stated to be most common in children. Perhaps it is so if you take the number of cases in children as compared with the number of cases in elderly adults, although this is by no means certain, but not if you take the individuals of either class relatively to the numbers of that class living at the time.

I think it may be said that the most favourite period for calculus is from about fifty-five to seventy-five; the next in order is that below puberty, and the most rare period is that of middle age. Looking at the cases numerically, you may put it down as a general rule that half the total number of hospital cases occur below thirteen years of age. I cannot refer you to any more exact researches than those which were made with great labour some years ago by myself. Out of 1827 such cases, each one of which was reported to me in writing, and of which I knew all the principal particulars, one-half occurred before the age of thirteen. You

will remember that this is in hospital practice, which gives a very different set of cases from those seen in private. For example, the operation for stone is excessively rare among children of the middle and upper classes. I don't know any disease which marks more distinctly, nor more curiously, its relations with class than this. So common is stone in the children of the poor, comparatively speaking, that at Guy's Hospital, surrounded as it is by a very large neighbourhood, densely populated by the worst-nourished classes of the community, quite one-half the cases admitted are children. Among the same classes, however, it is very rare at the other end of life; very few elderly working men in London being afflicted with it. On the other hand, among the well-to-do and well-fed, although almost never found in childhood, it is almost common at advanced age. This has been very much overlooked, and its frequency at this period is greater than most people believe.*

Now, with regard to the varieties of renal and vesical calculus, they are not numerous, and a few details suffice to describe them. Thus I shall regard three chief classes as the most important to consider in relation to the practical management and the removal of stone in the bladder. That which is most frequently met with there is formed of uric acid and its combinations; the second is that in which phosphoric acid is combined with volatile alkali and the alkaline earths; and lastly, there is oxalate of lime. For all practical purposes those are the three great divisions. Among these, uric acid and the urates form about three-fifths in number; while nearly two-fifths are phosphates, either alone or in combination with some uric acid, in which

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* *See* further observations on this subject in Lecture XVIII.

latter case the term "mixed" is applied; lastly, about three per cent. of the entire number are composed of oxalate-of-lime. It is necessary only to remember further, that very rarely a calculus may be formed of pure phosphate of lime or of cystine. It has fallen to my lot to operate on one case of each in my life.

Next, what is the ordinary history of stone? You know well, of course, that the appearance of a stone of some size in the bladder is not the first stage of the malady. The stone begins always—I am now speaking of uric acid—as fine sand or gravel, to use popular terms: that is to say, there is an excess of urates, which, perhaps, steadily persist; then, possibly, of uric acid, in characteristic cayenne-pepper-like masses of crystals; then there are small rounded bodies of this latter aggregated within the kidney, about the size of shot, or somewhat larger, of which you have very good specimens here.

An acid calculus, then, is always formed within the kidney; and it is a fortunate thing if it descends into the bladder, because sometimes it is retained in the kidney; and, as renal calculus, becomes the source of great misery, for which surgery can do little, although medicine may be of some small service. But if it comes down into the bladder, it is usually passed—say in nineteen cases out of twenty—without any operation whatever. The patient has an attack of severe pain in the back, over the hip, in the groin and testicle, lasting for some hours, and mostly accompanied by vomiting, which symptoms commonly disappear with the descent of the calculus from the kidney to the bladder. When it gets there, after a day or two, or before, it is generally expelled by the urethra, and there is an end of the matter for the present at all events. But the

patient ought to know, or must be told, that this occurrence shows a strong proclivity towards the formation of stone, and he should immediately do all he can to prevent its continuing, as in the nature of things it will do (on this subject see Lecture XV.). But if the bladder is unable to expel the calculus, it soon increases in size by deposit on its surface of acid from the urine, and a very hard but rather brittle stone is formed in the course of time. All the stones which you see in this box have been passed through the urethra by the natural efforts; and it is worth knowing how large a stone may be so passed in some cases. Usually, when they get as large as some of these, they fail to pass, and then some operation must be performed for their removal.

The phosphatic calculus is not often formed in the kidney; it is so sometimes, but usually it is formed in the bladder. In the mucus of a diseased bladder a good deal of phosphate of lime is formed, and this, meeting with phosphate of magnesia, a constant urinary product, and with ammonia from the decomposed urine, produces the ammoniaco-magnesian or "triple" phosphate. This, again, with the phosphate of lime, makes "fusible calculus," the commonest form met with. Its structure is not dense, and it is easily crushed.

The oxalate of lime, or mulberry calculus, I need not tell you, is not originally formed in the bladder, but in the kidney, and it is the hardest in structure and the roughest in external surface of all.

Now, what are the symptoms of stone? These we will seek, if you please, by means of the four questions always to be used. A patient tells you, perhaps, that he has passed some gravel for a year or two, and may show you some

small stones which he has passed. For the last few months, perhaps he has not seen any; but during that period, has had increasing difficulty in passing his water, a circumstance which will strongly excite your suspicion.

First, you will commence with an inquiry as to frequency of micturition. The patient has for some time had more or less frequency, but it is increased during the day when moving about, and is less observed at night, when he is at rest. This is contrary to what usually takes place in prostatic enlargement, and hence it is a good diagnostic point.

You next ask for pain. The patient with calculus of the bladder has almost always pain at one particular spot, the lower part of the glans penis, about an inch or less from the external meatus. Remember, you may have some pain there when there is no stone in the bladder, as in chronic prostatitis and in some affections of the bladder; but in stone it is almost always present, and is usually severe. Further, with regard to pain, the question should be asked, whether the patient feels it before, during, or after making water. He will tell you that it is during and after; whereas you know, in hypertrophied prostate, and in all cases in which water is retained, the pain is before passing water, and it is relieved by the act. A man with stone feels pain after making water, because the foreign body is then left in contact with the lining of the bladder, and being carried to its neck, severe pain and a strong desire to micturate are felt, perhaps for four or five minutes, until fresh urine entering, the coats of the bladder are separated from the stone.

Then you ask as to the condition of the urine. In nine cases out of ten you find that there is muco-pus, and also, perhaps, streaks of blood. There is almost always, but not

invariably, more or less clouded or muco-purulent urine with calculus.

Then, lastly, you ask him with regard to blood. Almost without exception blood has been passed at some time, and is seen in the urine by the naked eye: and almost invariably, even when no blood-tint is observed, a few corpuscles will be found by the microscope. But it is generally apparent after exercise, and therefore he can rarely ride on horseback or in a jolting vehicle without communicating a tinge of blood to the urine; nor without considerable pain. On the other hand, the bleeding caused by calculus is rarely considerable, as is sometimes the case in prostatic disease, and in tumour of the bladder. Finally, all the symptoms of calculus are much intensified by any quick movements of the body. A patient, therefore, presenting himself with the conditions described ought always to be sounded.

Then, how do you sound? You should employ an instrument like this, with a small short curved beak, because it can be turned in any direction. (Fig. 31.) If

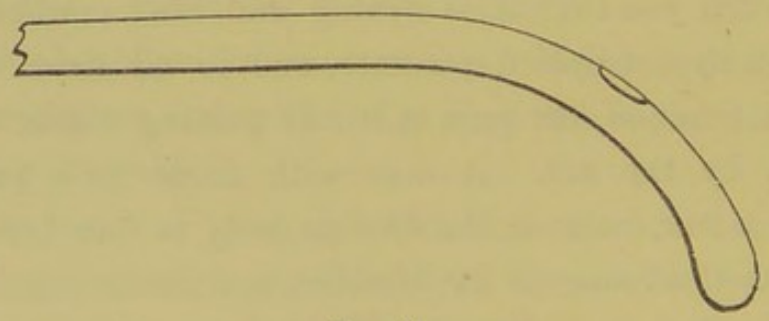


Fig. 31.

you use an instrument with a large curve, like a catheter, you are unable to rotate it in the bladder, and hence it cannot explore sufficiently.

When I entered this room, you heard me ask for the hospital sounds, for I knew I should find among them a good

example of what a sound ought *not* to be. Here is one, for example, which no one could rotate, or ever find a small stone behind an enlarged prostate with, except by sheer accident. It has precisely the form of a common catheter, and its only claim to existence now is as an example of antiquated and obsolete instruments in a museum of surgical history. You will say, naturally enough, "Why are such sounds here, and who has used them?" They were used formerly, and found a good many stones, too, in the hands of our illustrious predecessors. But I will answer for it, they have missed a good many stones, also; and this is precisely what I want you not to do. I have no hesitation whatever in saying that more stones are missed in sounding than are found by the ordinary methods still adopted, I regret to say, in this country; and that must be the case if a sound of the form of the common catheter is relied on for the purpose. But with an instrument which has this small beak at the end of it, you can search in every direction (see Fig. 32). If there is a large stone, of course you may usually find it with anything; but our great object is to find the small stones. As a rule, anybody can find a big stone; the art consists in finding a small one. It is most important to find a small stone, because it will grow large, and may be very formidable to deal with; whereas, when it is small, it is a far less serious matter. You may promise the patient, in the case of a small stone, that it may be removed without risking his life; whereas in the case of a large stone there is always some risk, often considerable danger. It is impossible to overrate the importance of finding all stones when small,*

* *See* also Lecture XVIII.

and this you can only do with an appropriate sound, rightly applied.

In the next place, how are you to use this instrument?

First of all, it is not to be introduced in the same way as the ordinary catheter. With the ordinary catheter it is the custom in this country to stand at the left side of the patient, and make a gentle sweep thus into the bladder. With the sound you stand at the right side, and use a different manipulation, which I shall show you on the living patient, at another lecture, postponing, therefore, my remarks on the subject until then (*vide* pp. 181–2).

But you have something else to do besides merely discovering the presence of stone. It is necessary to have other particulars respecting it, because the nature of the operation to be performed will depend on them. First of all, it is essential to know what the size of the stone is before you decide on what you will do with it. From the note elicited by merely striking it, and by the sensation communicated to the hand, you can get some indication of its size; certainly as to whether it be large or small, but which is a distinction not sufficiently precise for our purpose.

There is a more exact, and at the same time a simple, method of determining size, sufficient for most cases, which I have long employed myself and more recently have introduced to the profession. It is far less irritating to the bladder than is the action of any measuring sound with two blades which I formerly used, or of the lithotrite, which is the same thing on a larger scale. It consists in the mere addition to any ordinary sound of a little ring or collar which slides along the shaft, and which by proper manipulation, enables me to ascertain very nearly the size of a stone, as you have frequently seen in the wards. The manner of

using it is this. Introduce the sound, feeling the stone as the end passes over it, by a succession of delicate taps, until you have placed the end of the instrument distinctly beyond the farther or distant extremity of the calculus as it lies in the bladder. This done, slide the "collar" down the shaft to the end of the penis, so that it touches the external meatus. Now draw the end of the sound outwards over the stone, delicately tapping as before, until you have reached its near extremity, which is most likely close to the neck of the bladder. The distance of the "collar" from the end of the penis is the diameter of the stone in the direction passed over. There is nothing painful or irritating in this procedure if conducted, as it always ought to be, with a light and delicate hand.

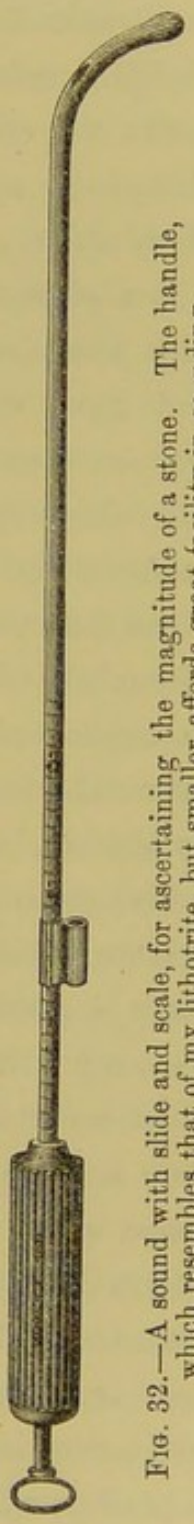


Fig. 32.—A sound with slide and scale, for ascertaining the magnitude of a stone. The handle, which resembles that of my lithotrite, but smaller, affords great facility in sounding.

Then there is the other way, already mentioned. You may introduce a lithotrite (which is very apt, however, to occasion considerable disturbance to the patient), and seize the stone in two or three directions, so as to ascertain its diameters.

At the same time, it is necessary to ascertain the nature of the calculus. A phosphatic stone gives a very different sound from the others. The specimen before me is dry, and, therefore, will not give the sound to which I refer. When wet, it is spongy and soft, with a rough surface, and always gives a dull note when struck; whereas the uric-acid stone gives a hard ring. Then you will judge partly by

the condition of the urine. If the urine is acid, and if, also, uric acid is thrown down, you may conclude that the patient has a uric-acid stone. If so, it is likely he has passed small calculi before. Probably also the patient empties his bladder perfectly by his own efforts.

On the other hand, if the urine is alkaline, and deposits phosphatic matter; also, if the patient is unable to empty his bladder, and requires a catheter, you may conclude that it is a phosphatic stone, or, at all events, that it is covered with phosphates.

I have spoken of uric-acid and of phosphatic calculi. But we may have to deal with an oxalate-of-lime stone—a fact which it is a very important thing to ascertain. You examine the urine, and see if there is much oxalate of lime thrown down. The patient may have passed a small mass of oxalate of lime before, and it may be thence inferred that an oxalate-of-lime calculus exists now; but it may have an external coating of phosphates, and thus its real nature may be hidden. The following is a case in point. I had some time ago to operate on a large stone in the bladder of a private patient. I crushed the stone four times, bringing away a good deal of phosphatic material. I soon noticed that my lithotrite never went through the stone: it always went a certain way, and then there was a hard mass. After four sittings I could not crush any more. It was clear that there was a very hard centre stone, on which my strongest lithotrite made no impression, the crust only having been removed. I know, from experience, the recoil of the lithotrite from an oxalate-of-lime stone so well, that I had no hesitation in saying such an one was present. Accordingly I performed lithotomy, and removed a well-marked specimen of that kind. In a case like that, there would not be

oxalate of lime in the urine, but phosphates. In the case of the hardest uric-acid stone in similar circumstances, an impression will be made upon it by a turn of the screw, the jaws of the lithotrite will bite into it; but an oxalate-of-lime stone communicates a sensation when grasped by the instrument of laying hold of a piece of iron—you make little or no impression upon it.

The number of calculi present is the next thing to be ascertained. Usually there is only one, but occasionally there are more. There is a patient here on whom I shall perform lithotrity to-morrow, who has two rather large uric-acid stones in the bladder. The way to determine that point is this: Having seized one in the lithotrite, you move it gently in every direction as a sound for others. If then you encounter one on one side and one on the other, you know that there must be at least three stones. There is a source of deception here which it is necessary to guard you against. While retaining the stone between the blades of the lithotrite, and moving the instrument from side to side in search for another, a rattling sound is easily produced which resembles very closely that of contact with another stone. This arises because the stone seized is not closely fixed between the blades of the lithotrite, and it rattles between them. I have seen the error committed of inferring a second stone from this cause.

Sometimes a great number of small calculi are present, varying between the size of a small nut and that of a pea, so that the rattle of several is heard, and, I may add, felt. These are favourable cases for operation, when compared with those with a single calculus, *taking equal weights*. The large stone on being crushed results in large hard and sharp fragments. The small stones may be already regarded as

fragments, but of a much less irritating form. Thus, also, much less mechanical work is necessary to crush and remove like weights of calculous matter. In the patient's interest I would rather remove six drachms of such small calculi, than four drachms in the form of a single stone.

Having obtained all these data, the important question is, What operation is to be performed? Are you to perform Lithotomy or Lithotrity?

You know there are only two modes of removing the stone. You must make an opening sufficiently large to admit of its withdrawal at once, or you must crush the stone into very small fragments, so that they may be expelled by the natural passage. It was less important to make a diagnosis of all the points named, when there was but one operation—namely, that of cutting. Formerly, whether the stone was large or small, the patient was always cut. There was no other way of removing it. Now that we have two operations, it is very necessary that we should choose the right one; because—and let me impress on you the importance of the fact—if you do not determine pretty accurately the characters of the stone, and select the right operation, you may do more harm than if you cut every patient who comes to you. Thus, if you crush the very large stone, and cut for the very small one, you will have greater mortality than if you simply resorted to the one operation of cutting in all cases. When lithotrity was first introduced, it was unquestionably a rather clumsy operation; and when the cases were not judiciously selected, when surgeons operated without making a diagnosis of all these points—crushing stones that ought really to have been cut, and cutting for stones which might have been crushed—the entire mortality resulting from operations for stone was greater than it had been

previously, when every case was cut. I cannot give you a stronger argument for the necessity of apportioning the operations judiciously.

Now, without taking up your time too much, I will lay down what you will understand to be the axioms which should direct you, in a general way, in making your selection.

First of all, I will say that all patients with stone, under puberty, with very few exceptions, are to be cut. Under fourteen or fifteen years of age, stones occurring in the male are to be removed by cutting unless they are very small, and can be crushed, say, in one operation; because lithotrity is not a very easy or successful operation in children, the urethra being small and the bladder very irritable; whereas, as is well known, lithotomy is a very successful operation in these cases. We do not want a better operation, comparatively speaking, and may be content to let well alone. Not more than one death in fifteen or sixteen cases occurs from lithotomy in children. I do not think, therefore, we can do better than cut in these cases, as a rule. If, however, you have in a child of, say three or four years old or upwards, a stone no bigger than an orange-pip, you may very probably succeed in crushing it, under chloroform, in one, or at most two sittings; and this it is usually advisable to do with a very small lithotrite.

That leaves us all the cases above puberty; and here lithotomy is only exceptionally available. I will put it in this way, and say, in general terms, that all the cases above puberty are to be crushed, with certain exceptions.

The first exception is in a case of an oxalate-of-lime calculus, which is, let us say, upwards of an inch in diameter. Up to an inch in diameter you may crush an oxalate-of-

lime calculus. I have crushed five or six such at least; such cases being somewhat rare. Two of them were in this hospital. An oxalate-of-lime stone, from the size of a bean up to an inch in diameter, can usually be crushed; above that size, no lithotrite which it would be desirable to pass through the urethra can deal with it, and the fragments will be so hard that the operation might be of doubtful value, even if we succeeded in crushing. That, then, is the first exception to the broad rule that the cases in adults are to be crushed.

Secondly, a large stone of uric acid, or a phosphatic stone of very large size, had generally better be treated by lithotomy than crushed. Mechanically speaking, it is possible to crush almost any stone, whether uric acid, phosphatic, or mixed; but, considering the number of sittings required, and the amount of irritation produced, the single operation of cutting will be the better of the two when the stone is—shall I say—two inches in its long diameter. A stone which is two inches in diameter, either phosphatic or uric acid, had better be removed by cutting. No doubt a rather larger phosphatic stone may be crushed. Here is a very large one, two ounces and a half in weight. The phosphatic stone is very friable, and you may deal with rather larger phosphatic stones than uric-acid stones by lithotrity. So much for the exceptions to cutting, regarding the characters of the *stone* itself.

Now what are the conditions on the part of the *organs* which will make it necessary for you to cut instead of crush? They are very few indeed. Formerly, almost any kind or degree of disease in the urinary organs was held to contra-indicate lithotrity. I think it has fallen to my lot chiefly to demonstrate that this was an error.

First of all, I will tell you what are not exceptions, but

which are stated to be so in books, and are generally considered as exceptions; because lithotrity itself has advanced faster than the general literature of the subject.

Thus, it is said that in stricture lithotrity is of course impossible. That in marked hypertrophy of the prostate it is difficult and undesirable. That in an atonied bladder which cannot empty itself by the natural efforts lithotrity is contra-indicated, since the fragments cannot be passed. That if the bladder is very irritable, that is, if the calls to pass water are exceedingly frequent and painful, lithotrity is a most unpromising operation. That in any severe disease of the bladder, it is out of the question; and finally, that in disease of the kidneys, it is more dangerous than lithotomy.

I reply first, in relation to stricture of the urethra, that the limit of our ability to crush a stone is not great, but that small stones may be safely dealt with. I have recently crushed a uric-acid stone in a case of organic stricture with small instruments made for the purpose; but the stricture was not a very narrow one. And more recently I have crushed stone in two cases in the wards, where confirmed stricture has existed, by the following method:—I tied in a catheter for a few days, and dilated the stricture thus to No. 10; then placed the patient under chloroform and introduced a small lithotrite, removing as much as possible. I then re-introduced the catheter, and let it remain there for three or four days, until he was ready for another sitting, and so on until all was removed. This plan answered well for two men who were not in condition for so formidable an operation as lithotomy, and whose calculi were not large.

Secondly, in marked hypertrophy of the prostate, I make

no difference whatever, and would almost as soon crush in the presence of this condition as in a younger patient without it. If the hypertrophied prostate occurs in a man who has had instruments passed, he will have become habituated to them, and is sometimes, therefore, a better subject than a healthy one who has not been so accustomed. If he requires very frequent catheterism, his case is one of increased hazard, but he is to be treated by lithotrity; although in very exceptional circumstances it might be better to open the bladder above the pubes, remove the stone, and leave a tube there. See Lecture XIX.

Thirdly, in relation to the bladder which is atonied, and unable to void its contents by its own power, and the urine has to be drawn off by means of a catheter, I do not dislike such a case, for the reason just assigned—that is, the bladder and the urethra are habituated to instruments; and as to not removing the fragments, there is no difficulty at all in removing the very last fragment, thanks to the improved methods now employed.

Fourthly, irritability or extreme sensibility of the bladder is not at all an objection. It used to be said that if the bladder could not hold above three, or four, or five ounces of urine, there would be no room for the lithotrite to work, and therefore the surgeon must cut. I make no objection on that ground, because the irritation of the bladder is due to the presence of stone; and as soon as you begin to get away the stone, the irritation often diminishes. Besides, it is not necessary to have four ounces of water in the bladder; one ounce is ample. There is no occasion to have four or five ounces in order to perform the operation of lithotrity. It might have been so with the old clumsy instrument, but with modern instruments there is not this necessity to pro-

tect the bladder from contact with them. When instruments were used that were apt to catch the coats of the bladder, it was no doubt desirable to have a quantity of water in its cavity: but with modern instruments, which will not lay hold of the coats of the bladder, there is no difficulty whatever in crushing with a single ounce of water. I do not care whether the organ is empty, or contains a large quantity of water, provided only that it is not too full. Nothing is worse than too much water, because the stone rolls about, and you must, figuratively speaking, play a game of hide-and-seek to catch it. It is better to have an empty bladder than a bladder with half a pint of water in it.

Fifthly, as to advanced disease of the bladder, each case must be dealt with according to its particular merits. In cases of notable tumour of the bladder, complicated with calculus, which are very rare, the propriety of any operation must be doubtful. I once in this hospital greatly mitigated, for the few weeks he had to live, the sufferings of a poor fellow with cancer in the bladder, by crushing a phosphatic calculus. No one certainly could ever have dreamed of cutting him.

Sixthly, as to the comparative applicability of the two operations in the presence of the various forms of renal disease—a very large subject—I must defer the consideration of it to a separate lecture (see Lecture XXII.). Suffice it to say here, that modern lithotrity will in most cases be safer than lithotomy. Some years ago the contrary decision would no doubt have been preferable.

You see, then, that the exceptions are few; limited almost entirely to cases which are difficult or hazardous, because the stone is large. Indeed there are very few

adult cases which cannot be crushed with advantage, provided you give proper care and attention. If surgeons of the present generation now growing progress, as they must, and become more intelligent and more careful than those who have gone before—if they are better acquainted with the subject, as in the nature of things they must be, as our sons will be wiser than ourselves and our grandsons wiser than they, there will be fewer and fewer exceptions. For it is certainly true that if the stone is discovered when sufficiently small, *it can always be crushed with an almost* CERTAIN CHANCE *of success;* lithotomy, therefore, for adults must at some day disappear, except for cases which have been neglected by the patients themselves, or have been overlooked by the medical attendant.

A rather large uric-acid stone is the growth of several years; a large phosphatic stone is perhaps the growth of two or three years; an oxalate-of-lime of full size, say from seven to ten years; and it is very hard if, long before the expiration of such periods, the stone cannot be found and disposed of by lithotrity. It is certain that if there be proper intelligence and proper supervision of the patient, a stone would be always discovered, when it can be crushed with almost a certainty of success; so that the only cases in which lithotomy will have to be performed will be those in which the patient has neglected himself, and although suffering from severe pain for years, has never gone to any surgeon to tell him about it. But those cases ultimately will be very few indeed. I hope you will live to see the day when lithotomy for adults will be one of the rarest operations in surgery. I do not suppose I shall; but I do expect to live to see one thing, and that is, lithotomy becoming less common year by year. I do not say that I

look forward to that with unmixed pleasure; for it is a grand operation, demanding skill, self-command, and sometimes all the resources of an experienced and able man. It is one of the best practical tests of a good surgeon, and looking at it from that point of view, one cannot desire its discontinuance: but it will disappear, most assuredly; and as it will be for the benefit of humanity that it should, we must acquiesce in the result.

Next week I shall place two stone patients on this table, and demonstrate the operation of lithotrity for you here in my lecture on that subject.

LECTURE XI.

ON LITHOTRITY, ITS HISTORY, AND ON THE INSTRUMENTS EMPLOYED IN THE OPERATION.

Gentlemen,—I shall place on our lecture-table two patients with stone in the bladder, one of sixty-two, the other of sixty-five years of age. One man has a stone about an inch in diameter; the other has two stones, each about three-quarters of an inch in diameter: and their composition in both patients is uric acid.

Now, if a patient has never had any instrument passed into the bladder before, and if the urethra is not capacious, it may be desirable to pass a bougie two or three times before commencing; this, however, is rarely necessary. In the present cases the urethra is not very sensitive; it is large in size, and there is no occasion to do this.

Next it is desirable that the patient should not be below his ordinary standard of health. You will not begin to operate when there is an attack of fever, nor unless the digestion is in fair order, and the bowels are acting tolerably well. Take care that you have the local organs, and the whole system, in as favourable a state as possible at the outset. If his habits have been of necessity too active, as in the case of the labouring man who has been compelled to work almost up to the time of his admission to the hospital, a few days' quiet in bed or nearly so, are useful before commencing operations.

Having decided to crush, there arises the question of

instruments. Now the best way of studying the lithotrite and its use, is to examine, although very briefly, through what stages the instrument has passed in arriving at its present perfection. The lithotrite before you, with its cylindrical handle, may be accepted as the type of a modern instrument. More than fifty years have elapsed since the first operation by lithotrity was performed; and then the method was widely different from what it is to-day.

I may commence by saying that lithotrity, as an operation, owes its existence to the French surgeons, mainly to Civiale, but the labours of Leroy d'Etiolles, Amussat, and others were not without value in developing a system. My old friend Civiale, who died in 1867, at a good old age, and full of honours, was the first surgeon to crush a stone successfully; and this he did in the year 1824, with instruments which he had designed in 1817. No doubt something of the kind had occasionally been accomplished by patients themselves. In one instance a man had managed to grind down with a small file a little stone in the bladder, a circumstance which has been recorded as an operation of lithotrity. But the first man who designed and performed a systematic operation on the living patient was Civiale, and he operated on his first two patients before a committee of the Academy of Medicine, with this instrument that I hold in my hand. You see how different it is from anything we now employ. It is a straight instrument, with a central axis and three claws, which were made to project after its introduction into the bladder. [The manner of using it is shown.] You see what a very different mode of proceeding that is from the method now adopted. It consisted in drilling holes in the calculus in various directions until it gave way, and each fragment was subjected to

a similar process, until the whole was converted into débris. Notwithstanding the tedious character and the difficulty of the procedure, it was to a certain extent, a successful operation. I cannot now describe to you all the varied proposals made about this time, but the principal change was the production of an instrument in which pressure between two blades placed at an angle with the shaft was the medium through which the force is applied. This was a great improvement, to which the profession is indebted to a late Mr. Weiss, of London, at so early a period as the date of Civiale's first operation (1824). This system soon replaced the perforator, and although several details have since been modified, is still the favourite one with all operators. While the method of Civiale was originally perforation and grinding, lithotrity became after Weiss's instrument what it still is, a process of crushing.

The next improvements were those which related to the opposite end of the instrument—that is, to the kind of mechanism adopted for the purpose of transmitting the power of the surgeon's hand to the crushing blades. Various ways of accomplishing this were tried: in one, the patient was fastened to a special bed, the lithotrite was fixed in a vice, and the force was communicated by the blows of a hammer. [Baron Heurteloup, 1832.] The screw was used also in some form at or before this period, it is said first at the suggestion of Mr. Hodgson, of Birmingham. Costello subsequently made mechanical modifications in the details of the screw lithotrite, which at this time was an exceedingly clumsy and heavy instrument. Mr. L'Estrange, of Dublin, also made a useful alteration in it. The apparatus thus gradually improved, and used here long after this time (1840–55) is the next which I show you. It is

worked with a thumb-screw, and very slowly. Nevertheless, it is the instrument with which Sir B. Brodie earned his success, and it is handled thus. [Explanation.] You see how long a time it takes, and how much movement is necessary with it in the bladder. You cannot accomplish much by crushing even in five minutes in this way. Meantime, and at an early period, Sir William Fergusson devised and adopted the rack-and-pinion method, which is an improvement on the instruments last described, since it can be used with greater rapidity and facility.

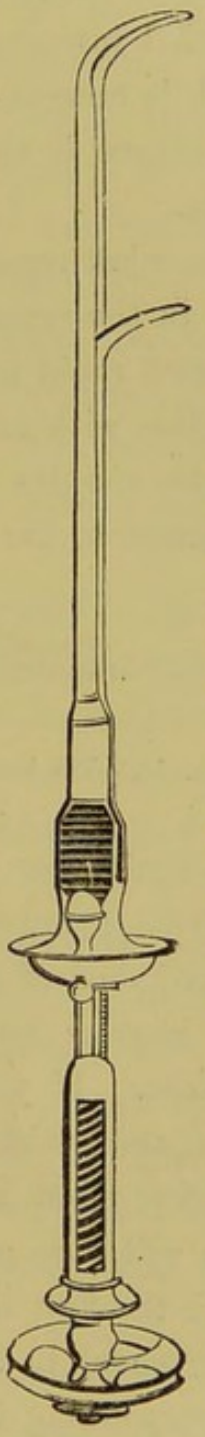


Fig. 33.—Lithotrite of Civiale and Charrière.

The next improvement was a very great one, and is due to Civiale and to the late M. Charrière, of Paris. An ingenious mechanism in the handle, moved by a disc there, enables the operator to exchange the screw-movement for a sliding one at will, and *vice versâ*. This saved all the time lost by the slow process of unscrewing, necessary to open the blades of the previous instruments every time they have been closed. (Fig. 33.)

We now come to the lithotrite before you, which is due in part to my own design, and in part to Messrs. Weiss, and is moreover that which you have always seen me use here. And this instrument is now in general use throughout Europe; and of course, as would naturally happen, various "modifications" of it have been made by instrument makers and others, with the result only,

as far as I have seen, of impairing its power in some way, and evidently devised through ignorance of the proper mode of using it. The principle of the cylindrical handle which I introduced, and for the importance of which I contend, is however retained in all the varieties, and this circumstance is the best tribute which could be paid to its value.

In what respect does it differ from others? It enables you in the search for a small stone or small fragments, to execute rapid and delicate movements, which would be impossible with an instrument without the cylindrical handle. It also enables us to operate in less time, and with less disturbance to the bladder than any other instrument. Now

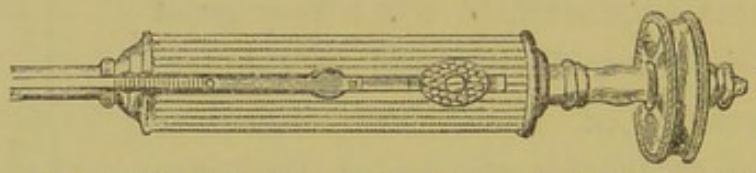


Fig. 34.—The handle of this lithotrite is shown; as it is this which affords the power to operate with great facility.

this limitation of movement and shortening of time are vital improvements in the operation of lithotrity. It makes a good deal of difference to a patient whether you retain in his bladder an instrument for three minutes or for one minute. If you pass a bougie into your own bladder at once and withdraw it, you may experience very little discomfort; but leave it there for three or four minutes and you will soon perceive the effect of time; every half minute after the first the pain increases. The mere sojourn of the instrument in the bladder is a source of irritation precisely corresponding to the time, within certain limits, it continues there. Anything, therefore, that will diminish the time of the operation, and the amount of movement and concussion, will necessarily give a greater prospect of success.

Now, for the proceeding itself. There is no operation that I know which demands more attention to minute details, all of them being very important. For its successful performance, it is essential also that the surgeon should not only attend to the operation pure and simple, but to all the particulars of treatment necessary to the case. If the patient submitted to lithotrity is not carefully watched, the operation had better not be done at all. Either let it be done according to certain principles, and with great attention to detail, or let lithotomy be performed instead. We naturally recoil from the study of details; it is therefore essential to find out what principles regulate them. And, happily, these are very simple.

What is the problem to be solved by lithotrity? It is the removal of a stone without injury to the urinary passages; and this can occur by two means only, either in employing the instruments, or by the action of the fragments themselves. That is what we have to aim at, and if accomplished success is certain.

Now, I need not say that by any cutting operation that is impossible. There is at the outset a severe injury to the patient in the shape of a large and deep wound, and it is this which, in any form, is always a risk. Let us see how far we can hope to solve the problem by lithotrity. I have said that all the chances of injury possible arise from these two sources: the stone itself, and the instruments used to extract it.

First, the stone. In its natural condition, as we know, it occasions no dangerous injury to the bladder, although it causes much pain, and ultimately chronic disease. But when it is broken up into large angular fragments with sharp edges, it becomes a source of injury, and severe

cystitis may be thus readily induced. It is in accordance with my principle that I advise that these should be pulverized one at a time; you do not attack them all at once, and break them up indiscriminately into sharp pieces. Then, unless it should be desirable to remove them at the time of operating, as it often may be, you will take care that this débris is not hurried through the urethra when first made, and while it is sharp. If angular particles can remain in the bladder two or three days before being expelled, they will become somewhat water-worn, and will pass more easily; at the same time the urethra will be less sore, and in better condition for transmitting them. The patient should at this stage be kept at absolute rest in bed, so that the fragments may not be moved more than is necessary. It may be well, also, sometimes to promote the flow of urine by giving diluents and diuretics.

Secondly, the instrument used, and the method of manipulating it, may be productive of much injury, both to the bladder and to the urethra. It has, therefore, been an object with me to lessen, as much as possible, the number of instruments employed, the amount of manipulation applied to them, and the time devoted to the process. I have shown you how, in conformity with this principle, I have endeavoured to produce an instrument which should give the least possible irritation. And I will only add, that if we can get an instrument which will do its work with less disturbance still, it will be, *pro tanto,* a valuable step in advance.

Now as to diminishing the number of instruments used. Formerly it was laid down as an axiom that you should never use a lithotrite in a patient's bladder, unless it contained a known quantity of urine or other fluid. Hence

the urine was always withdrawn before introducing the lithotrite, and four or five ounces of water were injected. I have shown that these preliminary injections are wholly unnecessary, and I never use them—never even asking a patient to hold his water beforehand, nor when he micturated last. It is said, "If there is only a small quantity of water, how can you be sure that you will not injure the coats of the bladder in endeavouring to seize the stone?" There is no difficulty in that respect, because these instruments are so constructed that you could scarcely lay hold of the bladder with them, as we shall see, if you tried to do so. When instruments were used in which the edges of the blades closed upon each other accurately it was different. But these edges never do so: hence the safety of the instrument.

Then there is another species of mechanical irritation which may be met with. It was common—and it is so still, I believe, with some surgeons—to withdraw large fragments of stone from the bladder through the urethra. The surgeon would lay hold of them with the forceps, or with some other contrivance, and would really seem to think he had achieved a feat of dexterity if he drew from the bladder a calculus as large as a bean. Now, in order to draw out such a calculus, you must first catch it. Well, if you have once caught it, why not give it one turn of the screw and reduce it to powder? Why subject the neck of the bladder and the urethra to pain and injury by forcibly dragging for a distance of six or seven inches, through a delicate and sensitive canal, a sharp angular fragment of stone? So far from looking upon it as an achievement in surgery, I look upon it as a thing especially to be avoided. Never, then, on any pretence, withdraw an instrument containing a

fragment of débris too large to pass easily through the urethra. Our object is mainly to crush the stone into small broken material, which will then pass harmlessly and easily enough.

Again, it was the custom, after crushing, to inject repeatedly and forcibly several ounces of water into the bladder, the patient being placed upright, in order to remove the fragments just made. Now, this is an irritating process, more so often than the use of the lithotrite, and for the reason just named I regard it as a useless and meddlesome proceeding. You see, then, that we get rid of the preliminary injections, the after injections made in that manner, and also the withdrawing of the fragments. As a rule, the greater part is to be done with the lithotrite. One good flat-bladed lithotrite will do seven-eighths of all the work. Other means, Clover's apparatus for example, which is the best of all, may be employed in a good many cases. I use it more than I formerly did, and with advantage.

In enunciating these simple principles of lithotrity, I have necessarily illustrated them by description of parts of the practice. This I will now continue, and shall ask your attention to further points in the construction of the lithotrite itself, before I show you how to use it.

Referring now to the blades of the instrument by which the calculus is to be seized and crushed, be pleased to observe that there are here two specific varieties, termed fenestrated and non-fenestrated. Usually, when the stone is large and hard it has been the practice to begin with the fenestrated instrument—that is, one in which the female blade is entirely perforated, allowing the male blade to pass through it. This mode of construction renders the instrument always more or less dangerous, since its edges must

meet and fit accurately: the teeth must be sharp; the blades require much space in the bladder in order to include a stone between them, on account of their width: and the fragments produced by their action are necessarily hard, sharp, and angular. Such an instrument should be used as little as possible. (Fig. 35.) I never use it now, although I did so many years ago. Certainly for eight years I have not employed one.

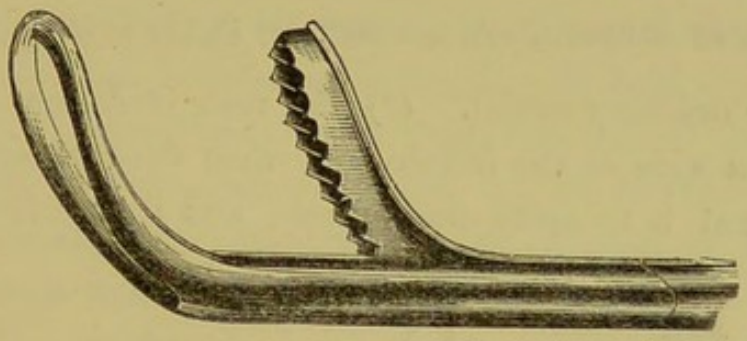


Fig. 35.—The fenestrated lithotrite.

The non-fenestrated lithotrite has solid but flattened blades, so that little space in the bladder is required to include a stone between them, beyond that which the stone itself requires. When closed, the edges of the blades, which are well bevelled, do not meet, and the male blade is always narrower than the female, so that a groove exists all round between them, by which included débris, when too much is present, can be expelled. Pressure of the stone between such blades has a tendency to produce small débris rather than large fragments. But there are two chief varieties of these instruments, adapted for two different results required. (1) The male blade may be made narrower than usual, and very slightly wedge-shaped, and then the function of the instrument is that of dealing with the larger and harder stones, and to make large fragments.

(Fig. 36.)* Such an one admirably replaces the fenestrated one just spoken of: it should, of course, be rather stouter

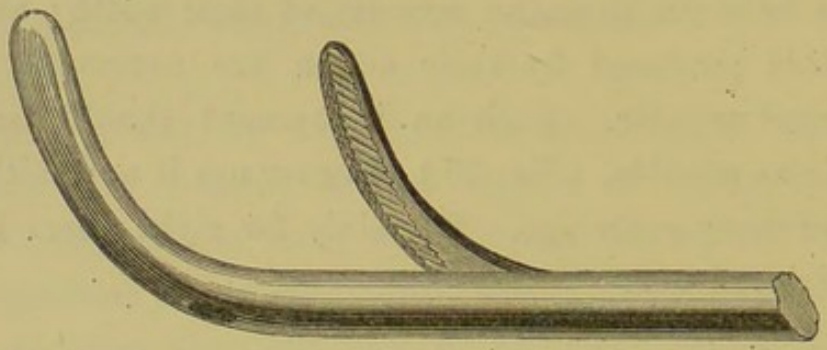
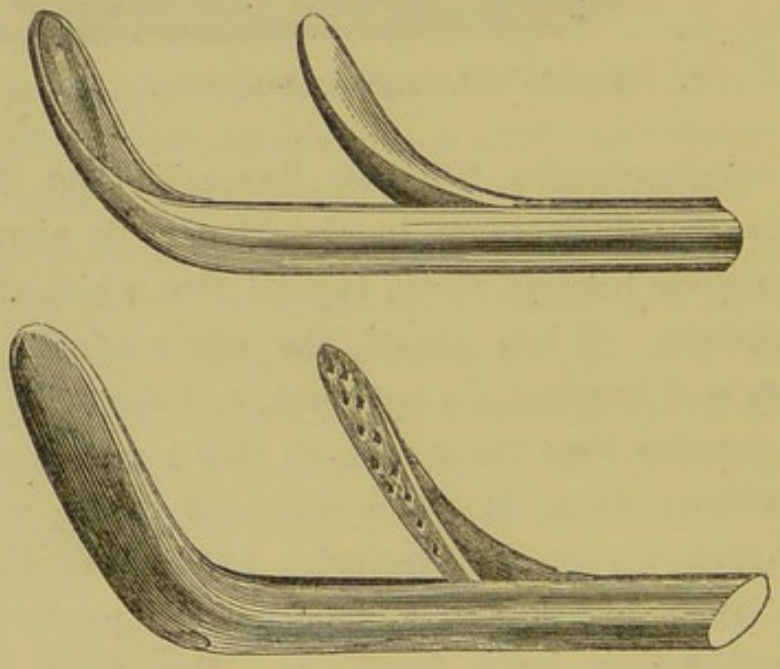


Fig. 36.—Lithotrite with male blade very slightly wedge-shaped.

than the ordinary model. (2) The male blade may be made almost as wide as the female, and then the function of the instrument is to make fine débris; and its use is to com-



Figs. 37 and 38.—Lithotrites with flat blades.

* Only the slightest approximation to the form of the wedge in the opposing surface of the male blade is permissible. If it has an angle, say of 90 degrees, great danger is incurred; it may be driven through almost any stone, it is true, but the fragments will fly off right and left with prodigious force, even in fluid, and injure the coats of the bladder. An obtuse angle, of not less than 150 degrees at most, can be safely employed, and this is an unquestionable advantage at the first sitting, with a stone of medium size

plete the work commenced by the first. (Figs. 36 and 37.) The wider the blades are, the more liable they are, of course, to become impacted with débris in the bladder. A little opening at the angle of the female blade, as large as it can be made without materially weakening the instrument there, permits some of this to escape, this being the point at which impacted débris is most effective for mischief; while, as I show you, rapid backward and forward rotary movements of the wheel at the handle (the screw being *in* gear) will expel much of the débris at the sides. A collateral advantage of this flat-bladed instrument is that it will hold a good deal of fine débris without undue augmentation of its size, so that some can be safely withdrawn by the urethra.

Such instruments should be made of steel of the finest temper, cut from the solid block (not forged), so as to be completely trustworthy. The power and leverage of the screw in the handle should correspond with the strength of the blades, and therefore with the amount of work they have to do. One lithotrite of each kind, the narrower and the wider male blade, suffice for all cases in the adult which ought to be submitted to the operation of lithotrity. There is still a little point, well worthy to be named. If by any chance too much power is applied by the surgeon's hand in his endeavour to crush a hard or large stone, the only accident which ought to happen to a well-constructed lithotrite is the fracture of the male blade at its angle with the sliding shaft. That ought to be the weakest point in the instrument; if so, all that occurs is that a narrow bit of steel, three-quarters of an inch long, remains in the bladder. An expert lithotritist will remove that easily enough with a flat-bladed lithotrite having a wide male blade.

Flat-bladed non-fenestrated instruments, therefore, properly handled, will crush every stone that ought to be crushed, and what is beyond their reach should, as a rule, be reserved for lithotomy. For example, you have just seen me crush an oxalate-of-lime calculus, of a full inch diameter, in Ward 9—as successful a case as we have ever had. It was very hard, no doubt; but by a rapid turn of the screw, you saw how it gave way, and then the smaller fragments were dealt with in detail after. (1872.) Without great confidence in the quality of the instrument, I would not have attempted it; nor do I think the result would have been possible with French lithotrites of this kind, since they are less powerful for their magnitude than those which are made by the best makers here.

We will proceed to consider and illustrate the actual performance of the operation at our next lecture.

LECTURE XII.

THE DETAILS OF THE OPERATION OF LITHOTRITY.

We now come to the performance of the operation.

A patient is brought in, is placed on his back on a deal table, with a firm flat cushion, about three inches thick, beneath his pelvis; his shoulders flat on the table, and the head only supported on a small pillow.

I have already mentioned that there is a difference in the mode of introducing the lithotrite and the catheter. You know that in passing a catheter, we, in this country, stand on the left side of the patient; in France, the surgeon stands on the right side. In passing the silver catheter for a recumbent patient, you hold it somewhat horizontally, draw the penis gently over it, and give a gentle sweep, in this way, into the bladder.

In passing the lithotrite a different movement is required. You may stand on either side, but it is better to be on the right side, because that is the convenient side for operating, while it looks awkward and wastes time to go round the patient to operate after passing the lithotrite. Well, then, standing at his right side, and partially turning your left shoulder to his face, you let the lithotrite slowly and easily find its way until the shaft reaches nearly the vertical direction. Arrived at this point, you retain it in that position for a few seconds, allowing it to go on by its own weight, still so placed, in that vertical position, in order that it may slip under the pubic arch. This done, you gently depress

the handle, and it slides readily into the bladder. There is no more easy instrument to pass than the lithotrite with proper management.

You see I have thus introduced the lithotrite, and have to find the stone and seize it. In order to do this, and

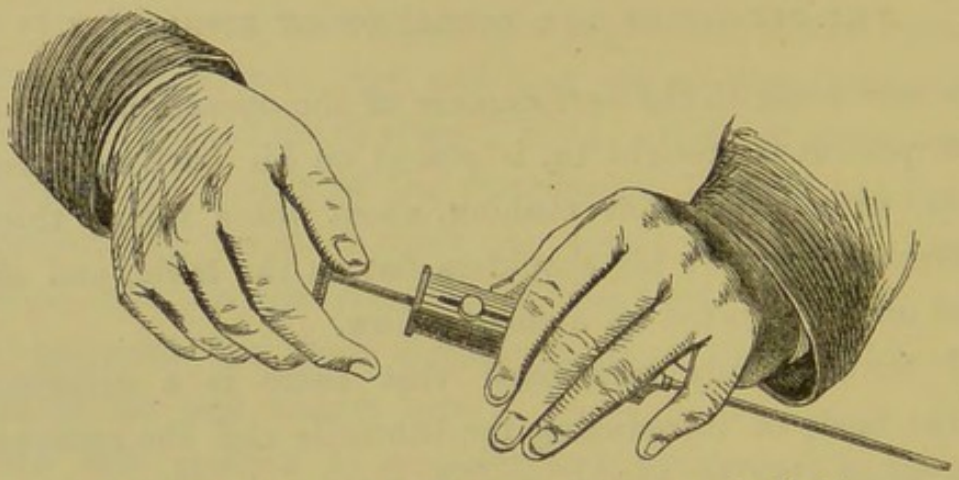


Fig. 39.—Manner of handling the lithotrite in the bladder when searching.

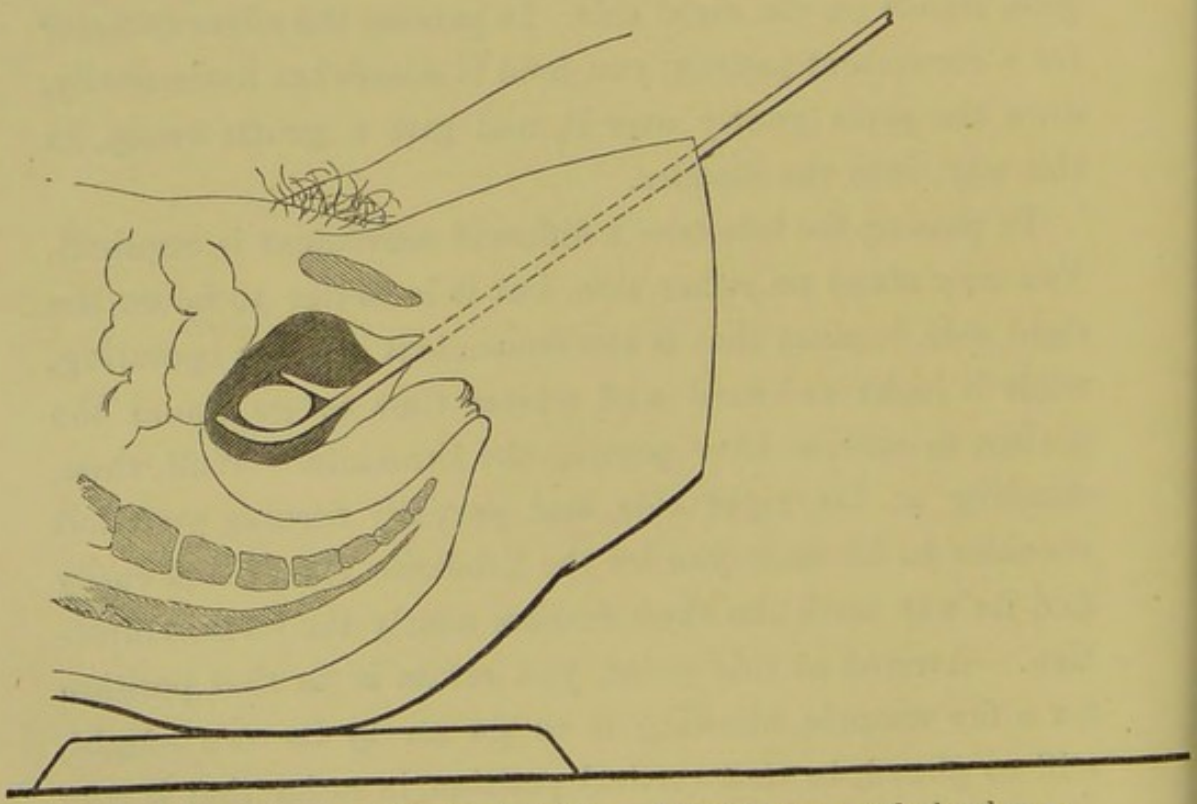


Fig. 40.—Ordinary position for lithotrity. Lithotrite open and closed on a stone: showing relations of parts.

holding the instrument thus (Fig. 39), I simply open the blades and close; the stone is between them. I touch the little button here, which changes the sliding movement into a screwing one, turn the handle and crush. I then disengage the button, again open and close, and now I have a large fragment between them, and, repeating the action, again crush. Fig. 40 shows the position of the

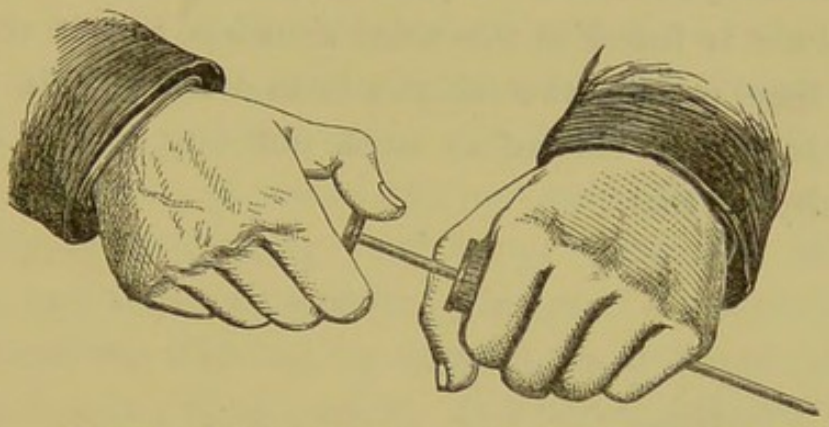


Fig. 41.—Holding the lithotrite firmly and crushing.

patient, and Fig. 41 the action of both hands, when holding firmly and crushing. A good quantity of débris results; less than a minute has been occupied, and I withdraw the lithotrite slowly and gently, and here is some of the débris, which you see is uric acid, between the blades. There is no trace of blood, and the patient has made no complaint of pain. If you ask him he will, I dare say, tell you it was not agreeable; but it is nothing to take chloroform for—nothing like extracting a tooth, for example. Now we will have another patient [who is placed on the table, the other walking away]; he has had two sittings before, and knows all about it. I introduce the instrument in the same way as before. I open and close the blades, and find nothing. Turning them to the right, I feel nothing; turning to the left, I feel nothing. I then depress the handle of the litho-

trite, and turn it halfway round, so that the blades are reversed and point downwards; I open and close, and seize a small fragment deep behind the prostate. (See Fig. 42.) Having turned the lithotrite round again, so that the blades point upwards, and having crushed the piece in that position, I again reverse them, and find one a little larger, and having crushed it I withdraw the instrument. This is always rather more painful for the patient than when the stone is found in the usual situation, and it occupies more time, perhaps two minutes instead of one. It is not usual to have a case of so much difficulty, if you call it difficulty, as that.

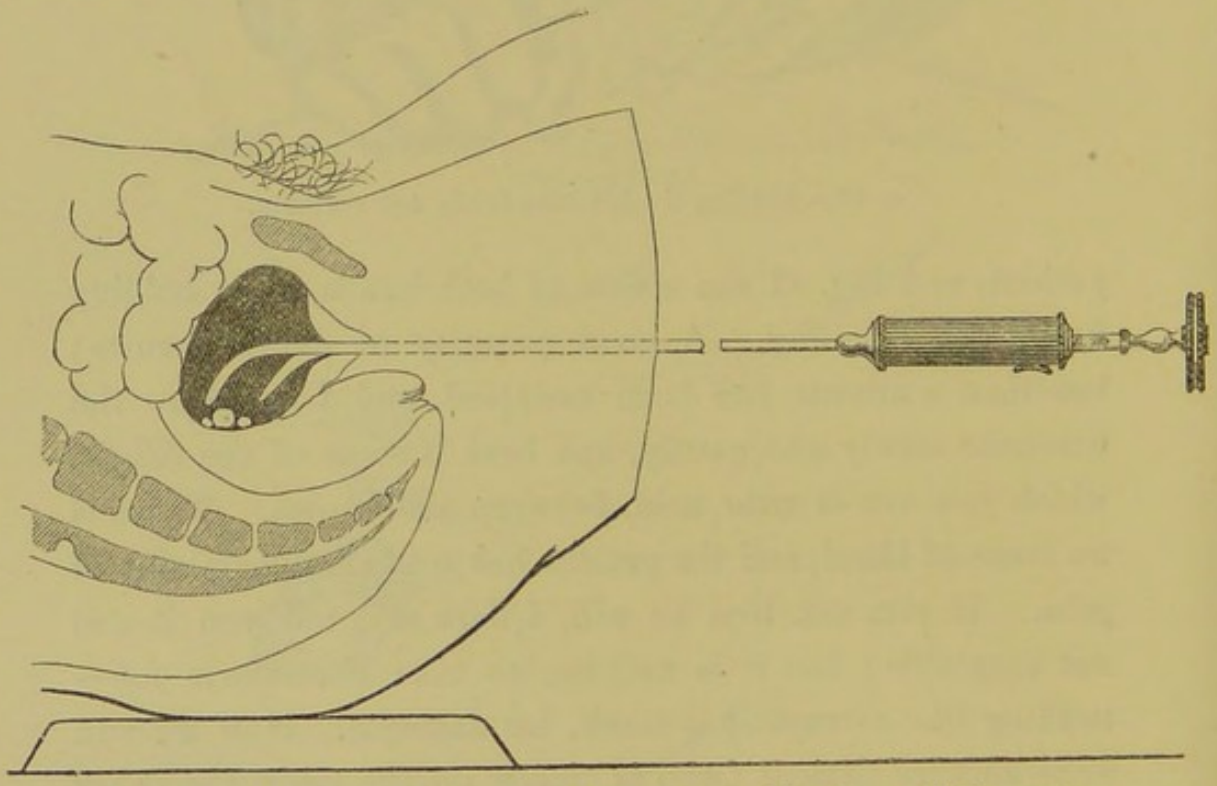


Fig. 42.—Lithotrite with reversed blades in searching for small fragments.

Now let me give you a hint about crushing, which is a very useful one. Whenever you have found a stone, or a good-sized fragment, and have crushed it, keep the lithotrite exactly in that place, and although you may have had

some trouble in finding it, you will now continue to find it several times running. It reminds me of fishing for perch; when you have caught one, you may catch, perhaps, twenty or thirty more out of the same hole, if you will but stop there, and not go fishing about among the shallows. It is the same in lithotrity. You will go on seizing and crushing if you contrive to keep the lithotrite precisely in the same place. In fact, there is what may be called a certain favourite "area" in every bladder in which to operate—a certain spot which is a favourite haunt, so to speak, for fragments of stone. If you find that out in each bladder you will always be able to crush; if you do not, you may often have some difficulty in discovering your stone. The area will, of course, vary somewhat with the position of the patient. If the patient was standing, for instance, the area would not be the same as in a lying posture. It is best to raise the pelvis two or three inches; then you get an area for operating which is not too close to the neck of the bladder. The neck of the bladder is a very sensitive part, and you should always avoid it, because in pulling out the male blade you may impinge against the neck of the bladder if you are not careful. One of your maxims in lithotrity should be never to pull out forcibly the male blade. You should pull it out carefully and delicately, so as to *feel* the neck; and it is a bad lithotrite, remember, if the male blade does not slide with perfect ease; so that you ought to perceive the slightest contact with the neck of the bladder when, in opening the jaws, the male blade is drawn towards it. The diagrams Fig. 40 and Fig. 42, with the lithotrite in the bladder, will show what I mean by the area for operating. If the patient is lying without a cushion, it will be nearer the neck of the bladder than if the pelvis is well raised. In the last case

you saw just now, the man had an enlarged prostate, and when the lithotrite was introduced the stone was not found, as you saw, until the lithotrite was reversed. It is more essential in the case of an enlarged prostate to put a high cushion under the pelvis, in order to throw back the fragments to the posterior part of the bladder, so that the area may be as far from the neck as possible.

You ask, perhaps, how often is it right to introduce the lithotrite at each sitting, how much débris should you withdraw on each occasion, and what interval of time should intervene between the sittings? The answers to these questions, which involve several considerations, may be given together. First, in relation to frequency of introducing the lithotrite at each sitting, this must partly depend on your own facility of hand. A may introduce a lithotrite three times, crushing each time, and removing some débris easily on each occasion, with less of resulting irritation to the patient than B, who only introduces the lithotrite once, but does not do it happily.

Secondly, one patient may bear three introductions better than another can bear a single one; that patient having larger or less sensitive passages than this has.

Thirdly, supposing that the case proceeds smoothly and well: that there is not much irritation of the bladder; that at most a little feverishness has occurred, perhaps not that, I generally resume the crushing on the third or fourth day, that is, an interval of two or three days may elapse between each sitting. But there are special circumstances which sometimes render it necessary in any case to hurry on the operation and also to empty the bladder as soon as possible. For example: the fragments of the last sitting, being sharp, have produced much pain and cystitis. Each day the

urine is becoming thicker with mucus, and the mucus acquires daily a more decided blood tint. In such a condition I operate at once and remove as much as I safely can, usually placing the patient under the influence of ether for the purpose. It is a natural but a grave mistake to wait, and to treat the cystitis by the usual remedies; these will be useless as long as the exciting cause remains. You should break up the large fragments, withdraw a considerable quantity of débris with care, and immediately afterwards you will find the urine much clearer and the patient improved. I lay much stress on the importance of this prompt and decided action. Probably in two or three days the urine is again thick, and again you should operate in the same way, by which time you have perhaps removed the whole of the irritating matter, or nearly so.

Fourthly, in the case of a patient who has no natural power to empty his bladder, and does so solely by catheter, and has consequently almost no power to pass the débris you have made, it is necessary to crush freely and to remove results. And you may do this fearlessly, always provided that you do it well, for the urethra in these circumstances is accustomed to instruments.

The case in which you must exercise the most caution, and not use instruments too much at first, is that of the rather young and fresh healthy-looking patient from the country, who has scarcely had a day's illness, has led an active life until lately, and never had an instrument in his urethra. This man will bear the operative proceedings necessary for lithotrity worse, as a rule, than any other patient, unless you begin very easily: excepting only the man who is thoroughly broken in health, and has either advanced chronic pyelitis, or renal disease.

As a rule, then, at first commence with one introduction of the lithotrite, crushing four or five times during a sojourn, say of two minutes, in the bladder, which I will allow you, although you know I do not occupy so much time myself; then withdraw a moderate quantity of débris in the blades—that is, as much as you find comes through the urethra easily. Give it time in withdrawing, so as not to scratch or tear the urethral mucous membrane at all. The external meatus is often small, and here the removal may be the most painful part of the whole operation. If so, just divide it with the little bistourie cachée.

I may here state, in reply to a question often put to me, that for the purpose of acquiring the practice necessary to qualify you to operate, there is no doubt some advantage in becoming familiar with the proper mode of handling a lithotrite by using it in the dead body. But you will find a great difference between the sensations communicated to your hand by the movements of the instrument and the stone, in the living and in the dead body. The sensations in the latter case are simply those of a stone lying in obedience to gravity at the bottom of a flaccid bag, which has no life of its own, nor any power of movement, and is subject simply to mechanical laws. In such a cavity the foreign body is uniformly found at one place, and cannot be missed. Totally different is the sensation of encountering a similar body in a living bladder. By no means does the stone appear always to obey the force of gravity, and to lie at what you believe to be the bottom of the viscus. Sometimes indeed it seems strangely otherwise. The bladder has movements of its own, which are doubtless aroused or called into activity by undue disturbance occasioned by instruments: and the result of these is strangely

at times to displace, as one must imagine, the calculus sought. This is one of the reasons why a stone is more readily and certainly seized, when the lithotrite has been very quietly and easily introduced, without the disturbing influence of a preliminary injection; without, so to speak, awakening the resentment, if I may use the term, and reflex contractions of the bladder which it occasions.

So much for the sittings. But it is of great importance to watch well the patient in the interval between the sittings. You heard me say in the theatre the other day, and I may shortly advert to it here, that you should not encourage the early passing of the fragments. They rest at the bottom of the bladder; and I usually keep the patient in bed, and pretty much on his back, for thirty-six hours or so afterwards; he should, at all events for that period of time, pass urine in that position, so that the sharp angular fragments are left at the bottom of the bladder, and are not forced into the urethra. This used to be, and still is, much neglected, and the consequence is, that if a man has an urgent want to pass water, he will get up and strain. The sharp fragments are driven into the neck of the bladder by the effort, and bleeding, pain, sometimes inflammation of the prostate or of the testicle follow. But by adopting the position named, the sharp fragments become water-worn, and the urethra, which has been irritated, and is perhaps a little swollen from the contact of the instrument, recovers itself, and the passage and fragments are better adapted to each other than before. I believe this is not taught anywhere but by myself; it may appear to be a very simple matter, but it is an important one. Never allow a man who has been subjected to lithotrity to micturate in the standing position between the

first and the second sitting, when the fragments are all large and sharp. When you have crushed two or three times, perhaps, he may get up and make water occasionally; but after each sitting for forty-eight hours, he should not pass water in the erect posture. I am more than ever convinced (1876) of the importance of absolute quietude and rest in the recumbent position in bed between the sittings, for the purpose of avoiding the local and constitutional troubles which must more or less be occasioned by the passing of fragments.

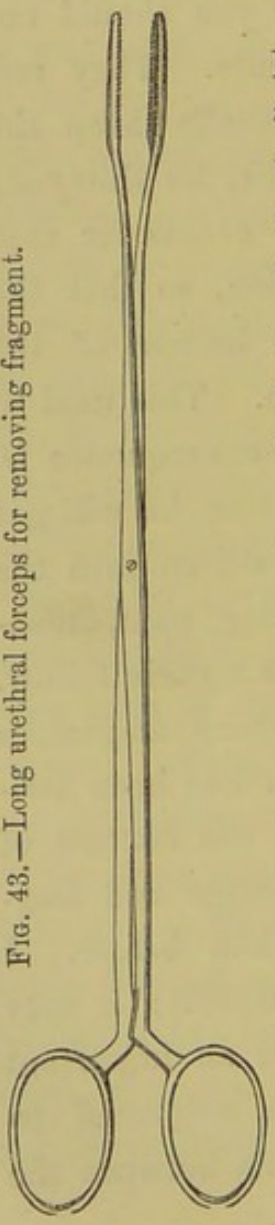


Fig. 43.—Long urethral forceps for removing fragment.

Immediately after a sitting, a hot linseed poultice may be placed above the pubes, and is a comfort to the patient. Pain and irritation are always much relieved by the repetition of this, or by very hot fomentation-flannels to the parts. The bowels should act the day before or on the morning of the sitting, so that the patient may not have to rise soon after and strain.

One troublesome circumstance that very rarely happens is the impaction of a fragment: and I think if you adopt the system of lithotrity which I have endeavoured to expound, you will very seldom meet with it. I have never had to open the urethra to remove a fragment in my life. I have occasionally had to remove one by the forceps, but that is very rare; and among all the complicated inventions for the purpose, I know nothing so good as the common long forceps which I show you here. (Fig. 43.) During the last three years,

certainly, I have not even had occasion to use them. The more thoroughly you crush the stone, the less use there will be for forceps. Here is a bottle containing what I will venture to call a well-broken stone. You see it is almost powder: a very different sort of thing from that in the other bottle, where you see a large number of large fragments that were probably passed with difficulty. It is an old saying, "a carpenter may be known by his chips:" certainly the skill of the lithotritist may to some extent be known by the débris he makes.

Now, suppose that we have—at four, five, or six sittings, according to the size of the stone—almost if not quite removed it, a very important duty remains. It has been objected to lithotrity—and there was some truth, perhaps, in the allegation formerly, but not now, if the operation is done well—that you are never quite certain of getting rid of the last fragment; that you may leave a portion to become the nucleus of a future stone. But there is very little more difficulty in removing the last fragment than any other, provided we pursue the proper course. Generally speaking, in four cases out of five, the last fragment passes as the others—that is, by the patient's natural efforts. But suppose that there is a small fragment just too large to pass—suppose you have reason to believe this from the continuance of the pain, &c.—you then take a lithotrite with short wide rounded blades, with which you can explore easily in the reversed position. With such a one you may thus search the whole floor of the bladder with perfect safety. And here the cylindrical handle is of great value.

It is quite easy to procure an audible note from a fragment no bigger than a split pea, by this means, as I have times without number demonstrated in the wards and else-

where, for the purpose of verifying the observation, by withdrawing the little bit entire after it has been struck. The handle of the lithotrite should be depressed, the beak turned downwards behind the prostate, and the forefinger of the left hand placed on the shaft an inch below the handle. Very slight and quick rotary movements, alternately right and left, should be made with the right fingers lightly holding the cylindrical handle, while the shaft turns on the end of the left index as on a pivot or fulcrum (see Fig. 44). With this form of handle and with no other that I know is this possible.

Now, supposing that you have made a careful exploration, and not finding a fragment, have a suspicion that there may be one still hidden which evaded your search, since some symptoms remain. What is to be done? You do

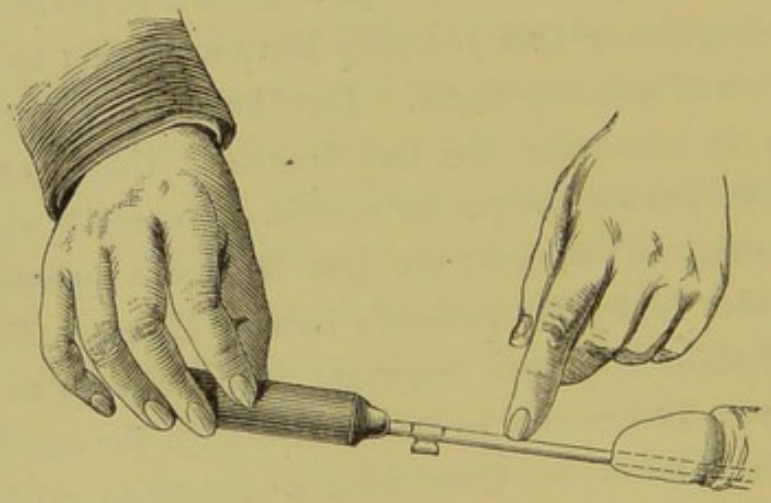


Fig. 44.—Mode of searching for the last fragment; the blades turned downwards.

not know whether these symptoms are due to a fragment of stone, or whether to the irritation arising from the long residence of the stone in the bladder, or to the instrumental efforts made to find it. This is what I advise: wait for a week and see whether the patient is better, and whether

that period of rest will not produce a marked improvement. If not, observe what is the effect of exercise. I do not know anything here in London better than a long omnibus drive. Tell him to expend a shilling in omnibuses—say between Mile End and Kensington—and if that does not find out the fragment in a man's bladder, I scarcely know what will. If he can stand that, especially if the roads are mending—if he is not worse for such a journey—rely upon it he has not any fragment left: the irritation is due to the state of the bladder, and not to a fragment. If the latter exists, the patient will to a certainty be the worse for his drive, and perhaps there may be some bleeding. I admit that it is difficult to tell sometimes, although very rarely, what the irritation is due to; and it is only by waiting and testing in some way that you can find out.

Then there is another very good mode of getting rid of the last fragment, and also of removing fragments at any time when they are not well expelled by the natural efforts, —I mean the apparatus of Mr. Clover, who, well known by his most experienced and highly successful administration of anæsthetic agents, has also given us a valuable addition to the instruments for lithotrity. It is a very fascinating apparatus, and looks so well that there may perhaps be some risk of its being used when not required (Fig. 45). There are certain conditions in which the fragments never come away well. For example: for the patient who has no power of making water, except by a catheter, the apparatus in question is sometimes the very thing. After crushing, a capacious catheter with a large aperture is introduced, and the fragments are sucked out by the action of this powerful india-rubber bottle which is attached to it. The process is rather trying, however, for the bladder; and it costs rather

more pain and time than an ordinary sitting for lithotrity. If, however, you find it necessary to execute a large crushing, and the patient is, as he then ought to be, unconscious, it is certainly desirable to remove the débris and small fragments, and relieve the patient of the pain and irritation they will produce in passing naturally; and this apparatus is then invaluable for the purpose.

But there is sometimes a very insidious cause for frequency of micturition and a little pain in the act, which occurs especially in elderly patients, which is very apt to be overlooked. I call your attention very particularly to this matter. Instead of hunting further for a fragment, find out whether the patient quite empties his bladder. Let him pass all the urine he can, introduce a soft *coudée* catheter, and mark how much is left behind. If you draw off only from two or three drachms of urine, a little cloudy perhaps, on each occasion, you will probably afford him relief, and clear up the case. It is quite remarkable how small a quantity of residual urine will give rise to pain and irritation, and if neglected will gradually increase and form a nidus for the deposit of a phosphatic stone, and so lead to bitter disappointment in the place of what might have been a successful result.

One other point I have to mention—namely, should you employ chloroform?

In general terms I may reply that a short sitting for a small stone ought not to be sufficiently painful to make chloroform necessary. If the pain were as severe as that produced by the extraction of a firmly-fixed molar, I should certainly advise an anæsthetic agent, but this is certainly very far from being the case. Moreover, there is a certain advantage, and especially to young operators, in the con-

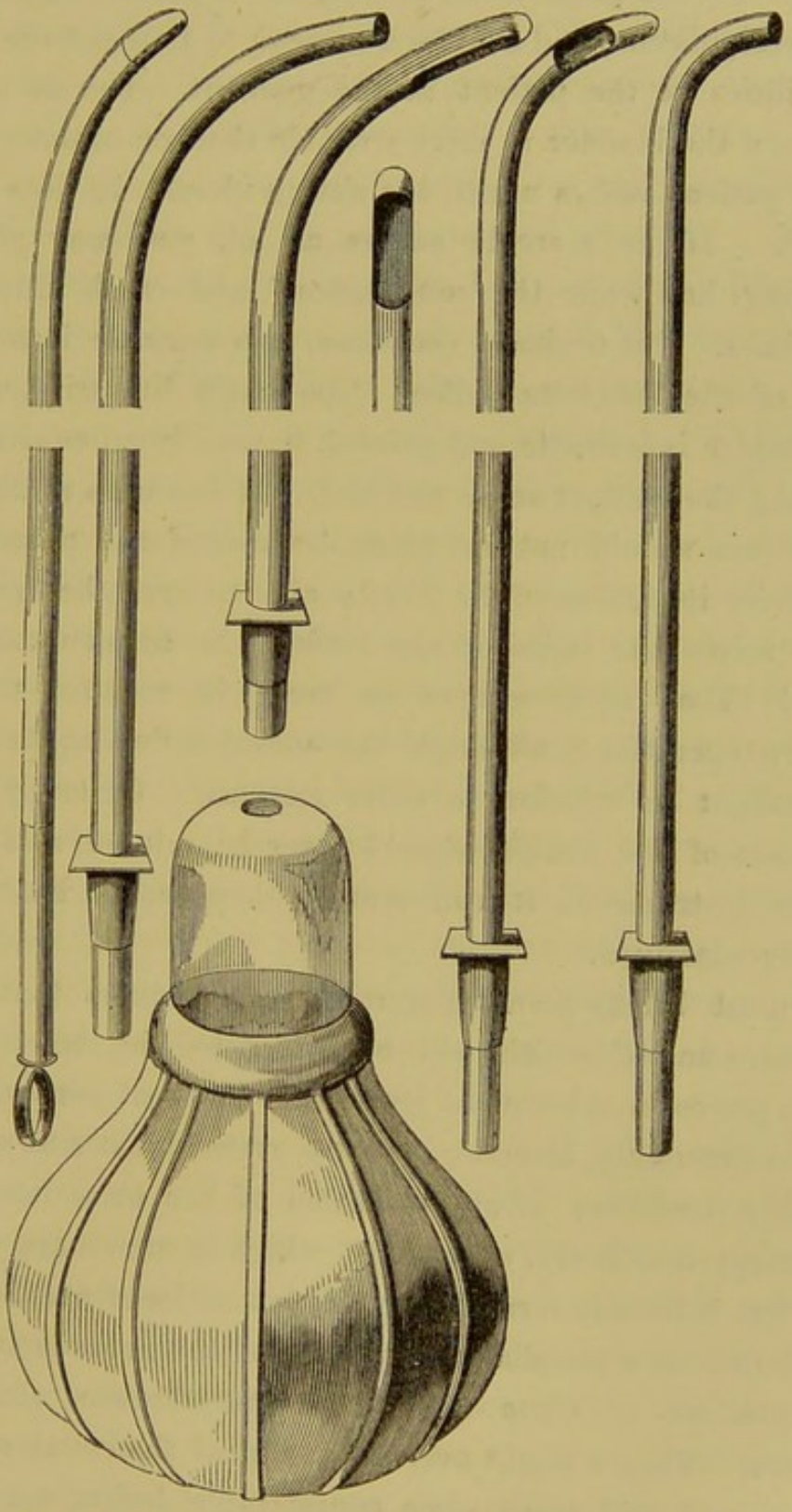


Fig. 45.—Mr. Clover's aspirator or apparatus for removing débris after lithotrity.

sciousness of the patient, and that is, that it ensures very delicate manipulation, and enables a surgeon to judge of the susceptibilities of the patient at the moment. For on some occasions the bladder is more irritable than on others; and if the patient suffers much, the sitting should be less prolonged. If he scarcely suffers at all, you may go on "making hay while the sun shines," and crush three or four times. On ordinary occasions, two separate introductions of the lithotrite suffice. Too much lithotrity, when the bladder is irritable and painful, is usually an equivalent to doing the patient some mischief. It has been said that chloroform should not be given, because if the patient is not under its influence, he will be able to warn the surgeon if he seizes the coats of the bladder in mistake for the stone! That is altogether an error in relation to the modern operation; although the consideration might have had weight in relation to older methods. Certainly now the coats of the bladder should never be injured, and with proper instruments it can scarcely happen, as has been already explained.

I must briefly mention certain contingencies that may happen, some of which will be considered in their appropriate places in subsequent lectures. The first contingency is fever; secondly, bleeding; thirdly, cystitis, just referred to; fourthly, orchitis; fifthly, retention of the urine (see next Lecture); and lastly, exhaustion, which is sometimes fatal.

What is usually termed "fever" is a series of phenomena, which denote a peculiar disturbance of the nervous system, the product of some mechanical interference with the urethra. Thus a slight over-dilatation of the canal with a bougie, and still more some considerable lesion, may produce the access; while, on the other hand, many injuries

happily occur without any fever following. So in lithotrity a febrile attack is by no means an unfrequent occurrence, although sometimes a patient goes through all his sittings without it. What happens is first a rigor, followed by dry heat and thirst, often accompanied by pains in the back, head, and limbs, and by prostration of strength. After an hour or two sweating takes place, and with it sensible relief; and the patient remains always more or less weakened by the attack. What I have now to say is, do not "meet these symptoms" by a too active treatment. I know no drugs which are of much service. When he is cold let him be well covered with blankets, and let hot water-bottles be applied liberally: some hot tea is better than brandy and water, the popular remedy in these circumstances, as in so many others where it is not merely harmless but prejudicial. As he becomes warm, remove the coverings cautiously, and let him have soda-water and seltzer, or toast and water freely, to quench the thirst which accompanies this stage; also effervescing citrates are agreeable and may be prescribed. The patient will have no relish for any solid food until the attack has passed off, and the pulse and temperature, which rapidly rise and which almost as rapidly fall, have nearly reached the accustomed standard again.

The phenomena so described are not to be regarded as "fever" at all, in the sense in which it is employed by the physician as denoting a specific malady. They simply indicate with greater or less vehemence that a struggle, to speak roughly, is taking place in the system against some poison which is in the process of being eliminated. The attendant has mainly to take care that the hygienic conditions are good, and that the patient's strength is restored by mild nourishing diet and other aids as far as possible.

Bleeding, as a result of the operation, is very rarely troublesome, and does not require much treatment. Cystitis gives a little trouble occasionally, and is to be treated in the ordinary way described in our course. Inflammation of the testicle requires you to desist for a time from operating. Chronic retention of urine is apt to occur very insidiously—not absolute, but partial retention. Always look out for it even between the sittings, if frequency of micturition increases, and the urine contains much muco-pus; and pass a soft flexible catheter with all the gentleness you are master of. If you find that the bladder does not empty itself by its own power, you must repeat the process once, twice, or more frequently, according to circumstances, in the twenty-four hours.

Sometimes a patient's strength has been miscalculated, or repeated attacks of fever have undermined it, and he succumbs without other known cause. Phlebitis occasionally appears; and with, or without it, deposits may occur in various parts of the body as the result of blood-poisoning. Such conditions are almost invariably fatal. Happily they are rare and exceptional circumstances, to the occurrence of which lithotrity, like other operations, is liable.

LECTURE XIII.

ON SOME IMPORTANT POINTS IN CONNECTION WITH LITHOTRITY.

THERE are two or three subjects in connection with lithotrity to which I particularly desire to call attention, since they are the result of increased experience in relation to that operation; and I wish to make them prominent because I consider them extremely important with regard to successful practice. I find that those who are unacquainted with the progress which lithotrity has made of late years, and who know it only as it was practised some fifteen or twenty years ago, reproduce the same old objections with which we were so familiar then, or speak of it with the same "faint praise" which was then so current. I do not mean to say that any striking novelties in the instruments or in the system of operating have been recently achieved. The mechanical procedure has probably long been too nearly perfect to permit us to expect results of that kind. But insensibly, as the result of experience and careful observation, modifications of practice have gradually taken place, which have increased the success and improved the after-results, I do not hesitate to say, at least very considerably. What these are I will endeavour briefly to illustrate.

1. The first principle I wish to inculcate in connection with the management of patients during lithotrity is, that it is desirable to treat any cystitis that may occur during the course of the sittings, especially if it is severe, by freely crushing the stone without delay. I have for some years

insisted on the importance of this practice in my teaching. I believe that in this country its value has long been to some extent recognised; but the more I see of the operation, the stronger is my conviction of the great importance of this practice, and the more ready I am to adopt it. Abroad, cystitis is more generally treated by baths, diluents, low diet, and medicine; and the next sitting is postponed until the patient may be, as it is said, in better condition for the instrument The surgeon fears the effect of introducing a lithotrite into the inflamed bladder, lest the disturbance should increase the inflammation—a result which it appears at first sight not unreasonable to expect. Now the precisely contrary effect is that which occurs. For example, I crush a uric-acid stone once; or it may be twice, with two or three days' interval between. In thirty-six or forty-eight hours after the sitting the pain and frequency of passing water become considerable, the urine is loaded with muco-purulent matter, and it assumes a full-red tint. Some slight febrile condition may or may not be apparent in the patient. Under these circumstances I place him under the influence of ether, crush freely all the large and sharp pieces, and wash out the débris with Mr. Clover's aspirator. Six hours after the urine is much clearer, the muco-pus has almost disappeared, and the patient's general condition is greatly improved. This will happen certainly in nine out of ten of the cases described. I have had the opportunity of demonstrating this to many of my foreign brethren, who are invariably struck with the result. The fact is that the cystitis in these cases is purely a traumatic one, that it is due to the injurious effects of the sharp, hard portions of stone which lie in continuous and close contact with the mucous lining of the bladder, the result of which

is that incipient ulcerative action takes place. Crush and remove these, and that instant repair commences, inflammation is rapidly diminished, and the patient is no longer in danger, but is greatly relieved. Even simply changing the situation of the large pieces in the bladder is followed for a few hours by manifest improvement, showing in what manner their presence is injurious. If some large pieces still remain after the fresh crushing, the former symptoms of cystitis reappear in two or three days, and may be again relieved by another sitting, this time probably altogether or nearly so, as a succeeding crushing will, no doubt, dispose of the principal part of the stone, and leave at all events no considerable fragments. This practice has, moreover, an important relation to the after condition of the patient, as we shall see by-and-by.

On the other hand, let us suppose a case of lithotrity in which all goes well with the patient, and no fever, no cystitis, &c., happen; still the interval between the sittings should be short, not more than two or three days. You take advantage of the tranquil state of affairs to proceed steadily and carefully, not tempting fortune, but without a day's unnecessary delay. But if cystitis appears you are, as already advised, still less to lose time; and so in either event the operation of lithotrity is soon completed. I rarely exceed now fourteen or sixteen days as the full term which includes all the sittings. Often eight, ten, or twelve suffice.

This practice is no doubt facilitated by the recent improvements in anæsthesia. I have never, as you know, been very well disposed towards the employment of chloroform for any purpose when it could be dispensed with, but I have of late, mainly owing to the improved methods

of producing anæsthesia, availed myself of it much more than formerly. I refer to the system which Mr. Clover always pursues, of administering first nitrous oxide for about thirty seconds, and then following with ether vapour. The rapidity and greater safety of the process as compared with that by chloroform, together with the freedom from subsequent sickness usually attained (the latter an advantage of no slight value), have influenced my practice, and I now make anæsthesia the rule and not the exception. Consequently, also, I avail myself of the opportunity to do a larger amount of crushing than I did when the patient was conscious—a course which, while it is permissible or advantageous in practised hands, is not to be necessarily recommended to the young operator. To him, now as ever, I repeat that success can only be obtained by the greatest caution and prudence. He must not be tempted to introduce the lithotrite so frequently as he sees that I sometimes permit myself (especially in cases of cystitis requiring immediate relief) to do. I still advise you to be content with two, at the most three, introductions of the instrument at a sitting, and thus much only if you are able to make them with tolerable facility.

2. The second principle which is to guide your practice in lithotrity is the importance of detecting at all stages of the procedure any inability on the part of the patient to empty his bladder by his own efforts. Let me say at once that a very little negligence in relation to this matter is the chief cause, beyond all question, of the subsequent troubles which occasionally become evident at an early period after the stone has been removed, and which have constituted, in a certain proportion of cases in elderly men, sources of discredit to the crushing operation. In the cases referred to,

the calculus is often removed easily enough, little or no trouble occurs during the procedure; but it becomes evident afterwards that the frequency of passing water is not remedied, and small pains and discomforts continue. The patient leaves his surgeon, and reappears in a few months, or even weeks, with clouded, perhaps alkaline, urine, depositing triple phosphates, and with other symptoms more marked than when he left. My friend, Mr. Cadge, who has been reporting of late his valuable experience in relation to this matter, regards these phenomena as not unfrequently due to the escape of a small fragment into a sacculus in the bladder, where it becomes the source of irritation, phosphatic deposit, and occasions the formation of a fresh vesical calculus, with ceaseless discomfort and repetitions of crushing for the patient. I agree with him that this sometimes happens, having had, like him, ocular and other demonstrations of the fact; but I have no hesitation in saying that in the large majority of cases this is not the cause, and that, happily, it is due to another cause, one that is in a very great degree preventable. These after-troubles will appear in patients who have had very little uneasiness antecedent to the operation. Their stones have been small, and their bladders have been in excellent condition; no ground, therefore, can exist for supposing such a patient to be the subject of sacculus in the bladder. Every presumption, indeed, is opposed to that view, because sacculi, as a rule, do not form without the existence of an obstruction to the outflow of urine, which has been in operation for some long period of time.

Now the particular fact which I am going to state is one I was scarcely aware of five years ago. I have long been aware of the necessity of watching carefully for inability to

empty the bladder during lithotrity, have long also spoken of the insidious manner in which that inability commences, and pointed out that it must be dealt with by the habitual use of the catheter. But I have only learned during the last few years how extremely small a quantity of urine habitually left behind in an elderly patient's bladder after each act of micturition, provided that he is undergoing, or has just undergone, lithotrity, suffices to lead to phosphatic deposit and to chronic cystitis. You will scarcely believe me that one drachm, or one drachm and a half, only of this residual urine is enough in most such cases to produce the condition so feared and detested by every lithotritist;* and I now add, that if the condition is detected early, and this small quantity is promptly and frequently removed by the patient himself, which he can easily do with a soft *coudée* catheter, almost certainly the dreaded symptoms will not appear.

I have been surprised at the result; not less surprised than I have been at the fact that the patient, who towards the close of lithotrity, or afterwards, is making urine every hour or so, and who, on passing his catheter, finds only one or two drachms behind, often obtains at once an interval of three hours or more. Such an one should pass his instrument at least three times a day until he regains the power to empty the bladder completely by his own efforts. I confess that formerly so small a quantity of urine did not seem to me worth the trouble of removing; as I assumed, on theoretical grounds of course, that it could not be of any

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* It is not to be supposed that I regard so small a quantity as equally important in a patient whose urine is clear, who is not the subject of any chronic cystitis, and who is not undergoing lithotrity. In an elderly man the presence of a drachm or two of "residual" urine suggests that at some future time he may require the catheter, but certainly it would not yet be necessary.

importance. I now know that the practice of removing it constitutes for many cases the difference between a permanent success and an ineffectual result and painful future.

Now then, how does the plan of crushing for cystitis, referred to under the preceding head, affect, as I said it would, also this important question which we are now discussing? Thus: it is precisely in those cases where the treatment has been prolonged, or where cystitis, either acute or chronic, has been allowed to go on unchecked, that the inability to empty the bladder is most likely to occur. Again, this inability, once commenced, very rapidly becomes the established order of things in elderly people, unless it is checked at the outset. Once let the bladder be accustomed to the smallest degree of accumulation of urine, and the power to empty itself entirely is, after a certain age, often permanently lost. The best chance of preventing this, and the phosphatic deposit which results, is, in the first instance, to avoid or cut short cystitis during the treatment by lithotrity in the manner described; and, secondly, to teach the patient to empty his bladder himself towards the close of the operative proceedings or immediately after, if the smallest failure to empty it is detected. Once for all, let me say, I cannot exaggerate the importance of these recommendations.

Now, when this tendency to produce phosphatic deposit has been unfortunately established, we are often able to benefit the patient by teaching him to wash out the bladder, by means of an ordinary catheter and bottle, with weak acetate of lead, nitric acid, &c. But of late I have adopted another method, with manifest advantage. I advise the patient (who may or may not be habitually using the catheter to empty his bladder) to use every second or third day the following apparatus:—

(1) A black flexible catheter, No. 11 or No. 12 in size, made thin, and with polished interior, so as to facilitate the passage of débris through it (a great improvement on the ordinary French flexible catheters, which are thick and have often rough interiors), and having a large oval eye on the upper surface of its extremity, which is slightly turned upwards (*coudée*). (See Fig. 46, A.)

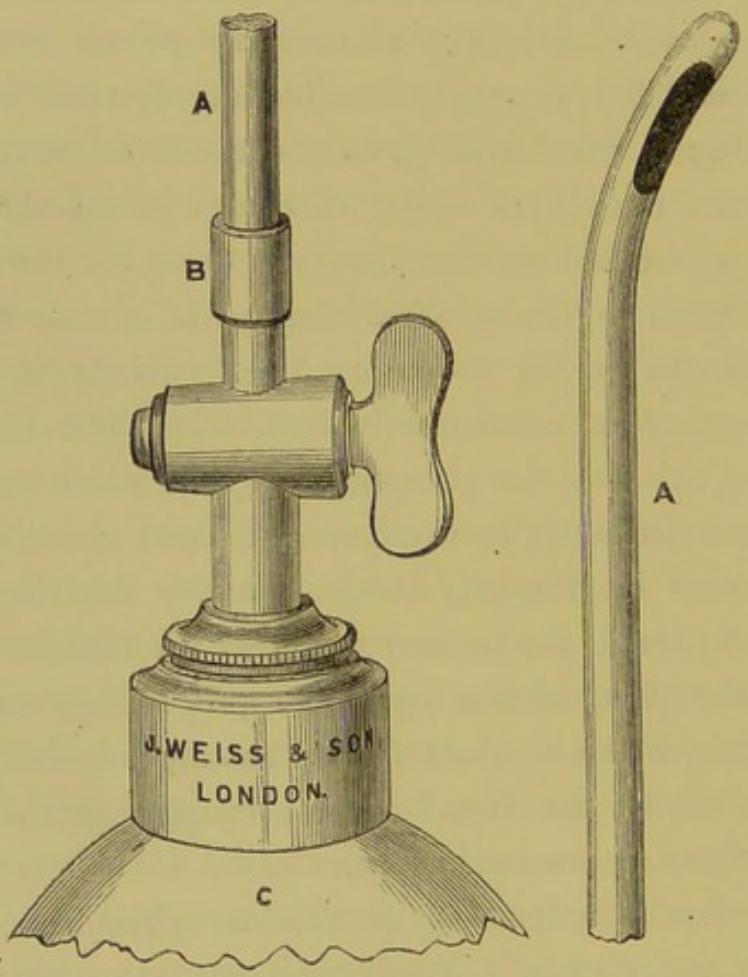

FIG. 46.—A, the catheter described. The actual measure of the drawing is No. 9. It will be understood that the size indicated is usually No. 12. B, the nozzle of the bottle, which fits *over* the end of the catheter, A.

(2) An eight-ounce india-rubber bottle, with a brass nozzle (B) which fits *over* the outer end of the catheter, and not into it. The manifest result of this mode of attachment

is, that a powerful uninterrupted current can enter and issue from the bladder; indeed it is scarcely possible that débris should remain in the organ under the influence of the action of this apparatus, as any one can perceive on using it. It may also be used as an aspirator, with a backward and forward current, if desired. (See Fig. 46, c.) For the patient's own use it is even more easy than the ordinary four-ounce bottle, which I have long been in the habit of desiring such to apply, since the size and freedom of the channel—not narrowed at the point of contact between bottle and catheter—permit the fluid to be propelled with very slight pressure.

There is still one admirable remedy for that low chronic cystitis which is associated with the production of phosphatic calculus in the bladder—viz., the injection, every day or every other day, for a short time only, of a very weak solution of nitrate of silver. About half a grain to four or six ounces of distilled water is amply strong enough; and one or two injections sometimes suffice, in these circumstances, to produce a very notable diminution of the muco-purulent secretion.

In my next lecture I shall take the subject of lithotomy, and give you a general sketch of the different modes which have been practised, and which are being used at the present day.

LECTURE XIV.

ON LITHOTOMY.

GENTLEMEN,—It was understood, as the result of our discussion in the first lecture on Stone in the Bladder, that all cases below the age of puberty, with very few exceptions, should be cut; those only in which the stone is quite small being reserved for lithotrity. Then there were certain adult cases, where the stone is large, or other difficulties exist, in which the operation of cutting must be performed. Hence we have next to study the operation of lithotomy, and this advantageously follows the consideration of lithotrity.

The proceeding of "cutting for the stone" has always been a subject of extreme interest; indeed, you will find no operation that has exercised a greater fascination for the veteran operator, while there is none which more excites the ambition of young surgeons. There is none respecting which an old student comes to his teacher here with so much just pride and happy sense of newly acquired power, as when he tells him, "I have just cut successfully my first stone case down in the country." On the other hand, the true surgeon who loves his art, is always at home when the theme of discussion embraces the history and practice of lithotomy, and I verily believe that some acquaintance with the former is one of the best ways of commencing a study of the latter. I will therefore give you a sketch, although it must be very slight and meagre, since the literature

belonging to this famous subject would of itself stock a library of the different stages by which lithotomy has arrived through earlier periods at its present condition.

The first description we possess of the operation of lithotomy appeared in the Augustan era, at which time it had been performed some hundreds of years, among the Greeks and Romans. I shall speak, therefore, first of lithotomy under the Classic period, which operation continued, as far as we know, unchanged throughout the Middle Ages. Secondly, of improved methods which arose with the revival of letters; and lastly, of the operations adopted during the last and present centuries, marked as this period is by disregard of ancient authority as the sole and sufficient guide in all matters which are determinable by experiment and observation. I dare say there was an earlier period still, and if some enterprising Lyell in surgery would make the inquiry, he might find traces of a pre-historic period; because wherever there are human remains, calculi must exist. I do not know that uric-acid stones would endure long. We know that the excreta of fishes are preserved for thousands and thousands of years, and I doubt not that some of these human excreta might be found also, and that oxalate-of-lime calculi, at least, must exist, among other human remains. As so many observers are seeking the early records of the human race, I throw out the hint; and certainly, if I were so searching, I should not forget to seek, among other things, the matters in question. Whether we shall thus ever find any instruments which could be identified as the means by which those stones were removed is doubtful.

We will, however, not occupy our time with speculation, but will be satisfied to begin with such facts as we can

find, say about 2300 years ago. The first allusion on record is in the works of Hippocrates [born B.C. 460], who obliged his pupils to take an oath that they would never practice lithotomy, but leave the operation to those who were in the habit of performing it; so that at this early period the proceeding was a completely established practice. For it appears that the practice of cutting for the stone was an occupation by itself, not a very exalted one, at any rate in the estimation of physicians, and was in the hands only of certain itinerant performers. After this, Celsus, who probably flourished about the commencement of the Christian era, described the operation as it was practised by these men. In his seventh book he gives the details, and termed it "cutting on the gripe." The method was simple, and so were the instruments, on which account they were long afterwards termed the "apparatus minor," to distinguish them from the "apparatus major," which came into vogue in the second period. The operator commenced by placing his patient, usually a boy, upon the knees of a man who was seated. If it was an adult patient (but such were rarely cut), two men sat side by side (their legs forming the operating table), so that their arms might clasp the patient and control his struggles. The operator used no staff whatever, but inserted two or three fingers into the rectum, and endeavoured so to feel the stone, which he could only do if it was large. If he succeeded in this, he fixed it firmly, or "griped" it with the ends of his fingers—hence the term "cutting on the gripe;" and pressing it down towards the perineum, he made a semi-lunar cut with a broad scalpel until he reached it. Then, if unable to press it out with his fingers, he drew it out

with a hook. Now this rough-and-ready mode prevailed until about the sixteenth century; indeed, up to the seventeenth century it was largely practised in Europe. Even in the latter part of the seventeenth century, when Frère Jacques appeared, the ancient mode of cutting on the gripe was chiefly practised.

We now come to the second, or period of the Renaissance, when at least three different operations appeared. Appropriately enough, too, a brother of one of those monastic orders which had cherished and exercised most of the arts hitherto, figures now as the most famous operator.

First, we will consider the "Marian method" or "apparatus major"—a median operation, originated by Johannes de Romanis, but receiving its name from his pupil, Marianus Sanctus, who published the first account of it A.D. 1524. It is called the "apparatus major" because, while "cutting on the gripe" required only a knife and a hook, this small table would be scarcely large enough for the instruments employed for the Marian operation. They are not here, but you may see them at the College of Surgeons. By this method a vertical incision was made by the side of the raphé, and the urethra was opened on a staff at about the membranous portion. A dilator was then thrust into the wound, and upon that another (male and female dilators they were called), and the canal and the neck of the bladder were torn asunder with great rudeness. Its only resemblance to the present median operation is, that the incision is in nearly the same place. But anything more barbarous than the practice you can hardly conceive. The stones were larger then than they are now, and the incision was small; and in order to dilate and extract, various machines

were employed, the result of much mechanical ingenuity, and forming the origin of many of the surgical instruments now in use. It was a very unsuccessful operation, and was gradually lost sight of in consequence. Still it held its ground in places, and for certain cases, as late as to a part of the eighteenth century.

Next I shall name the high or supra-pubic operation, which appeared about the end of the sixteenth century, and this has maintained a position of greater or less importance to the present day. More than this I shall not say on the present occasion, as we concern ourselves mainly with perineal lithotomy.

I now come to a new proceeding, which rudely shadowed forth our present lateral operation. It was performed on a staff, which was not grooved as now, but yet it roughly served as a guide into the bladder. The operator commenced by thrusting a long knife into the ischio-rectal fossa, and so on into the bladder behind the prostate, and, cutting forward, he made the entire wound at one incision. Invented, as it was believed, by Pierre Franco (about the middle of the sixteenth century), its apostle and promulgator was the celebrated Frère Jacques, who flourished in the latter part of the seventeenth century, and is said to have cut 5000 times for stone. Probably he did not cut above 500; but a cipher more or less was a trifle for the inexact and credulous mind of the period. Like others of his craft he was an itinerant operator, not at first embarrassed with too much knowledge of anatomy, although later in life he studied it seriously in Paris; and then France was mainly the scene of his labours. After him, Rau, in Holland, pursued the same practice.

It will be interesting to you to know what was going on

meantime in our own country. Most patients, up to the end of the seventeenth century, who were cut, submitted either to the old operation "on the gripe," or to the "Marian." In the beginning of the eighteenth century the high operation was first practised here. At this period there came to London a Leicestershire lad, subsequently known as Cheselden, the celebrated surgeon of St. Thomas's Hospital; and he at first did the high operation. But he had heard of the recent successes of Frère Jacques' method, and tried it, modifying it as his experience suggested, until he performed almost exactly what we now call the lateral operation, and with the best results. His success was so great, that in 1729, when he had performed the operation several years, and cut about one hundred patients, Morand, the French surgeon, was sent from Paris to see him operate, and report upon the subject. He remained here for some time, Cheselden getting together a number of cases and operating on them before him. Morand then returned and reported to the French Academy so favourably on the subject, that Cheselden's operation became generally accepted as the best. In it the deep incision was made, if possible, within the limits of the prostate gland, and involving its left side only, by means of a scalpel of moderate size, cutting its way inwards along the groove of the staff. A few years afterwards Cheselden retired, having cut 213 patients of all ages, with ten deaths. Those are the first figures that we can depend upon in connection with the operation, for, as I have told you before, the figures of the mediæval period are monstrous and incredible; for not only was the famous monk said to have cut 5000, but to have lost "scarcely any." Cheselden, who improved the mode, and cut at all ages, including very many children (who are, as you know,

extremely safe to cut), had barely five per cent. of deaths, which was a most successful result, and no doubt the best that had been yet made.*

At this point the operation continued for some years until the end of the century, and then "the gorget" came into fashion. A few years ago a patient was rarely cut without it; now, I suppose, few of you know what it is. Originally, one of the directors used in the "apparatus major," its edges were sharpened for the purpose of making

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* The exact results were as follows:—Of the 213 cases, no less than 167 were under twenty years of age. Only 14 patients were upwards of fifty years of age, and six of these died. Cheselden's Anat., 5th edit. 1740. Pp. 322-3.

There is also a famous series of stone operations which is very frequently referred to as perhaps the most successful on record, performed by Martineau, of Norwich, and reported in the Medical and Chirurgical Transactions, vol. xi. p. 402, 1821. The number of patients was 84; amongst whom there were only 2 deaths. The operation was, of course, in all, lithotomy. They occurred between 1804 and 1820 inclusive—a period of seventeen years.

In arriving at the exact results, it appears that here also a very large proportion were children, while 6 were females; deducting these latter, there remain 78 male cases, of which not less than 34 were under fifteen years of age, leaving only 44 adults. Of these 44 adults, no more than 12 were upwards of sixty years of age; only 24 were fifty years old and upwards, giving for the latter a mean age of sixty-two and a half years; the 2 deaths occurred among them.

No error is more common than that of comparing lists of cases without noting this most important element of age. Death after lithotomy in children is notoriously infrequent; indeed, it is a result scarcely to be expected, unless under circumstances of some rarity. During middle life, also, lithotomy is a very successful operation; but at the age of sixty and upwards it is one of considerable risk. Hence, unless an exact statement respecting the patient's age is afforded, no inference can be drawn from any number of cases of which the results are reported. A mere statement of the number of patients operated on, with the proportion of recoveries and deaths, is absolutely valueless, and is often misleading.

I wish now to compare with the above a series of my own, and shall take for that purpose simply my last 100 cases, as a round number easily dealt with, of operation in *the adult*. I have not included in my list any patient below twenty-two years of age, at which there happens to be one. There are, indeed, only four patients, including that one, below fifty years of age, while in Martineau's series of 84 there are not less than 54 below that age. Of my 100 cases, 65 are above sixty years of age (only 12 are above that age in Martineau's list), and

the deep incision through the prostate. This was the idea of Sir Cæsar Hawkins, whose name was affixed to it; but subsequently almost every surgeon had his own gorget, making it wider or narrower, or altering it in some fashion or another. A great deal of mystery has been made of this instrument, but it is simply a wide knife with a beak at the end, which is kept in the groove of the staff. In using the ordinary knife, if you require a deep incision, the blade must leave the staff a little. The object of the gorget is to make an incision sufficiently deep without leaving the staff. Here is one which formerly belonged to Scarpa, the celebrated anatomist, and here are others which, having been used

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the mean age of the entire 100 cases is not less than sixty-three and a half years (the mean of Martineau's entire adult series is under forty-seven years); consequently the age ranges far higher in my series than in his.

My present 100 cases commenced shortly before Christmas, 1872, and includes every one operated on by myself up to March, 1875, it consequently represents the entire work of two years and a quarter.

Ninety-six were adult males, 4 were adult females.

Of the 96 males, 87 were operated on by lithotrity and 9 by lateral lithotomy.

The mean age of the 87 operated on by lithotrity is sixty-three and a half years, the oldest being eighty-three, the youngest 22, but only 4 were below fifty years.

The mean age of the 9 operated on by lithotomy was sixty-three and a half years also, their respective ages being thirty-six, fifty-nine, fifty-nine, sixty-one, sixty-three, sixty-eight, seventy, seventy-five, and seventy-nine.

Among the 87 operated on by lithotrity were 4 deaths, the ages were sixty-one, sixty-five, sixty-six, and eighty-one.

Among the 9 operated on by lithotomy were 2 deaths—viz., at sixty-one and sixty-three.

Thus it will be seen that there was a total of 6 deaths in 96 patients, with a mean age of sixty-three and a half by the two operations.

While alluding to what has been termed a run of successful cases in practice, I may observe that in this 100 of mine there was one more remarkable than I have ever before witnessed or heard of. I had a succession of 51 elderly adult cases without a single death. They occurred between July, 1873, and June, 1874. These 51 cases (7 more than Martineau's entire adult series of all ages) had a mean age of sixty-four years.

I present this brief *résumé* as a fair example of what careful selection of the two operations is now capable of accomplishing for calculous patients.

[The above was published in *The Lancet*, April, 1875.]

by many celebrated operators, have fallen into my hands, and they are leading types of the instrument.

In France at this time the lithotome caché of Frère Come was much used, and with the same object in view, viz., of attaining certainty and precision in the extent of the incision through the prostate. The practical difference between it and the gorget is, that in the latter the division of tissues is made by pushing a sharp blade of known width through them : and that in the former a sharp blade is opened to a known extent at the farthest limit of the parts to be cut, and is drawn outwards through them.

In 1816, Dupuytren, of Paris, not being content with the lateral, introduced his bilateral operation. His object was to make the deep incision by a cut on each side of the prostate, instead of one large one on one side only. And he, with the same view of limiting accurately the extent of the wound, designed a special instrument for the purpose. This, the "two-bladed lithotome," is also a member of the ancient surgical armamentarium, made more elegant and manageable by modern skill. Here also, instead of making the internal incision by pushing a cutting blade *inwards*, as with the knife or gorget, you carry this instrument [showing it] into the bladder along the staff, there open its two concealed blades, and drawing it towards you, cut your way *outwards*. You can arrange the blades so as to have the incision as wide or as narrow as you please.

In 1825 or 1830, the "median operation," often loosely spoken of as a revived Marian operation, came into some note in this country, and with it Mr. Allarton's name is chiefly associated. In the meantime Civiale, in Paris, combined the median and bilateral operations, and you have seen me frequently perform both of them here. Then Nélaton

has recently performed the pre-rectal operation, which is, after all, only a carefully dissected bilateral operation, so as to avoid any incision into the bulb of the urethra.

I now come to the mode of performing the lateral and the medio-bilateral operations, and will give a few general hints which will apply equally to either. As I have said before, when we have to do with many details, let us try to revert to first principles, and define clearly the object we aim at.

I told you that the object of lithotrity is to remove the stone without injury to the patient, either from the stone or the instrument. In lithotomy you must have a wound, and the object is to make it in such parts as shall least endanger the blood-vessels, the rectum, or the neck of the bladder, and to remove the stone through the lower outlet of the pelvis with as little mischief as possible to any of those parts. When that problem is best solved, we shall have the best form of lithotomy. It is open to discussion whether we have yet found out the best way, although we have been 2500 years—to say nothing of the pre-historic period——in coming to our present position.

Now, in order to aid you to solve the problem for yourselves, I have placed before you a diagram drawn accurately from the preparation, showing the bones and ligaments of the pelvis, in the position for lithotomy. (Fig. 47.) The lower outlet is opposite to us; it is in the patient filled by soft parts, and it is the opening into which you have to cut, and through which you must remove the stone, and in all that you do, you must be limited by its boundaries of bone. I like to have that in my mind's eye when the patient is tied up and I take my seat to operate. Here also are diagrams, showing two stages of the dissection of the perineum.

(Fig. 48.) But I take it for granted that you know your anatomy too well to require any detailed account here of the important parts involved in the operation. I shall simply name those which concern us. First, there is the pudic artery, safely sheltered under the pubic ramus; but it gives a branch to the bulb, a vessel to be avoided at the upper part of the space. Then in the same part is the bulb of the urethra, which is not to be thought too lightly of; indeed,

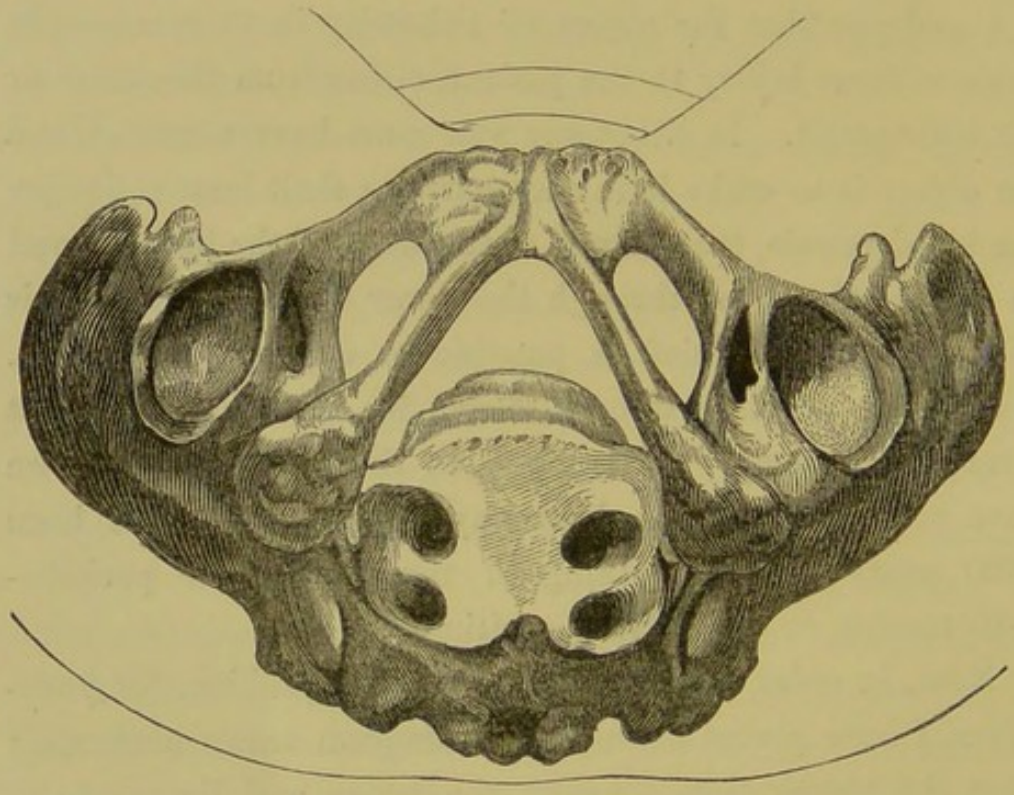

Fig. 47.—Bones and ligaments of the pelvis in the position for lithotomy.

it is the source of some of the chief dangers; it is a vascular expansion from the vessel named, and cutting into it deeply is as bad as cutting into the vessel itself, if not worse. Next, there is the rectum in the middle and lower part, which it is also important to avoid. The other diagram shows the position of the prostate, which must be divided in the deep incision.

I will now very briefly touch on the principal steps of the operation. The patient's bowels are to be thoroughly emptied by an enema a few hours before. Do not trouble yourself about the quantity of urine in the bladder. Some think it very important that it should be full. Cheselden, on the other hand, preferred it to be empty, saying that in this condition the stone was easily found close to the neck

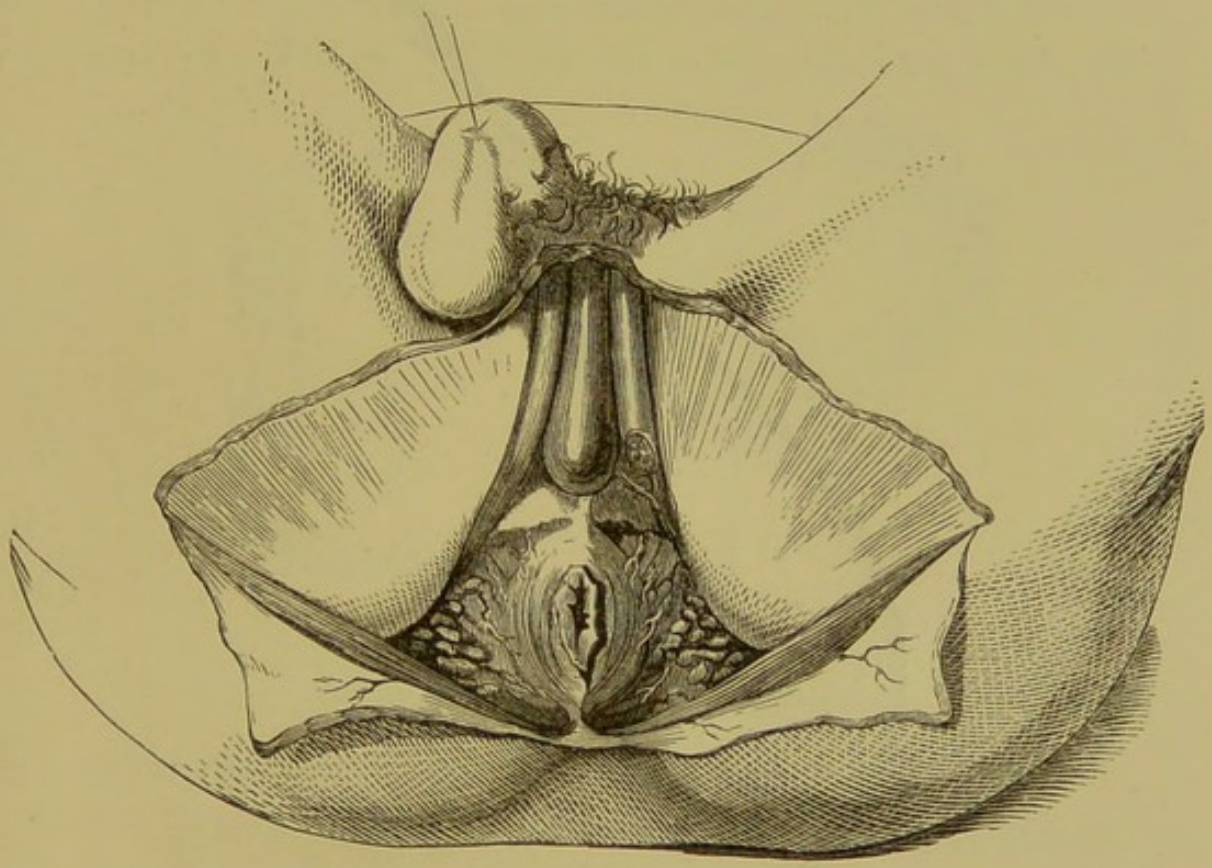

Fig. 48.—Dissection, showing the bulb.

of the bladder. I have seen great pains taken to inject the bladder before operating: but the unconscious patient has usually succeeded in emptying it, in spite of tying the penis, and such-like precautions.

The first thing the operator does is to pass a full-sized staff with a deep groove (Fig. 49), into the bladder, and with

it carefully to strike the stone. Never think of cutting a man if you are not fully satisfied that the staff is in contact with it. Frightful blunders have been made through indifference to this rule. Suppose, for example, the staff is in a false passage, and is not in the bladder at all; one shud-

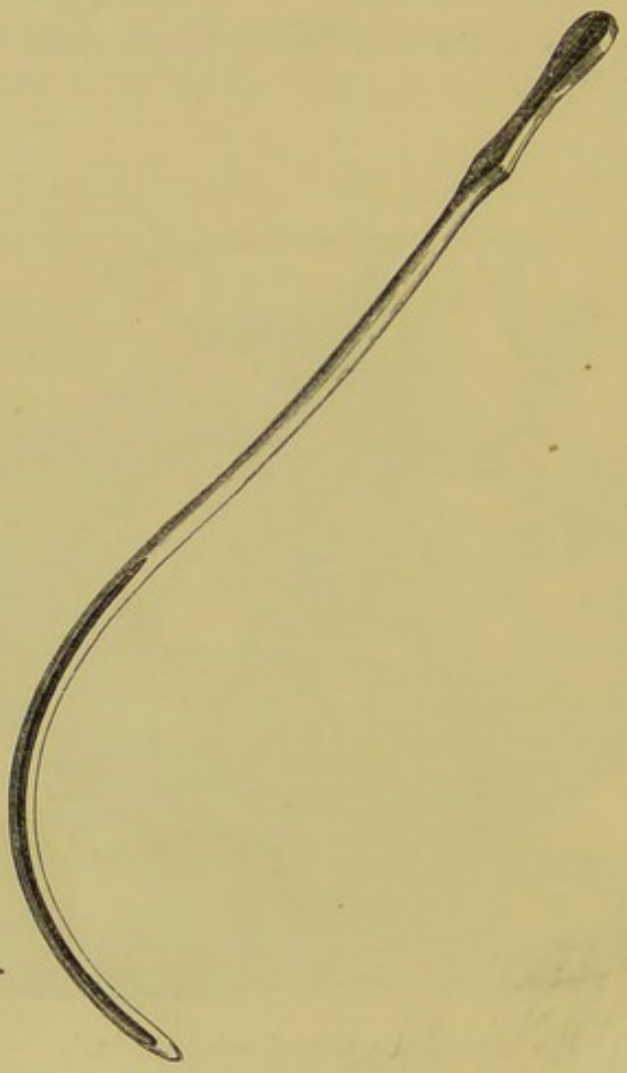

Fig. 49.—The staff.

ders at the idea of an operation performed on a staff so placed—an exhibition distressing to all concerned—never to be forgotten either by the operator or by the bystander, and probably fatal to the patient. The "click," then, is to be distinctly audible to yourself and to a witness, and the staff

is to be put into the hand of your best friend, who is to attend implicitly to your instructions, and to no others, whatever they may be. The patient is then to be tied up firmly; better still if secured by these leather anklets and wristbands, devised by Mr. Prichard, of Bristol, because they truly realize the proverb, "fast bind, safe find," which our old friends the garters often did not. (Fig. 50.)

Now, what are the instructions to your friend, the staff-holder? You want it held firmly, and, of all things, not to leave the bladder. I don't think you will gain much by

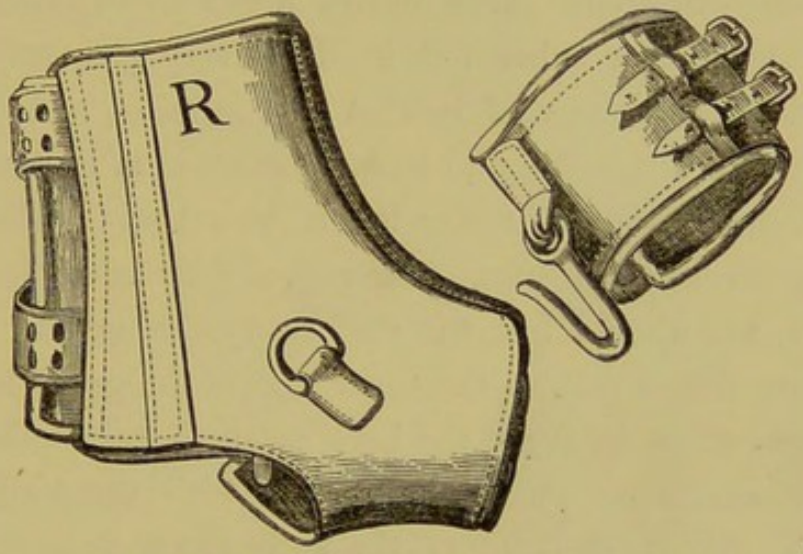

Fig. 50.—Lithotomy anklet and wrist-piece.

cultivating a fancy for any particular spot, such as right or left, or projecting in the perineum. If it is to be steady, always in one place, which is the main thing, there must be a point of support for it to rest against, and there is but one such spot in the whole region. Rely upon it, then, you had better tell him to keep it close to the arch of the pubes, well hooked up, with the handle pretty nearly vertical. Your fingers now traverse the region and find the lines of the rami, also the condition of the bowel, whether empty and contracted, or the reverse.

Now, relative to the first incision, different authorities advise different places at which to enter the scalpel and commence. Without discussing these, let me say that, as a rule, the usual point should be, for an adult, about an inch and a quarter in front of the anus, a third of an inch to the left side of the raphé. Having placed the fingers of the left hand on the upper part and right side (patient's right) of the perineum to steady the skin, enter the knife boldly, pointing slightly upwards, approaching near to or touching the staff, and cut gradually as you descend less deeply till you come out about three inches lower down towards the inner side of the tuber ischii. It is very pleasant to feel that you touch the staff in that first incision, and it saves trouble and uncertainty to have gone close to it, which you always ought to do; never let it be a timid shallow cut, merely dividing the skin. The end of your left index finger follows, and should feel the staff easily through the tissues. Fix your finger-nail on the inner edge of the grove tolerably far back, so as to avoid the bulb as much as possible; and at the same time guard the rectum with the body of the finger. Slide the point of the knife along your nail into the groove, and enter it firmly, feeling that you divide the tissues and have unmistakable contact between the point and the metal of the staff (Fig. 51). Then run the point firmly and steadily on in contact with the staff, so as to divide the prostate. Keep the point up, and you will be safe; let it down, and you may slip out and get into the rectum, or nobody knows where. Simply go on, letting the blade be a little more horizontal as it proceeds. Go on till the point has reached the bladder, not letting the knife leave the staff. The depth of the incision will depend upon the angle which the knife makes with the staff as it enters

the bladder: if you maintain the knife close to the staff, of course you will only make a wound the width of the knife; but if the angle between it and the staff is increased, the width of the incision will be increased also. Finally, with-

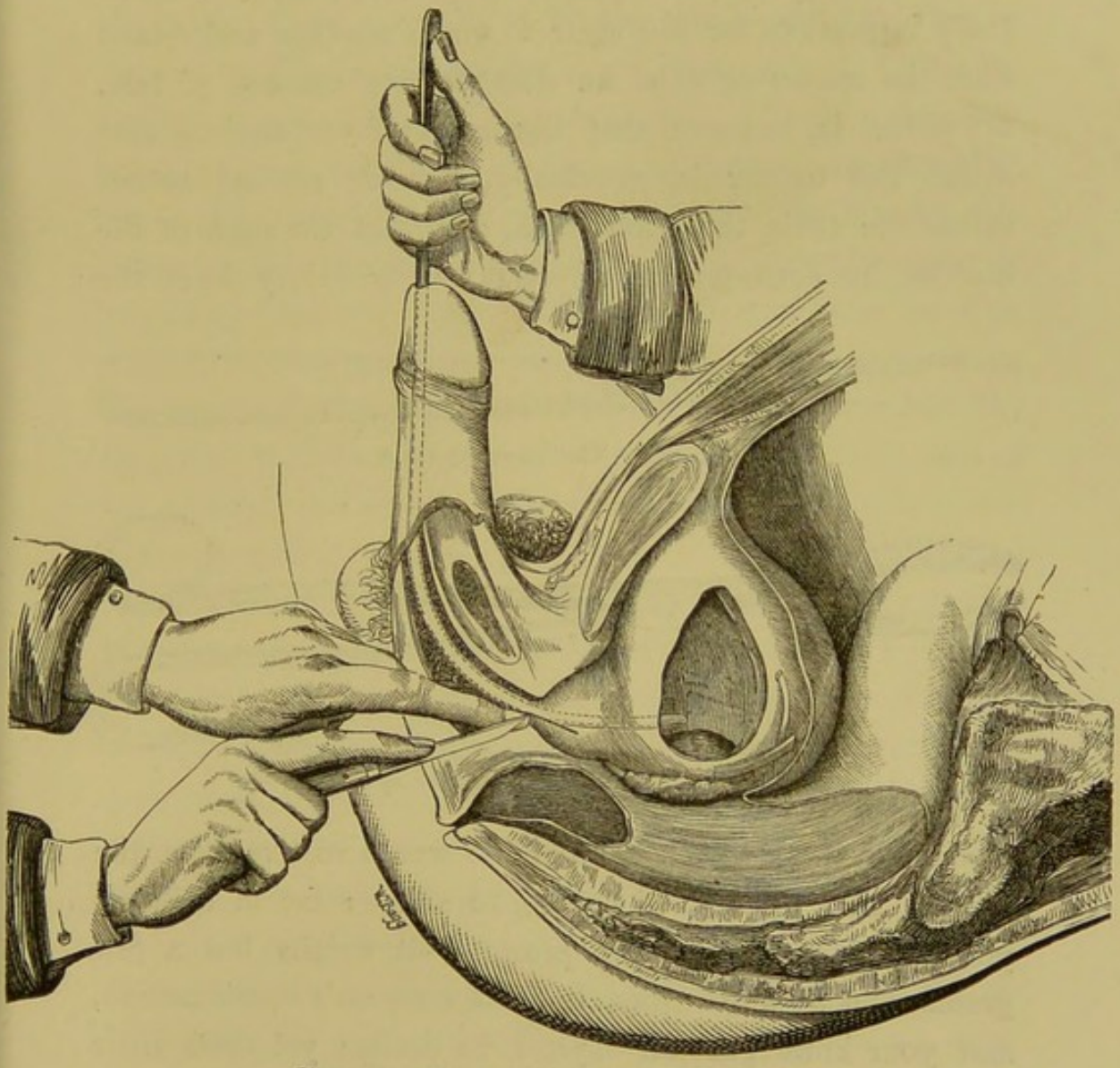

Fig. 51.—The incision through the prostate.

draw the knife without adding to the wound, unless you see reason to do so, in which case, if the edge is directed outwards and downwards against the soft parts, with a light hand, as you come out, you will make a freer and cleaner

opening. It is better to be rather free in cutting than otherwise [the presence of a large stone is assumed], but you must not make the incision too wide.

There has been a great deal of good advice expended upon this subject—the depth of the incision, but it is manifestly impossible for one man to make another understand what he means or what he does by any amount of talk. My belief is, however, that the result of our anxious care about this matter is, practically, that we are apt to cut rather too little than too much, and that the neck of the bladder, in consequence, receives severer injury from the

Fig. 52.—The lithotomy knife.

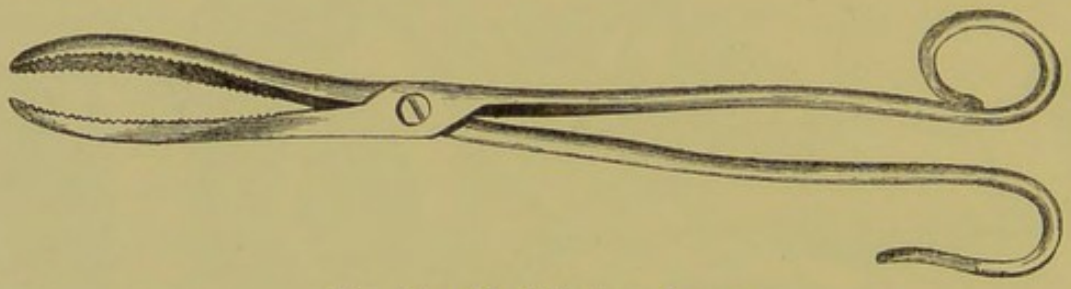

Fig. 53.—The lithotomy forceps.

stone and forceps than it otherwise would receive from the knife. This relates, of course, to adults; for in children you can scarcely find the prostate—it weighs but a few grains, and does not come in for a moment's consideration, and your knife goes far beyond its limits; yet these little patients are the safest to cut. Of course there is an essential difference in susceptibility to danger at the two ages, due to the widely differing conditions of puberty and childhood.

To return. The incision being completed, your left

index finger immediately follows close along the staff into the bladder, where you will probably just touch the stone. Order then your assistant to withdraw the staff. The finger goes firmly and deeply in, stopping the urine perhaps, to some extent in its outflow, and accomplishes the first dilatation of the parts. Then you slide the forceps closely along the palmar surface of the finger, and insinuate them into the bladder, which makes dilatation number two. Then, generally speaking, you have but to open the instrument carefully, yet widely, one blade flat at the bottom of the bladder, the other towards the top, and, closing the blades, the stone is probably between them. If it seems that you have a good hold, draw gradually outwards and downwards, easing or adjusting, if you can, with the left index, so that the long axis of the stone may correspond with the long axis of the blades; and so you make the third and last dilatation. Remember that you are not to pull out horizontally and bruise the soft parts against the pubic arch, but downwards into the widest part of the lower pelvic aperture. And don't be hurried for the sake of anybody else in order to make a rapid operation. You and your patient are to be, for you, at this moment, the only persons present, and your responsibility to him must never be forgotten for an instant through any influence of bystanders and lookers-on.

I must now briefly add, that you will search for a second stone, and always tie any vessel spouting within sight, for bleeding may give you much anxiety a few hours later. Occasionally the hæmorrhage is considerable, and much pains should be taken to apply the ligature. Sometimes the point of a well-curved tenaculum may be carried under an arterial jet high up, which you have failed to tie. Pulling the instrument gently towards you, a ligature may be made

to encircle the tissue laid hold of, and then the tenaculum may be left in place. I have one from which the handle may be removed by unscrewing, made expressly for this purpose, and it has been a very useful aid on two or three occasions (Fig. 54). Subsequently inject a large syringeful or two of cold water through a long bulbous-ended nozzle into the bladder; and introduce a tube through the wound if the oozing of blood is rather free. The tube is provided

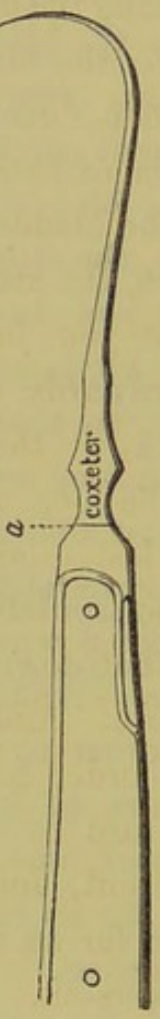

Fig. 54.—The tenaculum, which unscrews near the handle.

Fig. 55.—The tube, with "petticoat."

with a kind of "petticoat" of thin cotton material round it, into which you can tightly squeeze some strips of lint, and so make pressure on the bleeding surface (Fig. 55). If there is only slight bleeding, I prefer to have no foreign body in the wound; if it is considerable and continuous, I employ the tube and the lint. It may be removed in forty-eight hours or so, taking out first the lint, little by

little, and finally the tube itself. Remove the patient from the table, let him be placed in bed on his back, with one or two pillows under each ham, and the parts involved exposed to air and light, so that you see how the urine flows. The less meddling afterwards generally the better. The severe pain which is usually felt for a few hours after should be mitigated with full doses of morphia or opium. I commonly put a suppository, containing one grain of the former, into the bowel of an adult patient before he leaves the operating table.

I have only time to say a word or two about the median and medio-bilateral operations. For the median an incision is made in the line of the raphé from about two inches and a half above the anus, downwards as near to its margin as is safe, for you want all the space you can get. Dissect down to the staff, with a finger in the rectum, so as to avoid it, and also the bulb of the corpus spongiosum as much as possible. Then open the urethra in the membranous portion or thereabout, and carry a director on into the bladder; your finger follows and dilates, and then the forceps on that. I may tell you that it is generally performed by thrusting a straight bistoury, with its back downwards, in front of the anus, into the staff, and cutting upwards and outwards at one incision. I prefer the other mode. Manifestly this operation will not do for large stones, which mainly, thanks to lithotrity, are those which have to be provided for by lithotomy. Hence the applicability of the "median" may be somewhat extended, by making it "medio-bilateral," and in this manner: Having performed the median, as just described, up to the point of opening the urethra, instead of introducing a director, you introduce the two-bladed lithotome, and when it is in the

bladder you open the blades, and two moderate incisions are made, one right, the other left, as you draw the opened instrument outwards in the groove of the staff. A larger opening is, of course, insured in this manner than by the simple longitudinal incision of the urethra.

These two operations I have now performed about thirty times, and I do not know, after all, that there is any reason for preferring them to the "lateral." To make an accurate estimate, one requires at least 100 cases of each operation by the same hand. Nevertheless, I may say a word, finally, on the principle which essentially distinguishes these operations. They are the result of opposite convictions respecting the hazard of the knife. There is a set of men to whom anatomy is a bugbear, and who are afraid of cutting as much as is absolutely necessary; and there are other men less timid,—mind, I don't say less cautious,—who regard the larger and freer style of operating as better than the small or fearful style. All surgeons, of course, tend more or less to fall into one of these two classes. The anatomical school have devised a variety of median operations in order to avoid certain blood-vessels, &c., and they sacrifice space in doing so. They answer excellently well for small and medium-sized stones; but these are, or should be, crushed now, and we do not want any operation for such stones. The perineal operation which offers the most room, the recto-vesical excepted, is the lateral operation. All the others named are essentially median operations. Now, I am bound to say that formerly, judging theoretically, and performing less lithotrity than now, I had a leaning to median methods, being disposed to think that they would be attended with less hæmorrhage than the others. But I do not find this so in practice, and I have arrived at the conclusion that

there is quite as much bleeding as in the lateral operation. I attribute this to the bulb. I regard the bulb as a large artery to all intents and purposes. You cut into that spongy tissue,—not in all cases, but in some,—and there is as much bleeding as if you cut the artery of the bulb, and more difficulty in controlling it. The bulb must be cut more or less in the median operation. The problem is how to get into the bladder without wounding the bulb, its artery, and the rectum; and I believe that a well-performed lateral operation more nearly accomplishes this, where a free opening for a large stone is required, than any other.

I cannot tell you which of these two operations is the easier; if anything, perhaps, the lateral. But here is the important fact, which is only beginning to be realized by the profession—viz., that the exceptional cases of large stone in the adult alone require any cutting operation, since all the small and middle-sized ones can be much more safely removed by the crushing process. And it is this fact, the demonstration of which is of comparatively recent date, that is bringing these various forms of lithotomy under the serious consideration of surgeons at the present day from a new and different point of view.

LECTURE XV.

ON THE INFLUENCE OF RENAL DISEASE ON THE CHOICE OF OPERATION FOR STONE IN THE BLADDER.

GENTLEMEN,—During the last ten weeks of the year 1872 eight cases of stone in the bladder were admitted to my wards. Of these, seven were adults, chiefly of advanced age; lithotrity was performed for all, and each patient has been discharged cured. The eighth case was that of a lad aged ten years; for him I performed lithotomy, and he also went out well. Towards the end of January, 1873, I returned to my duties here, and found a case just admitted, which possesses characters of considerable interest. I propose therefore to make it the subject of this lecture.

The man was sixty years of age. His first calculous symptoms appeared nearly three years ago. He was admitted to a hospital last summer with a rather large phosphatic stone, for which lithotrity was performed. He left relieved, but passed portions of phosphatic matter occasionally, obliging him to use a catheter sometimes to remove them. His bladder was in that condition in which phosphates are rapidly formed.

Present state (Jan. 24.)—Passing urine every half-hour day and night, with much straining and great pain: compelled always to leave his bed for the purpose. Urine pale, turbid, alkaline; specific gravity 1009; a granular cast found at first examination. General condition extremely feeble.

You will remember that I made long clinical remarks in

the ward, stating that the patient was the subject of chronic renal disease, discussing the influence this condition must have on the course to be pursued, were there a stone in the bladder; and that I should make a careful attempt to remove any fragment or phosphatic matter which might be the cause of his sufferings. I did so, taking away a small quantity of this without difficulty. On Jan. 26th he had passed a little débris, and the intervals of micturition were prolonged. On the 28th I removed one very small piece. On the 31st I made another short examination, discovering nothing. That very afternoon, contrary to orders and in the absence of the nurse, he went out of doors into the cold air in the yard. On February 2nd he had a rigor, temperature rising to 103°. On the 3rd another. On the 4th he was drowsy and incoherent. I ordered hot linseed poultices sprinkled with mustard to be applied frequently to the loins. Pulse was about 100; temperature 100°; urine but little diminished in quantity. This condition continued about two days, when he was much less sleepy, his intelligence returned, the tongue (which had been loaded) began to clean, and he took food very fairly. We had quite given him up, as you know, on the 4th, and now began to hope he would rally for a time. But on the 8th and 9th he was not so well; the urine acquired a marked blood-tint. Hot poultices to the loins were followed by manifest improvement on the 11th and 12th. On the 13th the urine was again worse, the patient weaker and indisposed to take food. On the 17th the drowsiness and incoherence reappeared; temperature was below natural; pulse weaker; urine more bloody. He gradually sank, dying in the evening of the 19th.

At the autopsy we found conditions of which the follow-

ing is a very brief *résumé*:—Bladder thickened; grey discoloration of mucous lining; patches of false membrane adhering. Very marked bar across its neck uniting lateral lobes of prostate; deep pouch behind, containing a few small phosphatic concretions, weighing 12 grains. Ureters somewhat dilated; the left more so than the right. Kidneys surrounded by fat, vascular and indurated, attached to the capsule, which peeled off with renal substance adhering, and opened tiny abscesses. Surface lobulated, minutely granular. Size normal, as if of granular contracted kidney temporarily enlarged by inflammatory action. Surface of right greatly congested, hæmorrhage in places; left less so. Cortical portion in both thin; in left particularly so. Section brownish, with small, pale, yellowish spots interspersed; the pyramids intensely congested. The pelves dilated; lining membrane deeply injected throughout. Microscopic sections were made, and on examination the tubules were seen in some parts to be filled with granular epithelium. The Malpighian bodies were surrounded by crowds of young cells resembling corpuscles. On microscopic examination of a section of the kidney hardened in alcohol, the tubules of the cortical part were found to be irregular in size; some dilated, some narrowed. In the dilated tubules the epithelium was granular, the cells being shrunken and atrophied. The epithelium had entirely disappeared in some tubules, and the lumen was filled with granular débris. Between them, in all parts of the kidney, were crowds of young cells. Around the Malpighian bodies these were accumulated five or six deep. In some parts in the immediate neighbourhood of the small abscesses the structure of the kidney was undistinguishable, and its place occupied by masses of young rounded cells.

For this poor fellow the only question to be entertained was how best to relieve or palliate the painful complication of his fatal malady: advanced Bright's disease, the one; diseased bladder, containing phosphatic matter, the other. It was no question of cure, nor could there be any prospect of it. His stone had been previously removed; but the decomposed urine and mucus together were daily forming phosphatic deposits, which, cohering and drifting into the urethra, occasioned intense pain. Such a subject is only one of several which are naturally suggested by the case before us. I shall, therefore, take the opportunity of discussing briefly a large theme arising out of this, which may be thus stated.

When stone in the bladder coexists with any disease of the kidney, how does this influence the decision in regard to operative proceedings for the former?

1. I must first define what is to be understood here by the term "disease of the kidney." It is a comprehensive one, and is apt to be employed somewhat loosely. It embraces, of course, all the morbid affections to which the kidney is liable. These I shall endeavour to classify in a broad and general way; and in doing so will put aside, as obviously foreign to the subject in relation to operative measures, the malignant diseases of the organ.

(*a*) Those chronic changes in the kidney structure associated with constitutional cachexia, of which they may be more a local expression than a cause, and which are comprehended under the term "Bright's disease," form an important proportion of the maladies in question. In the dead-house you know that we meet with kidneys differing very much in appearance, size, and structural characters, all yet furnishing examples of different kinds of Bright's

kidney, or, in some cases, of different stages of the same kind of disease. Most are included under the distinct types of "the granular contracted kidney," like that of our patient, and "the large, smooth, white kidney." Not to overlook a much more rare condition, I just name the "lardaceous" or so-called "amyloid" degeneration. Now the symptoms which denote Bright's disease are, for the most part, sufficiently clear and distinct during life, as you know; and the amount or stage of disease is, within certain limits, fairly calculable after some knowledge of the patient.

(*b*) Another kind of change which is wholly distinct from the foregoing occurs in kidneys which are either frequently or for a considerable time the seat of calculus.

The presence of minute foreign bodies, for the most part aggregations of uric-acid crystals, in the uriniferous tubes, at their orifices and around them, in the calices, is a cause of injury to the structure affected in a degree corresponding to the duration and the magnitude of the deposited matter. Any degree of injury, from a circumscribed and temporary inflammation of the lining membrane of the pelvis caused by a large quantity of rapidly formed crystals, up to almost entire destruction of the organ from the presence of a large renal calculus, may be observed. Happily, the latter condition is rare. On the other hand, the former is very common. I doubt whether any man passes much concrete uric acid for a few months without some very slight damage to the kidney. Certainly, during the process blood is almost always to be found in the urine by the microscope; and it must be inferred that when the habit of passing periodically uric-acid calculi has existed for some years, a certain degree of permanent deterioration has been suffered by the kidneys.

There are no other special signs of this condition. The patient's general health is often very good. There is no cachexia as in the class of diseases (morbus Brightii) just referred to. On the contrary, the patient is often hale and hearty in appearance. The characters of the urine are good; quantity abundant; specific gravity full average; no albumen, but urates often in excess, and blood-discs are present, insufficient to affect the naked-eye tint of the urine. Pain about the renal and sacral regions and the hips often complained of. But I have frequently remarked to you that such patients often exhibit considerable febrile phenomena on instrumental interference, and that, although they look so well, more than ordinary caution is necessary in dealing with their calculi.

(*c*) I name, without further allusion to it here, saccharine diabetes, which cannot be passed over while considering renal diseases. To save returning to the subject, let me say that there is no question that for this and the preceding class, in which patients with vesical calculus are usually elderly, lithotrity is certainly preferable to lithotomy, unless the stone is large. The exercise of caution on the part of the operator to employ instruments as little and as gently as possible is essential. I have operated on two patients with success who were the subjects of marked saccharine diabetes, one of them within the last month; both were very sensitive to mechanical interference. A large number of elderly people with uric-acid calculus possess renal organs which have been subject more or less to prolonged irritation produced by the formation of small renal calculi; and when the degree is considerable, all operations on the bladder are more hazardous in consequence.

(*d*) The last class of renal changes which I have to con-

sider are those resulting from diseases which habitually obstruct the outflow of urine. This affection also is not uncommon, and has an intimate relation to our subject.

Many years ago I described the process by which these changes occur. The principal conditions which originate them are, stricture of the urethra, enlargement of the prostate, large vesical calculus, and, less commonly, atony of the bladder. The order of enumeration is also the order of numerical frequency as a cause. Stricture always constitutes an obstruction to the outflow of urine commensurate with the degree of the narrowing. Considerable prostatic enlargement is a cause also, but notably less powerful than the preceding. Vesical calculus sometimes acts in the same way, but by no means as a rule; on the contrary, it is an exceptional circumstance when it does so, depending on certain conditions which vary with the individual, such as the habitual position it occupies in the bladder, its size, its liability to roll to the neck, &c.

This, however, is certain, that in cases of long-standing calculus, an autopsy will sometimes show only slight signs of renal changes produced by obstruction, while in another case those changes will be remarkable for their extent and degree. In no instance, be it remarked, do such changes occur apart from obstructed micturition in some form, and always of long standing.

The changes I refer to are dilatation of all the urinary passages behind the point of obstruction. Thus, in stricture of the urethra, we may observe dilatation of the urethra itself and its glands, protrusion of the mucous lining of the bladder through the interlacing fibres of the muscular coat, producing sacculi, dilatation of the ureters, of the pelvis of the kidney, of the proper renal structure, and thinning by

pressure of the renal substance itself; so that the organ has the appearance of a series of cysts, which formerly was really supposed to be its pathological condition. I may refer to a work published in 1854, where the details were given by me with considerable minuteness of the changes which occur through the influence of fluid pressure.* Let us consider for a moment the mechanical process by which this remarkable series of changes is effected. You know that hydraulic pressure is equal in every direction. Thus, if I make pressure on a flexible bag filled with fluid, that pressure is exerted equally at every point of the periphery; and if tubes are inserted, say in a vertical position at opposite sides, the fluid will rise and issue with equal force from each. Now, what happens in the flexible bag which constitutes the human bladder when obstruction exists in the form of stricture, enlarged prostate, or calculus? More force than natural is of course exerted to accomplish the act of micturition; the patient "strains," as he says, to pass his water, and sometimes, if the obstruction is considerable, the force exerted is very great. You see at once that this tells not only in the anterior direction upon the obstruction itself, but also on the ureters which enter the bladder from the kidney behind. Let us say that the ordinary pressure required to pass water in the healthy organs is one pound to the square inch (one number being, for the sake of illustration, as good as another), when obstruction is present the pressure may certainly be increased two, three, five times, or more. Further, the act of relieving the bladder, instead of occurring only five times in the twenty-four hours, and being speedily completed, may

* Stricture of the Urethra, first edition, pp. 64-70.

recur ten or twenty times, and the duration of the act may be greatly increased also. It is not necessary to explain to you how this state of things must act, and how that after a time (for the mouths of the ureters, not being so patent as the inner orifice of the urethra, do not easily yield to pressure) every act of straining tells on the passages, and dilatation advances by degrees until at last even the kidney suffers from the continued pressure and from the inflammatory process which necessarily accompanies it; for the ureters and pelves of the kidney may become supplementary reservoirs to the bladder, and are sometimes found filled with decomposed and ammoniacal urine. Long before this stage arrives inflammatory action invades these parts, a condition recognised, as you know, as pyelitis [diagram of dilated organs made]. By some this condition has been called "surgical kidney," a phrase which others have applied to denote the acute suppurative nephritis which sometimes closes the scene for a patient who has long had renal disease. I was glad to find Dr. Dickinson proposing at the Medico-Chirurgical Society to abolish so unphilosophical a term. It is one I never use and have a strong objection to. Why "surgical" kidney indeed? Certainly in one sense only—namely, that it is for want of surgical aid that the organs have come to the state in which they are. If that aid were rendered early in the history of the case, whether it be stricture or stone, no such condition would ever arise. Never was the proverb truer that "a stitch in time saves nine"—a surgical stitch, you understand. The pathological condition thus attained might well be termed "mechanical dilatation" of the ureter and kidney, as being mainly, although not entirely perhaps, produced by the physical process described.

Let me now inquire what are the symptoms which it produces during life? I know of none which are distinct and significant. I made this, I had almost said, humiliating admission, nearly three years ago at the Royal Medical and Chirurgical Society, laying much stress on the fact for the express purpose of inviting attention to it.* I have long sought for some sign that should indicate the presence of extensive pyelitis and dilatation, but in vain. Such a patient presents no sign of change in the urine itself. It is of full specific gravity, abundant in quantity, without albumen, except that which the presence of pus and blood accounts for, and such pus and blood are commonly found as vesical products formed by irritation from the calculus in cases where no renal disease exists. Whenever you have stone of more than small size you may have such products, and we are bound to expect them if the patient has any symptoms of cystitis, and some cystitis is always present in these cases of dilatation. Again, there is nothing which

* Referring to it, I said:—"It must be admitted that at present we have not an unfailing means of ascertaining the existence during life of these conditions. There may be no albumen in the urine, and not necessarily are there any deposits significant of the renal affection. The urine of a calculous patient frequently contains mucus, pus, and blood; but whether the origin of these is in the bladder (naturally its most common source from the irritation of the calculus) or in the organs above, it is impossible always to determine; and usually there are no casts or other pathognomonic signs of disorganizing renal structure. In fact, neither physical signs nor subjective symptoms are by any means frequently present, and yet advanced pyelitis, and even sometimes chronic nephritis, may exist. . . . . Could the existence of these conditions be accurately diagnosed beforehand, it might become a question whether the crushing operation, or any operation at all, should be performed. For there is little doubt that the existence of such organic changes is almost as surely a source of fatal issue in lithotomy as in lithotrity. Now, in the twelve cases before us, one or other of these conditions certainly existed in five; and had it been possible to be aware of them the operation might not have been performed, and the patient might have lived a little longer, with much suffering it is true, and he ultimately must have died at no distant period."—*Royal Medical and Chirurgical Transactions*, vol. liii. pp. 136-7, 1870.

we can identify as disintegrated portions of renal tissue—no casts of tubes, nothing but pus and blood-discs—nothing, in short, distinctive. Then at no stage of the disease is there any dropsical effusion, no habitual dryness of the skin, not necessarily any marked feverish state, constant or intermitting. Nor is there any diminution of weight; on the contrary, the patient may have gradually acquired fat. But he is always, if the condition is advanced, in feeble health, is worn, and easily exhausted—signs which impress you with nothing so much as his obvious inability to bear any severe test of his physical powers, from all of which, however, nothing absolutely diagnostic can be inferred.

But it has been said, and with some plausibility, if the kidney is much damaged by disease, the urine will certainly show a deficiency of urea. Practically that is not so. Practically, with much pyelitis and dilatation, urea is sufficiently eliminated. Two half-kidneys, to speak roughly, will probably do the necessary elimination for the system in circumstances of quiescence, just as two half-lungs may suffice for a patient in very favourable circumstances; and failure to excrete urea is only manifest when the action of those two moieties of kidney is suddenly interfered with, by disturbance from external cold, &c., or by the inflammation propagated by means of an operation on the urethra or bladder. Practically, again, if I examine the urine of a patient in order to determine the amount of urea, and find it manifestly insufficient, is it not the fact that my patient must at that moment be to some extent in a condition of uræmic poisoning, and that he will certainly show some clinical sign thereof? Is not the fact that no such sign is present the only real proof that urea is sufficiently eliminated? Once the urinary constituents begin to be retained

in the blood, the moment is at hand when symptoms of poisoning will appear. The chemical test alone must not be relied on in practice. When a patient passes abundance of urine of specific gravity 1018 to 1025, without casts, with no albumen except that which is due to the blood and pus found in the secretion, we have no ground for believing that any advanced organic renal disease exists, unless we obtain evidence of its presence from other sources.

Now, I never operate for stone without first ascertaining whether the condition of the urine is that above described; so that if I undertake an operation for a patient manifestly the subject of renal disease, it is in full view of that fact, and because it may be absolutely necessary that surgical relief must be attempted at all hazards. Of this I have to speak by-and-by. No one would be more ready than myself to obtain further aid from chemical tests. I only fear that none are known which can aid us to demonstrate the presence of the mechanical dilatation to which I have referred.

Again, it has been said, Can you not by palpation or percussion demonstrate the existence of this disease? I answer for myself distinctly "No." A foreign authority demanding the utmost respect has recently affirmed that it is possible. With great deference, and after giving much special attention to the matter for some years, I emphasize my dissent on this point. I have long recognised this condition as one of the great stumbling-blocks, perhaps the greatest now existing, in our way to diminish the mortality after operations for vesical calculi of large size. Had I any means of certainly ascertaining that a patient *with such a stone* had ureters and kidneys largely dilated, I would advise him not to submit to any operation, and I would do all

I could to prolong his life and make it tolerable—a condition within certain narrow limits to be attained. Something may be done under these circumstances to accomplish this end—more, perhaps, than is often believed, of which I have seen some remarkable instances; but sometimes, it must be confessed, such palliative measures are useless, and the patient demands relief from sufferings which are intolerable, no matter what the risk may be. Can we under such circumstances humanely refuse him?

To return, however: let us inquire what we can accomplish by palpation or percussion. First, I have determined the fact beyond all question, that there is by no means necessarily much, if any, tenderness in the regions of the ureter and kidney—that is, acute suppuration, active inflammation, or renal calculus not being present. You are accustomed to see how often I examine those regions in the wards. And you know how efficiently one may do it with a patient who is thin and spare; and also how particularly unsatisfactory is the examination when the patient is corpulent. Now the former condition is one you can by no means always reckon upon; on the contrary, I affirm that the latter condition must be more commonly expected in these cases. For a year or two, perhaps, the patients have been inactive, and fat has accumulated; and then you can learn little about the ureters by palpation. Again, the condition of the organs, even in the spare subject, offers no objective sign to physical examination. Let us suppose a ureter as big as the aorta, or larger still: Is it a tube filled with air like an intestine which will give you a corresponding note? Is it filled with fluid, and will it thus give you a line of dullness which may be traced? By no means; it

is a flaccid sheath with thin yielding walls, transmitting fluid it is true, but you can no more isolate it by percussion from the adjacent structures, so as to demonstrate its size, than you can isolate by a similar process—let me say, the lumbar plexus. Of the kidney itself the same thing must be affirmed. You may, if fairly practised, determine the solid mass of an enlarged kidney; but there is no way of demonstrating the existence of a dilated pelvis or of thinned kidney structure by any physical examination. No doubt you may guess—shrewdly perhaps sometimes; but it is no place or time for guessing when life or death hangs on the decision. There is a field here for further research; the door is open for investigation. For, you may rely on it, no method of arriving at anything like a certain diagnosis of pyelitis with mechanical distension is at present known.

2. But I have now to consider what influence ascertained disease of the kidney exercises on the prognosis, when the subject of it has also a stone in the bladder, and the question of operating for its removal has to be considered. Let me first say that when the stone is small—the size of a small nut—whatever the condition of the kidneys, there is no very great risk from lithotrity if well performed. But it is by no means always that we are so fortunate as to find the patient with a small stone. It may be large, and do what you will, the patient is in a position of danger; the only question for us is—by what treatment will that danger be least?

I have operated certainly in three cases in which advanced Bright's disease was known to be present, but in which the sufferings of the patient were so great that an operation was most desirable. In each the stone was phosphatic; in

the first and second it was large, in the third of medium size.*

The first was a gentleman whom I saw with Dr. Sharpe, of Norwood, in 1865. With extreme care I removed the whole in eight sittings, with great relief to the patient. His urine, although fairly clear, was of low specific gravity, and charged with albumen. The subsequent part of his life—I believe about six or nine months—was rendered comparatively comfortable. The second case was in this hospital in 1870. He was also handled with the utmost caution, having five sittings in ten weeks, owing to the severe rigors and prolonged fever which followed some of them; but he went out marvellously improved, and lost all his calculous symptoms. I saw him three months after, and he fully maintained all he had gained. I have heard nothing since.

The last of the three occurred about the same time, also in the hospital. His disease was more advanced than that of the preceding case. Only on his very urgent solicitation I consented to try lithotrity. I could not resist the appeal to diminish his suffering, if possible; that he must die at no distant time both he and I knew. With his pallor, debility, and uniformly rapid pulse, lithotomy could not be thought of for an instant. I kept him three weeks before touching him, in the hope of improving his condition. Five sittings sufficed to remove nearly all the stone; but the last was followed by severe shivering and vomiting, and death in a few days.

Should I have done lithotomy in any of those cases? I answer unhesitatingly, in not one of them was it possible to submit, with any chance of success, men in such a

* By "medium size" I intend always a stone which measures about an inch as the mean of its two diameters.

feeble state to any severe cutting operation. Nothing but lithotrity could offer the slightest chance, and it saved two of them from the anguish of stone, and from the additional proclivity to death which it entailed.

But these, you say, were examples of known "morbus Brightii," and you naturally enough demand if I should be guided by the same principle in a case of mechanical dilatation and pyelitis if I knew beforehand that I had to deal with such an one? To this I can only say that the patients whom I have seen, and whose autopsies have demonstrated that they were the subjects of that condition, have been manifestly defective in vital power—patients for whom I should certainly shun a cutting operation of any kind if possible. Although, as I said on another occasion, had we the means of identifying an advanced example, I should gladly avoid either lithotomy or lithotrity, still I believe that I have employed the latter with success for a few. I have thus operated three times in cases of bad old-standing stricture of the urethra (maintaining the urethra well dilated by a catheter permanently tied in for the purpose, as you have seen), in which I have no doubt that considerable mechanical distension of all the passages existed. But these people were so miserably feeble that nothing would have induced me to cut them, nor do I think that any man would have ventured to do so.

But you might still rejoin, and you would be quite right in doing so, "surely it has been said by surgeons of experience in the past, that when 'renal disease' exists, it is better to remove the stone by one operation, although severe, than to attempt it by a process which requires repeated introductions of a lithotrite, and more or less continued irritation from fragments?" The fitting reply to-day, as it appears to

me, is, that although this was undoubtedly true some thirty years ago, it is by no means necessarily true now, when the relative capabilities of the two operations of cutting and crushing have so greatly changed. The operation of lithotomy had arrived at its present perfection before lithotrity was invented. No results more perfect than had been attained by its means have ever been accomplished by it since. On the other hand, the perfecting of lithotrity has been a progressive process from fifty years ago to this very day. The lithotrity of to-day is a better and safer proceeding than that of twenty or of ten years ago, and thus it is that the axiom about renal disease, right as it might have been then, has been growing less so year by year. *I believe it is reversed for stones which may be easily crushed.* In support of this conviction I have called before you six unimpeachable witnesses—I might easily have called more—six patients who could not have been cut. To have placed those feeble and pallid frames on an operating table for lithotomy would have been to slaughter them outright. Of those six, five were saved. I believe, then, that for any stone of rather large size, *provided it is friable*—and calculi in these cases are mostly phosphatic, and therefore friable—in a patient of broken health from advanced renal disease, if any chance exists from operation at all, it will be by lithotrity; and that in such a case lithotomy will be surely fatal. The choice in a bad case is lithotrity or palliative treatment; with a stone not easily crushed, it is lithotomy or palliative treatment, probably the latter.

But then it is impossible to overlook one condition, and it would be useless affectation to do so. I mean by lithotrity an operation carefully done by an experienced hand. Rather than have it done in any other fashion, let litho-

tomy be selected by all means. It is impossible to compare these two operations as we do some others—as we can, for example, any two modes of amputating a limb. Nor may we blink the fact that, while the lithotomy practice of one good surgeon may not differ greatly in the long run from that of another, it is impossible to deny that the lithotrity of the two may be wide as the poles asunder in its quality as an operation, and as to the chances which it may offer to a patient. Thus it is that a bold, well-performed lateral lithotomy is quite possible to the young surgeon at the outset of his career, while nothing but considerable experience can make him a good lithotritist. The two operations can never be compared, nor their capabilities estimated, without keeping in view this fact. You whom I address had better, when in practice in the country, decide in difficult or doubtful circumstances to cut rather than to crush, until you have acquired some facility in the practice of the latter art, unless indeed the stone be quite small. Do not touch with the lithotrite in any circumstances a stone which is rather large until you have had experience with a small one or two.

Gentlemen, one great practical point remains, always recurs, and at last comes uppermost, on whatever side the great subject is considered. It is this :—Detect the existence of a stone in the bladder early; it is always somebody's fault if not found early. The stone will then be small. It may be crushed at one or at most two sittings, with almost no risk. No question of cutting need ever arise; the presence of kidney disease need scarcely trouble you. I never in my life lost a patient, whatever his condition, whose stone was found and crushed when it was small, and I never expect to do so.

LECTURE XVI.

EARLY HISTORY OF CALCULOUS DISEASE, AND THE TREATMENT BEST ADAPTED FOR ITS PREVENTION.

GENTLEMEN,—We have recently studied together and discussed very fully the various operations which are practised for the removal of stone from the bladder, and you have had the opportunity of seeing them performed many times, not less than eleven cases having passed through my wards during the last few weeks, each one with a successful result.

But, satisfactory as this is, it suggests very strongly to my mind that there remains an important question for us to consider; as important, indeed, as any of the preceding subjects, and one which must naturally arise in all thinking minds. It is this: Is there not a period anterior to the stage of the malady already examined—a time at which we might prevent the formation of stone in the bladder, and so get rid of the necessity for removing it? Admirable as the results of operative means have been—perfect (one may almost say) as they have become, at all events so far as regards the crushing operation—great as is the triumph which surgery has achieved in removing stone from the bladder—I take it there are very few men who would desire, if they could help it, to exhibit that triumph in their own persons; and who would not be infinitely better pleased if we could succeed in preventing the formation of stone, instead of only achieving its removal, however satisfactorily

the operation for that purpose might be performed. This, then, leads me to the consideration of an important question—Can we do anything to prevent the formation of stone in the urinary passages? It is, in fact, the earliest stage of this malady that will be the subject of our lecture to-day.

I commence by saying that I think a great deal may be done. But at the outset of the inquiry we naturally ask, What is the kind of stone (for there are several kinds) the formation of which we may hope to do most in preventing? All calculi are either of local or of constitutional origin. By "local," I mean formed by disease in the bladder itself, and not depending upon any constitutional conditions; by "constitutional," I mean formed by some vicious action, some error of assimilation inherent in the system. Now, the large majority of stones are of constitutional, and not of local origin. When they are local, you know that we cannot prevent their formation except by mechanical means. Calculous matter, the elements of which are produced in the bladder, may be washed out, or be broken or dissolved, and then washed out. But when stones are of constitutional origin—and we are going to refer entirely to these to-day—their elements are separated from the blood, and no mechanical mode of preventing their production can by any possibility be available.

Now, from observation, we know that nineteen out of twenty of such stones have uric acid for their basis, the remaining one in twenty being oxalate of lime;* and, less commonly still, there are phosphatic stones which are of constitutional origin also. Therefore, practically, to all

* The deposits of oxalate of lime and of uric acid so often replace each other that the consideration of the latter becomes practically generally sufficient for our purpose.

intents and purposes, the problem before us is contained in the question :—How may we best prevent the formation of uric-acid calculus.

Let us examine the early history of a case of persisting uric-acid deposit. First of all, let me say, going back to the root of the matter, that it is generally more or less hereditary. As an illustration on the spot, let me recal the man we have just seen with uric-acid calculus in the ward, of whom we learned that his father had "gravel or stone for the last twenty years of his life." And my almost invariable experience is, that either calculus or gout, more commonly the latter, has been observed in the family of the patient who comes to me with one of these formations in his bladder. I believe it, then, to be very strongly hereditary. We speak of tubercular disease and of cancer as being transmitted by blood relationship, especially the former; but I doubt if it is so certainly hereditary as the disposition to uric-acid deposits in one form or another. I make a point of asking the question of all patients who come to me with this complaint; and although I cannot at present furnish you with an exact numerical statement, I do know that in a very large majority either gravel or gout (for I wish to show you the identity as to the origin of these two complaints) has existed in the preceding generation; indeed, it is rare to find it otherwise. This hereditary tendency varies in force or strength in different families. You will find some persons with persisting uric-acid deposits at thirty years of age or sooner, others at forty, others at sixty. Of course, the earlier the time at which it appears, the stronger you will infer the hereditary disposition to be, and the more obstinate, probably, will be its tendency to persist.

What, then, are the first signs of this condition in the

patient? Usually, the first sign is that the urine deposits pinkish matter, on cooling, at the bottom of the vessel, or that the secretion has merely become cloudy when cold. Sometimes, too, a delicate film or pellicle covers the surface, which reflects faintly prismatic colours. It has been passed quite clear, becoming cloudy only when it acquires the ordinary surrounding temperature. This phenomenon, therefore, may appear more frequently in winter than in summer, because the external temperature is lower. It is simply a deposit of salts from a hot solution as the liquid grows cooler, all being easily dissolved by raising the temperature of the liquid to that at which it was originally passed. This is a condition of urine which very often and very unnecessarily excites much anxiety on the part of the patients, and only the persistence of which can be looked upon as a sign of what is called "the uric-acid diathesis." Mind, I mean strictly persistence, or at all events frequency of occurrence: for you or I, with no hereditary predisposition, may take a little more beer than usual, or an extra glass of champagne, or a glass or two of unaccustomed port, and find next morning a considerable quantity of this pinkish deposit, the urine looking almost like pea-soup, but not so thick, or like a mixture of rhubarb and magnesia; and when the vessel is tilted on one side, a tidal mark, so to speak, is seen, showing the height at which the liquid stood; all this, as I said before, being redissolved by heat. The opacity of the liquid, as well as its tint, which may vary from fawn to dull red, are due to the rapid production of the mixed urates; that is, urates of soda, potash, lime, &c. But if, without any errors of diet, of which any but a very small allowance of alcoholic drink is only one, a patient habitually passes this kind of urine—if in time there arrives

also a frequent deposit of uric-acid, manifested by the presence of little crystals, looking like particles of cayenne pepper, at the bottom of the vessel—when this occurs rather early in life, say before forty, we cannot doubt that there is a strong tendency to produce uric-acid, either inherited or acquired. For this tendency may to a certain extent be acquired, or a pre-existing habit may be intensified; but, as I have before said, it is almost always inherited. I now show you a specimen of urine quite cloudy with mixed urates, although you must be familiar with it in the wards, and also with the fact that on heating the liquid it again becomes clear, and that in a short time, while we are talking, it again becomes cloudy on cooling. Let me once more remind you that this may happen with the most healthy individual; and it is only the persistence of the symptom, without errors of diet, which should lead you to suspect a condition that requires treatment.

We have followed the complaint up to the formation of cayenne-pepper crystals. Of this deposit I have some very good specimens here, which have been collected from patients who passed it habitually. These consist mainly of the transparent rhomboidal uric-acid crystals—which you know to be very beautiful objects under the microscope. They may be passed almost daily and habitually by some persons; while others will do so only every few weeks, but then in large quantity, which usually produces a good deal of irritation. At such periods the patient may experience pains in the back and great discomfort, and he may then be said to have an attack of sand or gravel. These attacks occur at varying intervals, and usually become more frequent or severe, unless the patient does something to prevent their occurrence. Afterwards he passes tiny calculi,

popularly called "gravel," which seem to be rounded or irregular aggregations of the same crystals; and these little bodies tend in time to become larger, sometimes as large as small peas, or even beans; and they are still specimens of the same product—that is, of uric acid, associated more or less with some alkaline base, such as those above named.

Now let me recal for one moment what I said as to the relation of gout to this condition. I have sometimes seen these two complaints alternating, comparing one generation with another: gout appearing in the one, gravel in the second, and then gout in the third. But the same individual may also have alternating attacks of gout and gravel. I have seen a patient suffering for years from gout, which ceased for several months, when he developed for the first time a uric-acid stone. Lastly, the so-called "chalk-stones," which you have often seen infesting the knuckles and disfiguring the hands of elderly people in advanced stages of gout, are composed of the same material—that is, of uric acid, usually as urate of soda. The identity of the two things, then, is unquestionable; they constitute two different series of phenomena, but both spring from one and the same root.

Now what is to be done for these cases? What mode of treatment will help to prevent the arrival of at least the advanced condition—namely, that of calculus too large to be voided by the patient? Generally speaking, I think such patients come under observation in a tolerably early stage, although this is by no means always the case. Some are much alarmed at a very early period, when the urine is only occasionally thick with urates. You will of course disabuse such patients of their false impressions, because numbers of persons mistake such thick urine for highly

organized matter. I have known persons to become almost hypochondriac through not knowing that such deposits are of little consequence at first, and can be easily treated. But what are we to do for those who habitually pass the cayenne-pepper crystals of uric acid or small calculi? You will first seek the patient's antecedents, and learn all that he has to tell you of his habits, his diet, and his family history; and your mode of treatment will be determined accordingly. First of all, let me speak of the general principles upon which the treatment should be conducted. A very simple rule—indeed, too simple, I think—is often adopted. When the urine has persistently and habitually thrown down acid deposits, the patient has generally been prescribed alkalies: if, on the contrary, he has had alkaline deposits, he has been treated with acids. That simple mode has too often formed the main portion of the treatment. In the former case he has soda or potash largely administered, or he will be told to drink so many glasses of Vichy water, which is mainly a strong solution of carbonate of soda, only it is a natural instead of an artificial one. Now it is quite true that with alkalies, provided enough be taken, these deposits will disappear; the uric acid will no longer be deposited; the urine will become less irritating; the annoying symptoms will be diminished or got rid of. And of course the patient is very much pleased with this new condition of clear urine and disappearance of all deposit. And you will say, "What more can be desired?" This: you have merely made his enemy disappear, but he is by no means rid of its presence: you have not checked the acid formation. The uric acid is there as much as ever; but the uric acid and the urates are soluble in alkali, and you have only made them invisible. You really have the same condition as that

of the fabled ostrich, which is said to put its head in the bush when pursued by hunters, and, no longer seeing them, to believe itself secure. Just such is the security of the patient with uric acid who trusts solely to alkalies or Vichy water. His surplus deposits have become imperceptible to his vision; nothing more. I do not say the alkalies have been absolutely unserviceable as regarding his constitutional state, but they will not improve it to any great extent; and when he leaves them off the acid shows itself again. And further, I believe there is reason to conclude that large quantities of alkali habitually taken exercise an injurious influence on the viscera. Diuretics must be regarded in the same light. In those cases which are treated with diuretics, the secretion of water is no doubt increased *quoad* the amount of solids, and the solids are thus dissolved. In both instances what you have chiefly done has been to stimulate the kidneys, already overworked, to do more. You have by no means cured the patient.

Now let us ask what is the real pathology of these cases, and then I think I shall be able to show you a more efficient remedy. The problem has presented itself to me with great force and frequency, because people, naturally fearing they may arrive at the stage of calculous formation, come for advice in the earliest stages, and with the strongest desire to avoid the advanced one of stone in the bladder. So far from its being desirable to send them to Vichy, or to give them alkalies, I believe such patients can be more effectually dealt with by a different mode of treatment. Let me premise in broad and simple terms—as our time here, and, I may perhaps add, the extent of our knowledge, will not permit me to be more minute or exact in detail—that the origin of what we call gouty symptoms, as well as

of a superabundant uric-acid deposit in the urine, is due to defective assimilation on the part of organs associated with or forming the primæ viæ. I am quite aware that it is common in practice to speak somewhat knowingly of the liver, its action, and its states, although we have still a good deal to learn about all this. Some years ago we talked and acted as if we were thoroughly acquainted with the liver and its functions; but during the last fifteen or twenty years new light has been thrown upon the subject by Bernard, Pavy, and other workers in the same field, and we have learned that the more we inquired the less did we certainly know of its natural functions, still less of its action in disease. Thus, if one thing was more settled than another, at least since the time of Abernethy, it was that mercury had a specific influence on that organ; but now we find that there may be grounds for believing that the action supposed has no existence at all. There were other things, indeed, which were vaunted to take the place of mercury, but no one ever thought of disputing the fact that you could augment at will the bile secretion by administering that famous drug. I am not here to say whether that is so or not, but it seems to have been proved that there are substantial reasons for doubting if our ancient faith in that dogma be tenable. In speaking, then, of the "defective action of the liver," or of "torpor of the liver," I merely use provisional terms, which most will easily understand as indicating more or less distinctly a certain set of symptoms. Let them be briefly described as mainly consisting of a constant, or almost constant, deficient excreting function by the bowels, sometimes, but by no means always, associated with impaired appetite and slow or uneasy digestion; these latter being often absent if the diet is carefully selected, or

if the patient lives in the open air and takes much exercise. On the other hand, considerable and multiform symptoms of disturbed digestion may be frequently present. I cannot positively state whether those phenomena are really due to inactivity of the organ in question; practically, for us to-day, this does not signify much, but the current terms are still convenient formularies until better ones can be substituted for describing the condition in question.

Now, at the bottom of this tendency to uric-acid production there often lies what is thus understood as inactivity of the liver; and the true rationale of the unduly large formation of the urinary salts appears to be that, the liver or some allied organ not doing its duty as an excreting organ, the kidneys have more work than is natural thrown upon them. Thus the solid matters of the urine, or rather some of its ordinary constituents, are augmented—not all of them, for urea is not necessarily increased, but uric acid is largely produced, and is eliminated not only in solution but in crystalline forms. Uric acid is very insoluble in water; and although the quantity thrown out may be quite soluble at the natural temperature of the urine (100° Fahr.), when this diminishes to 60°, 50°, or 40°, the acid is deposited, and when the quantity becomes larger still, even the ordinary amount of fluid associated with it at a temperature of 100° will not suffice to dissolve the whole, and solid uric acid is deposited in some part of the urinary passages. This deposit may take place in the kidneys themselves, giving rise, if not thrown off, to the formation of calculus, at first renal, but sooner or later mostly becoming vesical. Now, if all this be so, the formation of uric-acid gravel is not by any means to be regarded as necessarily disease of the kidney; on the contrary, it is the

result of an active and capable organ vicariously relieving some other organ, the function of which is torpid. The true remedy, therefore, is not to stimulate the kidneys, already overworked—not, to use a familiar simile, to spur that horse of the team which is already doing too much work, but you are to seek the cause in that other one of the team which is doing deficient work, and that is almost invariably the liver, in the sense already explained.

The treatment, then, which I advise you to pursue is to employ such agents as will stimulate the excretory action by the primæ viæ without depressing vital power. No doubt that a powerful agent for the purpose is mercury; and it is quite unquestionable that relief of the symptoms above alluded to is to be obtained in a remarkable manner by occasional small doses of that drug. For our purpose, however, it is neither so successful in action, nor can it be considered so harmless, as another class of agents, I mean certain kinds of natural mineral waters. These I also regard as greatly superior, in these maladies, to taraxacum, nitric acid, alkalies, and the other substitutes, as they have been termed, for mercurial remedies, in promoting the function of the liver. The mineral waters which I refer to belong to a group of springs all containing sulphate of soda, and some of them sulphate of magnesia also, in solution. In studying these waters, I wish you to look with me at the composition of them, and at the same time to dismiss from your mind entirely those views of medicinal doses which you have acquired in the dispensary, and which necessarily belong to it, since small quantities of drugs, as they exist in mineral waters, will act more freely than will those quantities combined after the ordinary pharmaceutical method. You ask me for a demonstration, and I am quite

ready to give it you. At the same time, let me caution you against regarding the small doses of mineral waters as having any affinity, either in the matter of quantity or by manner of administration, with what is understood as "infinitesimal" doses. Thus, for example, you know that you may give A an ounce of salts, or B half an ounce, and you purge them; but you may obtain the same effect with one-fifth of those quantities if you give it as prepared in Nature's laboratory in the form of mineral water. It is a curious fact, which I give as an ultimate one, and without speculating here on the cause of the difference. As a proof of the superior force of the saline combinations found in natural springs, I may refer you to the following experiment. If you will reduce by careful evaporation, as I have done, such mineral waters to their pharmaceutical condition of crystallized salts, you will find them possessing little, if any more, power than similar salts as obtained by the ordinary processes, and met with in every chemist's shop. They no longer do their work on the same terms as when administered in the original water before they were separated by evaporation. You will therefore readily understand how essential to our end it is to employ the natural mineral waters; since what are called "artificial waters," however admirably prepared, are simply pharmaceutical products, and are destitute of the very quality which distinguishes the remedies they are designed to imitate.

Here is a table of the waters which I refer to, with a comparative synopsis of their distinguishing saline contents, representing the number of grains (without chloride of sodium and other less active agents which are also present) in an English pint. Below these I add two well-known alkaline waters.

—	Sulphate of Soda.	Sulphate of Magnesia.	Carbonate of Soda.	Other Ingredients.
Saline:				
Püllna	154 grs.	116 grs.	—	
Friedrichshalle	58 ,,	49 ,,	—	Little iron.
Marienbad (Kreuz) . .	48 ,,	—	9 grs.	
Carlsbad (Sprudel) . .	25 ,,	—	13 ,,	Little iron.
Franzensbad	30 ,,	—	6 ,,	
Alkaline:				
Vichy (Celestins) about .	3 ,,	—	47 ,,	Little iron.
Vals (Magdeleine) about	—	—	65 ,,	Little iron.

The most powerful water of the saline group is that of Püllna, which contains 154 grains, or nearly 2½ drachms, of sulphate of soda to the English pint, and nearly 2 drachms of sulphate of magnesia. Those quantities would give a tolerably efficient purge to anybody. But you must not give a pint of Püllna; 5 ounces would be a full dose. I do not like Püllna generally for our purpose, because it purges too freely, often gripes, and is very nauseous. Half a drachm of sulphate of soda and half a drachm of sulphate of magnesia in this form is too much for many people. I therefore much prefer Friedrichshalle, which contains not a drachm of sulphate of soda in a pint, and little more than three-quarters of a drachm of sulphate of magnesia. Nevertheless, you would not think of giving a pint; eight or nine ounces make an efficient purge; for many persons six or seven suffice. I think I may say that seven ounces is an ordinary average dose, and it should be warmed and diluted too, adding, say a third or a half of its bulk of hot plain water. If you take seven ounces of Friedrichshalle water in the early morning, say an hour before breakfast-time, then after the cup or two of hot fluid usually

taken at that meal, you will probably have a full, free action of the bowels; perhaps two. That, you see, would be about 25 grains of sulphate of soda and 20 grains of sulphate of magnesia, which, taken in any combination you like out of a druggist's drawer, would have no appreciable action; you might be a little uncomfortable perhaps, but there would be no action of the bowels. To repeat what I have said: if you evaporate a quantity of Friedrichshalle water in a warm water bath so as to avoid decomposition of the salt, or even loss of the water of crystallization, and so obtain as perfect a product as a chemist can produce, and administer four times as much of this salt as that which exists in a dose of the natural water, you would still not have such efficient or certain results as the small quantity contained in the natural water will give you. So that there is something, which I do not pretend to explain, and certainly shall not speculate about here, which distinguishes the action of mineral waters from the action of salts which are produced pharmaceutically.

The next water on my list is Marienbad, which contains no sulphate of magnesia, 48 grains of sulphate of soda in the pint, with 9 grains of carbonate of soda, and a small quantity of iron. With these constituents, there is enough free carbonic acid to make it an agreeable and slightly sparkling draught. Rather more than half a pint produces for most persons an easy motion. If this water is exposed to the air for a day or two, there will be an obvious brown deposit of the iron, and it may be regarded as slightly ferruginous, although that is a secondary character.

The next is Carlsbad, with its many springs, all of which contain about 20 grains of sulphate of soda and 13 of carbonate of soda in the pint; and differ from each other

only in the temperature; which is always very high when it issues from the source. Carlsbad water is often supposed to be purgative, but is not so unless taken very largely. No quantity ever given here exerts a laxative action on the bowels. The influence it exercises on the animal economy, although probably chiefly due to the sulphate of soda element, is not in any way as an aperient.

Then we come to Franzensbad, which contains 30 grains of sulphate of soda, 6 of carbonate, and a little iron, which Carlsbad does not. That closes this group of springs.

But now I shall just point out the distinctive characters of the alkaline waters which are so popular in this country. First, Vichy, which contains only 3 grains of sulphate of soda, but nearly 50 grains of carbonate of soda, in the pint —a powerful solution. Then we come to Vals, which is also from the volcanic district of France, some of the springs of which contain upwards of 60 grains of carbonate of soda, and nothing else worth mentioning. These two waters are extremely famous, and are much resorted to against gout and gravel. Under their use the uric-acid deposits disappear—that is, they are dissolved by the alkali. Inasmuch, also, as this appears to have some beneficial action on the liver, a certain degree of permanent benefit is perhaps also attained. Thus such patients are often better for a time after a visit to Vichy; but, as a rule, are not permanently benefited. I am satisfied, after observation on the spot, and on the effect of the waters here, that they only temporarily mitigate the complaint, and do not cure it. Now the principle upon which the waters of Friedrichshalle and Carlsbad are beneficial is, that they produce activity in all the digestive functions, and thus waste matters which have been hitherto thrown out as uric-acid

by the kidney are eliminated in some other form. And thus it is that, if it be necessary to send these patients abroad, I prefer very much Carlsbad to Vichy, provided always that the subject of a Carlsbad course shall not have become too weak, as for a time it makes a demand on the strength not well supported by a feeble person. Generally, however, this is not at all the condition of those who are passing uric-acid gravel. Happily, also, for most people our purpose can be attained as well at home. I believe that a short course of Friedrichshalle water first, followed by that of Carlsbad, or by a combination of the two, produces the best results in these cases. This method has, at all events, been more successful with me than any other. Such a course should be continued, according to circumstances, for six or eight weeks.

A few words upon the way in which you should give these agents. If you have a patient coming to you whose digestion is not good, complaining of foul tongue, with deranged stomach and loss of appetite, it is sometimes, not always, desirable to give first a single dose, no more, say three or four grains, of blue pill at night, and the next morning eight or ten ounces of Friedrichshalle water, so as to insure a free action of the bowels. Then commence the course with Friedrichshalle alone, say five or six ounces, combined with three ounces of hot water, every morning an hour before breakfast, diminishing a little the quantity of mineral water every day or every few days. And as you do so, three or four ounces of Carlsbad water may be added, taken together with the hot water from the same tumbler. One of the characteristics of Friedrichshalle is, that the longer it is taken the smaller is the quantity necessary to effect the purpose. If, for example, seven or eight ounces

taken in the morning, say with five ounces of hot water, produce one active movement of the bowels immediately after breakfast, the next morning six or seven ounces will do the same, and the morning after probably five or six ounces; and it is very likely that at the end of three weeks the patient will from four ounces experience the same effect produced originally by seven or eight. But after you have given it thus for a week or so, according to the nature of the case and the results, you should combine it with Carlsbad, say three or four ounces of the former and six or seven of the latter, with three or four of hot water every morning. When Friedrichshalle is given alone, and also when it is mixed with Carlsbad, 20 or 30 per cent. of hot water should be added that it may resemble somewhat the natural condition of the spring. Friedrichshalle is naturally hot, and is evaporated on the spot to a small extent, being regulated and rendered uniform by stopping the process when the water reaches a certain specific gravity; 1·022 at 54½° Fahr. After giving this combination of the two waters for two or three weeks, seven or eight ounces of Carlsbad may be taken alone for another fortnight or more; and if the bowels do not act fairly, one or two ounces of Friedrichshalle may still be added. Carlsbad, which at the spring is too hot to drink until cooled, should, when taken alone and unmixed, be raised in temperature to 90° or 100°, by placing the tumbler containing it in a vessel of hot water for a few minutes. The quantities given are considerably less than those administered at the spa itself, where a patient's stay is necessarily limited as to time. I am quite satisfied that the smaller quantity here recommended, and employed during six or nine weeks, instead of the usual three weeks of a foreign course, is better for a majority of the patients

we have to deal with. The same quantity of water given there in twenty-one days, producing often notable loss of weight and power, will, if given here in fifty or sixty days, attain the object as certainly and more safely. I by no means dispute that there are other cases which may be benefited by the more heroic plan adopted on the spot. I have largely and systematically employed these agents now for ten or twelve years, modifying the quantity and the mode as experience has indicated, and the system thus briefly described is the result of it. The course may be repeated with advantage, if necessary, for many patients after an interval of three or four months. Meantime, as an occasional aperient and a corrector of digestion for these patients, I know nothing at all equal to Friedrichshalle. It leaves the patient as a rule less constipated after discontinuing it than he was before; and, as already said, may be taken habitually without lowering the system. I have known patients continuing its daily use for three or four years, but I do not advise this course unless in exceptional cases. Nevertheless, I know a gentleman, nearly eighty years old, who has taken it for five years regularly, a wineglass every morning, and the effect has been for him most admirable. Suffering much formerly from an obstinate constipation, he enjoys perfect regularity and excellent health. Let me say here that what is called "Carlsbad salt" is often used for the same purpose, and is taken also in the belief that it represents Carlsbad water. This it does not do, since it consists almost entirely of sulphate of soda taken from the water, together with a little of the carbonate, and has the same and no more virtue than such a salt obtained from any other source. No doubt that the sulphate of soda, known also as "Glauber's salt," is one of

the most admirable medicines we possess, and deserves to be more popular than it is. I constantly ordered it, with or without a small addition of sulphate of magnesia, for the out-patients of the hospital, as the best substitute within their reach for the mineral waters in question.

In the few minutes which remain I will advert briefly to the subject of diet, certain restrictions in which are extremely important. It used to be said that when uric acid is largely deposited the nitrogenous elements of the food should be considerably diminished. I do not find in practice that a strict application of this rule is advantageous. On the contrary, diminution of the deposit is more certainly attained by a course which is almost the opposite of that. There are three classes of aliments which must be permitted to the patient very sparingly, in order to attain the end in view—viz., alcohol, saccharine and fatty matters. First, alcohol: any fermented liquor permitted as an article of diet should be selected in its more diluted and in its most pure form. No doubt for most patients, the best course is to relinquish altogether the habit of taking it. That it is not only not essential to the health of most persons, but is absolutely prejudicial to most, I am firmly convinced; but especially, however, to the "torpid liver" is it deleterious. No doubt, after long experience of the use of wine and beer, total abstinence at first entails no little hardship on some persons. They feel keenly for two or three months, or even more, the loss of their customary stimulus. In most instances, however, when this term has been passed, they are better, stronger, and no longer want any alcoholic liquor. But if the sacrifice is too great; or if there is a reason to believe that it is desirable, at all events while commencing the course of waters, not to make so great a

change, and that is I think the preferable course, I advise that form of alcohol which exists in light natural wines as the best, such as a light sound Bordeaux, or Rhine wine of similar quality, the former perhaps agreeing better with most persons here. You will forbid champagne, as for the most part imperfectly constituted, and always bad if containing much of the sweet compound often largely added and known as "liqueur." The stronger wines, as sherry and port, are most unsuitable, and strong beer is to be absolutely forbidden. Solutions of pure spirit and water may perhaps be exceptionally desirable for a very few persons with weak digestion. Secondly, sugar in all its forms, at every meal and wherever met with, forbid it altogether. Of the undesirable effect of saccharine matters in these cases I have a large experience. Thirdly, let fatty matters, butter, cream, and the fat of meat, whether simply cooked or in combination to form pastry, be taken very sparingly.

I cannot enlarge on the theory on which the foregoing advice is given. Suffice it to say that abstinence from the substances named probably lightens considerably the work of the liver, and so lessens the vicarious labour of the kidneys in accordance with the views already propounded. Let me just advert, however, to the dietetic system at Carlsbad. In recognition of some such principle there, no doubt, the use of sugar and of butter is absolutely forbidden during a Carlsbad course; and were you patients there, your purveyor would not supply you with the forbidden food, however much you might demand it. I can only say, as the result of observation, that this system, much more than the elimination of meat from the dietary, will reduce the uric acid deposit. If you will cut off a portion of alcoholic stimulant when necessary, and it mostly is so,

while in some cases, as we have seen, you may certainly with advantage forbid it altogether; if you will forbid everything that contains sugar, and diminish considerably all fatty matter—giving nitrogenous food in fact, and diminishing greatly hydrocarbons—you will generally accomplish more than by the contrary method. One class of food, neglected by most people, is particularly to be recommended here: I mean fresh green vegetables, for the most part cooked, of all descriptions. A sufficient quantity should be taken, at two meals in the day, to form an important portion of the daily nutriment. Apples, also, baked or stewed, without sugar, may be taken also, but not fruits containing much sugar—as grapes, pears, and plums. With many a light salad will agree, and if so, is quite admissible. Besides attending thus to diet, you will of course direct that the patient takes daily a fair amount of exercise in the open air, and that he protects his skin and encourages the performance of its functions by habitual ablutions and sufficient clothing. These points I can only name; but they are essential concomitants to the rest.

Well, then, it is this system of diet and regimen, and the occasional systematic employment of the mineral waters named, which mainly constitute the treatment I strongly advise for the purpose of checking calculous disease in its early stages, and so to prevent the formation of stone in the bladder in that considerable majority of cases which are due to uric-acid formation and its consequences.

LECTURE XVII.

ON THE TREATMENT OF STONE IN THE BLADDER BY SOLVENTS: ITS HISTORY AND PRACTICE.

Gentlemen,—The inquiry as to whether it be possible to dissolve stone in the bladder by medicinal agents, and so to avoid any operative proceedings for its removal, is one which is evidently exciting a good deal of interest at the present moment. During how many centuries has this question appeared and reappeared! Some accident calls public attention to it; much is written and said; little is done, and less is realized, in relation to this most desirable object; after which a cycle of indifference follows. Meantime, as the sum of these reiterated efforts, some sort of progress results. Nevertheless the subject is scarcely considered in standard surgical works, although it is one fraught with interest to us all. For myself, I confess, it has always had a degree of fascination. It would be so great a triumph to our art to dissolve the stone without damage to the delicate structures in which it arises and finds its residence. And thus it is that I have not only alluded to it in various works, but have discussed it at considerable length many years ago in one of them.*

I propose therefore to tell you what has been done, and what at present appears to be attainable by the agents employed; in short, to sketch the history of solvents for stone in the bladder from the earliest period to the present day.

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* The Enlarged Prostate (1858): last chapter.

You know that the existence of calculus was recognised, and that a cutting operation for its removal, at all events in the cases of boys, was practised, a few centuries before the Christian era. In course of time the attempt was made to dissolve it, especially in the case of adults. It appears that neither Hippocrates nor Galen entertained the belief that this was possible. One of the earliest allusions to the practice is found in Pliny, who says that "the ashes of burned snails' shells are good for expelling the stone." Aretæus (second century) recommends "quicklime in honeyed water" for the same purpose. Later authors, quoted by Paulus Ægineta (seventh century), speak confidently of the efficacy of goat's blood, and they observe that some solvents wrongly given increase the calculus.

Arriving at the period when medicine flourished in Arabia, we find numerous remedies and complicated combinations systematically given. The celebrated Avicenna (about the tenth century) enumerates many substances supposed to be efficacious. He and others of his time employed occasionally an impure carbonate of potash; but as an example of the kind of prescription current at this period, I give you one of them in full, translated from Avicenna, as it is a curiosity, and gives you a good idea of the very complicated mixture which constituted an ancient medicine:—"Take equal parts of calcined glass, of the ashes of scorpions, of the ashes of the root of colewort, of the ashes of a hare, of the ashes of egg-shells from which the chickens have escaped, of the stones found in the sponge, of goat's blood dried and powdered, of lapidis judaici; the same of parsley, wild carrots, marsh-mallow-seeds, and gum arabic. Make it into an electuary with honey."*

* Avicenna, lib. iii. fen. xviii. trac. i. c. xix.

Between this period and the fifteenth century we can mark no advance. About this time Basilius recommended the internal use of an alkaline salt, obtained from the cuttings of the vine in spring; this, on the authority of Boerhaave.* Crollius, in his Basilica Chymica (Frankfort 1608), recommended the patient to take a salt of tartar (carbonate of potash) in an infusion of parsley, and also some solutions of which lime was the principal ingredient. In 1650 Daniel Sennertus directs the internal use of the same remedies, and also that they should be injected into the bladder through a catheter. About the same time, Riverius, physician to the French Court, advises, as many others also did, the ashes of calcined egg-shells. The dose was a drachm of the powder, which was of course chiefly lime, to be given in white wine or with diluents twice a day; and it is stated that "potenter expellit calculum in urinæ meatibus hærentem."† Numerous other authorities might be quoted as repeating all these receipts with little or no variation.

Next in order comes, in this country, the famous Mrs. Joanna Stephens. This lady had acquired so great a reputation in the earlier part of the last century, that in 1739 the English Parliament, after a formal inquiry, purchased her secret for dissolving the stone at the cost of 5000*l.*—a circumstance which produced a large and remarkable literature during the next few years, and gave a great stimulus to research. The document, which was obtained at this cost, commences thus:—

"My medicines are a powder, a decoction, and pills. The powder consists of egg-shells and snails, both calcined.

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* Elem. Chimiæ, 1732, vol. ii. p. 73.

† Riverius, Praxis Medica, Lugd., 1657, p. 381.

The decoction is made by boiling some herbs (together with a ball which consists of soap, swine's cresses burnt to blackness, and honey) in water. The pills consist of snails calcined, wild carrot-seeds, burdock-seeds, ashen keyes, hips and hawes, all burnt to blackness, soap, and honey."*

The quantity given was a drachm of the powder three times a day, mixed in cyder or other liquor, and followed by half a pint of the decoction. If the decoction disagreed with the stomach, the pills were to be substituted. These compounds were found to be very nauseous, and were superseded by other agents.

After this, Dr. Whytt, Professor of Medicine in the University of Edinburgh (1761), brought soap and lime-water into favour, giving one ounce of "Alicant soap" and three pints of lime-water daily, and illustrating its use by a remarkable case or two.

In the hands of Blackrie (1766), Chittick—who made all his patients send locked cans of veal broth daily to his house that he might add the solvent and preserve his secret,—and others, mixed solutions of potash and lime were much employed; and a considerable amount of evidence of their utility to allay pain was published on good authority. Soap leys of different strengths furnished the potash in many cases; in others the "salt of tartar" was given, and always in a very diluted form.

In France at an early date alkaline remedies had many advocates, such as Darcet (1726)† and Pierre Desault (1736). Morand, the famous surgeon of Paris, who came to London to report to the French Academy on Cheselden's operation of lithotomy, made also very careful observations on

* *Gentleman's Magazine*, June, 1739, vol. ix. p. 298.

† Annales de Chimie. Paris.

forty patients treated by Mrs. Stephens's remedies. He was unable to certify to a single case of removal by the solvent, but said that four "thought themselves cured." Much later the subject of alkaline solvents was investigated by Fourcroy and Vauquelin; more recently by C. Petit (1834). The first and last named employed the Vichy waters. In Italy Girardi (1764) recommended the use of solvents, but extolled especially the virtues of a decoction of uva ursi for that purpose.

Meantime the vegetable kingdom had been largely explored for the same purpose. It will suffice to give a list of a few of the principal plants so employed during the last two or three centuries. I shall name those only which enjoyed the greatest favour. The "Banke cress," or "saxifrage" (hence the name): its seeds boiled in decoction of couch grass; dose of the seeds one drachm. Tincture of the "Pimpinella saxafraga." A tincture of the seeds of the "Lithospermum majus," or "great gromell." The decoction of "Broome;" a tincture of the seeds of "Fraxinella." Tincture of the root of the "Raphanus sativus," or garden radish. Tincture of the seeds of the common nettle. The marsh and yellow mallows, the couch grass, parsley, and the wild carrot were also ingredients in the compound decoctions employed.

And now I come to the experience of to-day. And I suppose you to inquire, What are the existing resources available for a patient who desires at the present time to attempt the solution of a stone in his bladder?

I shall divide these into two classes. First, there are the empirical remedies, which have a certain reputation; and secondly, there is the result of the latest investigation of the subject by scientific observers.

First, the empirical remedies. It is a curious fact that in almost every European country there exist certain persons who obtain a livelihood by making and selling remedies to dissolve the stone. The recipes employed are usually family heirlooms, and a sort of reputation clings to the family, each generation of which carefully preserves the secret, such as it is, and the traditions of their predecessors. In the same way the art of bone-setting, as you no doubt know, is associated with certain names and localities; an art the nature of which was so well discussed and appreciated by Sir James Paget in one of his admirable clinical lectures about five years ago. The solutions—for they usually take that form now—are sold in this country under the name of "constitution water," or some similar term; and they are moreover guaranteed to be useful in all forms of urinary disease.

Peculiar circumstances have given me large opportunities of observing and examining these agents. I have met with them here and in different parts of France. I well remember an old Frenchwoman and her son journeying on foot from the south of France to Brussels, about ten years ago, laden with a basket of heavy bottles filled with the family nostrum for a royal patient there. I may add that her devotion was substantially rewarded. Such unsolicited contributions, either material, as in this case, or by way of suggestion, of every conceivable kind, flowed in then from every part of Europe; and such is always the case in similar circumstances.

I may here tell you that I have recently (1873) received numerous communications on this subject from known and unknown correspondents, urging on me the value of the recipes which belong to the writers. I shall select two

which widely differ for mention here, each possessing interest of its own kind. One was from a French gentleman, who gives me his name, and offers an infallible cure, which of course he does not describe, but consents to communicate it for the moderate sum of a million of francs (40,000*l.* sterling); and I do not hesitate to say it would be well worth the cost if it could accomplish the wonderful results alleged to be within its power. The other is from an English labourer in Bedfordshire, who wishes me to know what cured his friend some time ago in the neighbouring parish. He freely gives me the formula, and it is a fair specimen of a good country recipe for the purpose, for I have seen many such, and it has some interest for us, as we shall see hereafter. I could not help writing my thanks to this man in reply, and was at some trouble to explain why his remedy might be good in some cases, and why it might be prejudicial in others. Here it is in his own words: "Get a peck of wood-ashes, and pour on them a gallon of boiling water; let it stand twenty-four hours: then strain it off as clear as possible, and take a wineglassful every morning, fasting." This is a large dose of carbonate of potash; our old friend the alkali, you see, always recurring. I had the curiosity to determine the quantity. A ley of wood-ashes thus made from pine-wood furnishes a solution of fifty grains of the carbonate to the ounce, so that the quantity taken at once was at least a drachm and a half or two drachms. The other soluble constituents of the ley are sulphate and silicate of potash and chloride of potassium.

Now as to the more pretentious compounds which are sold in this country as solvents, I have submitted the chief to careful chemical analysis, and I intend to present you with the result. Not that I had any doubt as to what

their general characters and composition were, nor of the fact that they were all nearly alike in their composition. But I wish you to have an exact statement founded on analysis. A recent examination of a well-known and typical one in some repute in this country, two bottles of which are placed before you, and which you may have for your own analysis if you please, is a simple undisguised solution of bicarbonate of potash in water. You see that they are ordinary wine-bottles, the old "wine-quart;" each contains about an ounce of bicarbonate of potash and fifteen grains of chloride of sodium—the latter possibly due to the spring water of which the solution is made. Half the bottle, which is equivalent to four drachms, is directed to be taken daily.

At this point, let us make a rapid survey of this long and curious history of man's painful, slow, and somewhat clumsy efforts to rid himself by medicine of his terrible enemy the stone. Observe that the agents have always been alkaline. At first, and chiefly, the alkaline earth, lime: you mark it as the agent in the calcined snail-shells of Pliny and the egg-shells of Avicenna, which do but reappear in that expensive prescription of Mrs. Stephens in 1739; but in Avicenna's time it was combined with potash, the representative alkali of the vegetable kingdom, as you see in the quantity of burned plants which enter into the composition; and Mrs. Stephens, probably without knowing it, employed also potash and soda in her addition of soap and calcined weeds and seeds to the egg-shells. Then lime-water and soap came next into fashion, giving a combination of the three alkaline agents named. And the popular remedy of to-day before you, sold at many shillings a bottle, and of which a large quantity is ordered to be taken daily for

three months, as the minimum dose and time, is, as you have just seen, a simple solution of bicarbonate of potash in water; and the cost of it is actually less than the bottle and the cork which enclose it! Our country labourer's nostrum is nearly as good in form, has precisely the same solvent power, and is almost absolutely without cost.

Then there is another popular remedy—namely, Vichy water, which is so largely employed by patients with urinary maladies, and which in its time has been vaunted for its solvent powers on the ground that it consists mainly of a strong solution of carbonate of soda, the alkali of the mineral kingdom.

We are now in a position to arrive at the following conclusion, the only one possible—viz., that all the quack and would-be secret medicines employed from time immemorial to the present day are solutions of either lime, soda, or potash, alone or combined. All the plants, after combustion, furnish alike only one and the same active agent—viz., potash; all shells, whether of eggs or of marine and land animals, furnish alike only one and the same active agent—viz., lime.

Lastly, the medicinal remedies employed by the faculty everywhere, at the present day, are hydrate of potash, in the form of liquor potassæ; the bicarbonate, the citrate, the acetate, and the tartrate of potash. After them, and less generally employed, are soda and lithia in different forms.

Now, before entering on any consideration of the applicability of all these agents as solvents, from a scientific and not from an empirical point of view, it is necessary to examine briefly the substances they are designed to act upon—namely, the stones in the kidney or the bladder which it is desired to dissolve. And the first fact that

must strike you at the outset is, that these calculi are of different kinds; some having characters diametrically opposite to those of another kind. And the question naturally arises, Is it possible that one form of remedy—namely, the alkaline agent—can be adapted to dissolve calculi whose composition is so varied?

I shall remind you of those general terms which I used in a recent lecture on that subject to classify the varieties of urinary calculi. Three-fifths of all the calculi met with among adults of all ages are composed of uric acid and the urates; nearly two-fifths are phosphatic, and about 3 or 4 per cent. are oxalate of lime. Cystine is too rare to be admitted to our reckoning. Three-fifths at least then are the products of a urine abounding in acid, of which excess they are the expression. The remaining two-fifths are the product of urine generally alkaline, mostly ammoniacal, of which condition they are the result. The urates, the oxalates, and a very few of the phosphates, are formed in the kidney, and are the product of certain constitutional derangements; the greater part of the phosphatic material, whether in mixed or in phosphatic stones, is produced solely in the bladder, and is the product, not of a constitutional state, but of local disease there. Now, uric acid we know by experiments conducted out of the body, to be easily soluble in alkaline solutions, but some of these have a more energetic solvent action than others; and the resulting salts vary in solubility. Thus, urate of lime is a rather soluble salt. Urate of soda is less so, and in this form enters into the composition of some calculi. Urate of potash is more soluble than either of them. Potash is the most powerful agent that can be employed on a uric-acid calculus, among those materials which can be taken in-

ternally for a long period of time with comparative impunity. These facts, then, indicate it as the most desirable solvent to employ under certain conditions, hereafter to be described, and as such it has long been regarded. Nearly twenty years ago I called attention to its pre-eminence for this purpose, stating that the "citrates and carbonates of potash are more potent and certain than Vichy water" for the treatment of "uric acid in the form of gravel," and that they should be given largely diluted, pure water itself being one of the best solvents.* I may add, that I have always declined to prescribe Vichy water for any urinary affection, and on the ground of its inferiority to the potash solutions. I think the citrate of potash may be fairly said to be the salt which of all others offers the best chance of success; and this by common consent of all who have examined the subject. If, however, it exerts too much diuretic action, as in some cases it seems to do, the next best may be employed—namely, the bicarbonate or liquor potassæ.

A question of great interest comes before us here—Has citrate of potash been fairly tried on stone in the bladder by a competent observer? I am happy in being able to answer this question in the affirmative. An accomplished physician, Dr. Roberts of Manchester, formerly a distinguished pupil of this school, has made carefully conducted experiments on calculi in and out of the bladder with certain results. I give you the following brief analysis of them.

Dr. Roberts finds carbonate of potash to be the most powerful solvent: better than soda, much better than lithia. The solution must not be too strong, otherwise an alkaline

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* *The Lancet*, 1854, vol. i. p. 439.

biurate coats the calculus and solution is checked. The best salts to administer by mouth are the citrate and the acetate, these, as you know, becoming carbonates in the urine. The adult dose should be forty or fifty grains in three or four ounces of water every three hours—equalling six drachms daily. The urine thus rendered alkaline may become cloudy from amorphous phosphates, but this state does not hinder solution, provided the urine is not also ammoniacal; but if it becomes so, it is most important to bear in mind that all solution then absolutely ceases. Hence it is useless to attempt the solution of a uric-acid stone unless the urine is naturally acid. If the urine is alkaline before commencement it is certainly ammoniacal, and no solvent will act, as mixed phosphates are deposited on the surface of the stone. He admits that it is quite useless to attempt the solution of a large calculus of any kind, or of an oxalate-of-lime calculus; and that nothing can be done with a phosphatic calculus except by injection into the bladder. Lastly, he states, alkaline injections of the bladder for uric-acid calculus are without efficacy. To resume: the following conditions are essential to success; certainty that the stone is of uric acid, and that it is of small size; that the urine is acid, and never ammoniacal. These extremely favourable conditions existing, the most powerful solvent known—potash—offers a fair chance of diminishing its volume considerably after a trial of several weeks, so that the nucleus may perhaps be passed by the urethra; but at present Dr. Roberts is not able to report so complete a success.*

There, that is the best thing that modern science has yet

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* Practical Treatise on Urinary and Renal Diseases. 1872.

done towards accomplishing the dissolution of the stone. Then you say, Have there been no results whatever from the empirical methods you have described? Have miserable calculous patients for two thousand years been swallowing to no purpose all the nauseous mixtures described from Pliny to Joanna Stephens, and onwards through Chittick, with his locked cans, to the nostrum dealers of our own time? I wish to give you a fair and distinct answer to that question, and will do so as far as it is in my power.

I reply, first, that there is very slender evidence as to the complete solution of a stone in the bladder by any alkaline agent. I cannot find that any patient, certified to have stone after sounding by a competent surgeon has, after a course of any solvent, been again sounded, or submitted to autopsy, and demonstrated to be free from stone. Less evidence than this is quite valueless. That the alkaline solutions often greatly palliate some cases, and enable some patients, but by no means all, to continue in comparative comfort without extraction by any method, I have always been perfectly satisfied. I have seen some remarkable examples of their influence among those aged and very infirm persons whom it would be impossible to submit to any cutting operation, and whose calculi are not within the limits of lithotrity. Such have sometimes been enabled to spend the remainder of their lives with little or no suffering, provided that they were also enabled to maintain a condition of repose and freedom from movement. Sometimes, on the other hand, the freedom from pain which they produce is temporary only; and in some cases, as I have not seldom seen, the effect of alkaline agents is to produce considerable aggravation of the symptoms. This was often observed during the "soap and lime-water" period.

The degree of palliative influence, however, is not the subject before us, but the question of complete solution of the stone. Morand's cases, already referred to, of which twenty-two were sounded before taking the medicine, did not supply a proved example of success. Among the alleged triumphs of the lime and potash treatment, many after death were examined and found to have stones still, often numerous and large, in the bladder.* But what is more to the point is, that the four persons whose cures were certified by the trustees appointed by the Government to examine into the merits of Mrs. Stephens's remedies, died, each one of them with stone in the bladder, where it was found by post-mortem examination.†

The case of Horace Walpole in the last century is well known; it was written by himself for the Royal Society. He commenced—being nearly seventy years of age—to take from half an ounce to an ounce of Alicant soap and three pints of lime-water daily for many months at a time, and with short intervals up to the period of his death at seventy-eight. He experienced great relief after taking them for a year or so, and ultimately believed himself to be cured. At his death three smallish calculi were found in his bladder. The case naturally attracted much interest at the time, and is one of the best results on record.

But there is another curious fact in connexion with this matter, which is, that the great majority of patients who took these medicines then, and who take such now, are not the subjects of stone at all. They have some symptoms

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* Dr. James Parsons reports twelve post-mortems of Mrs. Stephens's patients who, dying, were found in that condition. A Description, &c. London, 1742.

† Alston's Lectures in the Materia Medica, vol. i. p. 268. London, 1773. Their names were Gardiner, Appleton, Norris, and Brighty.

which resemble what they are pleased to consider calculous symptoms, and they take large doses of alkali—notoriously one of our best remedies for urinary irritations—and obtain relief. They then tell their neighbours, and often certify in print, that they have been cured of that "dangerous malady the stone." These are the great cures which the nostrum-mongers rely upon. For what happens to those few of their clients who really have stone? Two things may happen: first, that the stone, if uric acid, becomes coated, as Dr. Roberts has described, with the biurate, which either adheres or comes away in scales; or, secondly, the urine will become ammoniacal; and thus in either case no dissolution whatever can occur. During the time, however, large quantities of white sediment composed of the earthy phosphates or of shell-like fragments of the biurate, to say nothing of the white granular deposit of the mixed phosphates, come away; all which the poor patient believes to be the débris of his stone and the proof of the efficacy of the solvent process! This fact exists in the great majority of cases, and is always appealed to as an infallible sign of the value of the agent! Meantime the stone is acquiring, not slowly, fresh layers of deposit, and is becoming surely larger. Such must often be the inevitable result where the medicines are empirically given—that is, without reference to the nature of the stone and the condition of the urine, and where the procedure cannot be watched and regulated on the principles laid down above. But, say you, this is a mere *à priori* statement, and looks very plausible, no doubt; but how do you know that this happens? I will give you one instance which will suffice, and can give more if required. A few years ago a man came to me from Yorkshire, who, having had symptoms of stone for a con-

siderable time, was advised to take some well-known solvent for his malady. Accordingly he did so, and you will agree with me probably that he took enough to insure it a fair trial, for he swallowed twenty-five pounds' worth of that very water which you see before you on the table. He was relieved, but his life was necessarily an active one, and he had not the means of repose and the luxurious surroundings which Horace Walpole had, and his stone symptoms ultimately got worse. At last he came to me, and I crushed for him a large mixed calculus. Had he come to me before it would have been a smaller one. The case did well, and the man lives at this day to tell the tale, and, if necessary, he is ready to tell it again.

Now mind, I do not say that a calculus has never been dissolved, nor that it is impossible to dissolve a small uric-acid calculus by alkaline agents taken internally. I will go further, and express my belief that, given abundance of time and careful supervision, it may be possible. Nay, I will do more; the first case of such a kind that comes into the hospital, the patient consenting, I shall be pleased to submit to the process, and to give it a fair trial. But this I say with certainty, that there is no evidence whatever that one case in a hundred of those who have swallowed solvents for the stone has been cured of it, during all past experience down to this day. No man who deliberately takes solvents for even a small calculus the characters of which have not been carefully determined, can reckon on any better chance than this—viz., that it is a hundred to one against their success, and that it is probable that his stone may grow bigger meantime. And if the stone be large, the solution is impossible.

What is the value of the treatment in question? It is

impossible to say more than that it may be valuable, not for stone in the bladder, but for that earlier stage of the same malady—stone in the kidney. That is the period of its history in which to attack the stone by solvents. When small uric-acid calculi are passing periodically or occasionally, much may be done: first, and I believe mainly, by preventive treatment, on principles I have already explained to you in a lecture devoted entirely to that subject; and that being insufficient alone, secondly, by alkaline treatment. With these two together, there ought in time rarely to be much trouble with stone in the bladder. I confidently anticipate a future in which any severe operation for it will be rare. Uric-acid stones only, as you know, are amenable to the process by solution, and happily, they form the very large majority of renal calculi.

I must say a few words about agents to be used locally in the bladder for the solution of phosphatic stones, which are not dissolved, but rather increased by the internal remedies already described. This is a matter, one may say, almost of daily practice. You know that there are many patients, chiefly those who are unable to empty the bladder except by catheter, who are very prone to form calculous matter of the mixed phosphates, and this at a very rapid rate. For these persons acid solutions injected into the bladder are very valuable. The patient may be taught to do it himself; numbers have been taught in my wards. Once or twice a day, after withdrawing all the urine by catheter, he applies to the end of it a four-ounce bottle, with stop-cock, containing a solution of acetate of lead, about one-third or one-half a grain to the ounce of distilled water, or of one, two, or three minims of dilute hydrochloric acid to the ounce. He throws in half the contents, and

allows it to issue, carrying out with it some small débris perhaps. He next injects the second half, and allows it to remain there. This does much to prevent the formation of phosphatic calculus, or, at all events, of the aggregation of its elements in the bladder. I have no time to describe the considerable extensions of this process in the matter of quantity, &c., which are possible when more than this has to be achieved. See the Lectures on Lithotrity, pp. 193 and 206. The principle is the same, and the extension of it is easy; and I have elsewhere gone into detail in this matter.

I must not omit to name the agency of electricity which has also been locally employed, both for uric-acid and for phosphatic stones. Prevost and Dumas (1823) attempted direct solution of a stone in the bladder by the galvanic current, a plan which was more fully developed here by Dr. Bence Jones (1852). The amount of instrumental manipulation, however, necessary to bring the wires into contact with the stone and to maintain them there during the period necessary for its solution is considerably greater than that required to crush the stone by the modern method of lithotrity, and must therefore be regarded at present as inapplicable.

And now comes the inevitable final conclusion, inevitable because true. It has been shown that there is no chance for the dissolution of any but a small stone, and this provided only that it exists in the most favourable circumstances: and lastly, that in order to accomplish the task a considerable period of time must be devoted to the process.

For such a stone, Gentlemen, but one or two, rarely three sittings, by lithotrity are necessary. And, thus limited, no operation in the whole range of surgery is more certainly safe, rapid, and successful. I repeat the state-

ment, that such a case I have never lost in the whole course of my experience. Nevertheless, let the patient's voice be heard in determining the course to be pursued. He claims the right to exercise a choice, although he may not always manifest his wisdom in doing so; but it belongs to us to give him a full view of the relative merits of both methods. What they are I have endeavoured impartially to set before you.

LECTURE XVIII.

ON TWO CASES OF REMOVAL OF EXFOLIATED BONE FROM THE BLADDER.

The case before us is so unusual that I shall briefly recapitulate the history, and illustrate it by referring to one other very similar case on which I operated in this ward some years since.

You will remember that I performed the lateral operation on this lad three or four weeks ago, and you see that he is now making a good but rather slow recovery. He was sent to me by Mr. H. Evans, of Hampstead, and was admitted here on the 14th of February last.

W. D——, aged fifteen, a weak-looking lad, much reduced by long and severe sufferings, from symptoms of vesical calculus of at least three years' standing. I sounded him on the 23rd, having been prevented from making my usual visit sooner; and, at once striking a large stone, observed that I would next introduce a lithotrite to measure it, and ascertain whether it might possibly be within the compass of lithotrity, as he had a good urethra for his age. I did so, and, grasping it, remarked to the students around that it was unlike "in feel" to stone, that in turning it over I felt a portion projecting, and would remove a little bit in the blades of the lithotrite to see what it was composed of. I did so, and withdrew the instrument with a small piece of bone between the blades. It was handed round, and we all saw that there was no question as to its

being bone. I then learned the following history, with which I had previously been unacquainted. It was carefully taken by Mr. Lang, the ward clerk, whose words I now quote :—

"Four years ago the lad was run over by a cart, a wheel of which passed over his pelvis on a level with the superior spine of the ilium. Considerable bleeding from the urethra followed, and for more than a month after the injury he was unable to pass water by his own efforts, and a catheter was used to draw it off. Soon afterwards he felt pain during and after voiding urine, which was occasionally mixed with blood. During three years past he has also occasionally passed 'grit.' Once, about three years ago, he says he passed a piece of bone."

The usual symptoms of stone were present, but not in a very marked degree. I then determined, on account of the size of the foreign body, the irregularity of its form, and the certainty that it was at all events in part composed of bone, to perform lithotomy, and eventually decided on the lateral operation, after considering the claims of the high operation, which could not be overlooked in a case of this kind.

On the 6th of March I performed the operation in the usual manner, making the incisions rather free, and removed several loose phosphatic masses, and then a larger one, measuring about an inch and a half in length, which proved to be bone highly encrusted with phosphatic deposit. (See Fig. 56.)

I need make no detailed remarks on his progress, which has been an uninterrupted convalescence, except on one occasion by a large deposit of phosphates on the surface of the wound, which was removed and has not reappeared.

He now passes water mainly by the urethra, and a small quantity only continues to flow through the wound, which has not at present entirely healed.

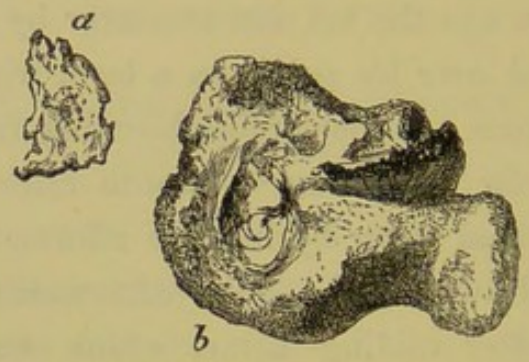

Fig. 56.—*a*. The piece of bone withdrawn by the lithotrite at the examination. *b*. The bone surrounded by phosphatic matter removed by lithotomy. A number of large fragments of phosphatic calculus were also removed, but are not represented. The above are shown of the actual size.

Now it must appear to you, as it really is, a very remarkable circumstance that a portion of bone detached by fracture from the pelvis should find its way into the bladder, and become the nucleus of a stone, requiring four years after to be removed by lithotomy. But, as I said before, the process which Nature instituted here may be illustrated by another case, equally remarkable, which I will briefly relate.

During June, 1865, I found, at one of my hospital visits in this very ward, a man aged forty, sent to me by the late Dr. R. Uvedale West, of Alford, Lincolnshire. I sounded him, and then, as usual, introduced the lithotrite to ascertain the precise size of the calculus; and, having done so, remarked to the bystanders, as in this case, that the mass did not feel like stone, and that I would withdraw a small portion as a specimen. I did so, and at once produced a small piece of bone for their examination. But in this case the mass was comparatively small, and I resolved to perform

lithotrity. I did so on June 27th and 30th, crushing bony matter and phosphatic matter together; and on July 3rd I removed a portion of bone with the forceps which had become impacted in the urethra. On the 15th of July he was discharged perfectly cured. The bony portions removed are shown in Fig. 57, and are drawn from the original now in my possession. One of the smaller pieces was removed by the lithotrite; the largest is that which became impacted as described. As before, the loose phosphatic matter is not represented.

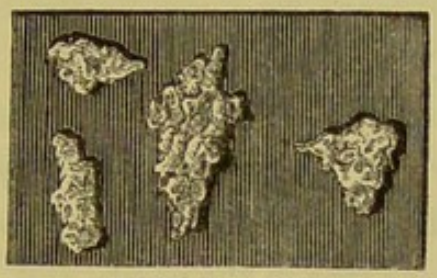

Fig. 57.

Now, what was the history in this case? Of course, as soon as I had withdrawn the bit of bone at the first examination I cross-examined him as to his history, and learned that during seventeen years he had had several attacks of pain in the right hip-joint, followed by abscess on three occasions. The last occurred two years before, soon after which he had symptoms of stone in the bladder. On stripping him, there were the cicatrices, and there also was the resulting deformity on the right side. At that time I presented this case, believing it to be unique, to the Medico-Chirurgical Society, with the bone and phosphatic fragments removed.* I stated that the origin of the stone had, without doubt, been a portion of necrosed bone from the os

* Vide *The Lancet*, March 3rd, 1866.

innominatum, which, instead of being extruded externally, in the usual manner, had found its way, by slow ulcerative absorption of the tissues which lay between it and the bladder, into the cavity of that organ. The bone here soon acquired a phosphatic coating, and produced the symptoms which led to its detection and removal.

In the case before us no doubt the same process took place. I do not imagine for an instant that a portion of bone was forced by mechanical violence into the bladder at the time of the accident. The organ was injured at the moment of fracture—as we know by the hæmaturia, and by the loss of ability to expel urine by the natural efforts,—and almost certainly by a portion of bone which became detached, but which probably was only partially driven through the coats of the bladder at first. Subsequently, no doubt, it became free in the cavity and acquired a coating of phosphates, and produced the symptoms of a foreign body there.

I shall briefly refer to the only cases I know on record in which bone is the nucleus of a calculus. The first is in the museum of the Royal College of Surgeons, London—a large phosphatic calculus removed from the female bladder; in the centre of this formation is a piece of bone, but no history whatever of the specimen exists. The second is to be found in the American "Report of Surgical Cases in the Army," Circular No. 3, page 259, in which lithotomy was performed for a large phosphatic calculus in 1865; in its centre was found a small piece of bone; and, as the man was wounded in 1862 at the battle of M'Dowell by a ball which passed through his pelvis, shattering the horizontal ramus of the left pubic bone, there can be no doubt as to the nucleus having resulted from the gunshot injury.

I have only one more remark to make relative to the two interesting and instructive cases which form the subject of our remarks to-day. It is to recommend you always—in accordance with the rule I have so constantly given and insisted on when lecturing on stone in the bladder—to make a careful and accurate diagnosis of the case, before entering upon any operative procedure, in every case of stone. For this purpose a rather small and light flat-bladed lithotrite is one of the most useful instruments. Were there no such process as lithotrity, the lithotrite would still be an invaluable instrument in this respect. By its means you see how easy a thing it is to determine the size, form, and composition of a foreign body before deciding the question, often so momentous, as to how it must be removed. For this purpose the old, clumsy, heavy instrument is wholly inadequate. Extreme lightness and facility for being moved are the essential requisites for such a tool; and the more I see of calculous disease, the more I am impressed with the value of such an one for the purpose of acquiring an exact notion of the body on which I am called upon to operate before I decide on the method to be adopted.

LECTURE XIX.

ON THE FUTURE OF OPERATIVE SURGERY FOR STONE IN THE BLADDER.

(*Delivered before the Midland Medical Society at Birmingham*, Nov. 1873.)

[After a few observations relative to the occasion of his visit and the selection of the subject, Sir Henry Thompson proceeded as follows :—]

The title I have chosen may probably, at first sight, suggest to you rather a speculative consideration of the subject than a practical one. On the contrary, I desire that it should be wholly practical, and I hope before the conclusion of my remarks to convince you that it is so. I admit it is not usual to commence the study of any surgical procedure by a forecast of what it may become in the future. You know that one generally first wades through some epitome of the ancient authors; and that most writers commence by observing that Galen and Hippocrates alluded to the subject, or, if they did not, by equally stating that fact; and so onwards through the learned Arabians, down to the renaissance for the experience of Ambrose Paré, Richard Wiseman, and the rest; and thus finally arriving by degrees at our own era. But this method, interesting and instructive as it is, is by no means what I intend to follow to-night. I propose distinctly a question relating to the future, and not at all to the past. I do so because I think we have arrived at a point in the history of surgical operations for stone in the bladder at which we are entitled to do that. Forecast, or prophecy—which is perhaps a

rather more formidable word than I like,—becomes always possible, to a greater or less extent, when we are well acquainted with the existing data belonging to, or constituting, the matter concerning which a prediction is to be made. Now I doubt if there is any surgical subject to which this axiom better applies than that which I have chosen for discussion.

I commence then, boldly, by saying that I have come to the conclusion that stone in the bladder, like many other maladies, is an exterminable one. I believe that this grave malady, which has tested surgical skill during two thousand years and produced a ponderous literature, which has been dreaded beyond all things by mankind, and has been the source of untold suffering to thousands in every age, is nevertheless a malady which may be exterminated; so far, that is, as it is a painful and dangerous one.

The greatest achievements of the healing art, throughout all time, are those which have been connected not merely with the cure but with the prevention or extermination of human maladies. You know that I can name diseases of the gravest kind which, thanks to scientific medicine, do not now exist. The plague, at all events with very slight exception, is in Europe a matter of history, and has been so for a long period. Small-pox is, at the present moment, simply an anachronism. It has no right or title to existence, and shows itself only because some people are foolish or ignorant. I will go further, and say that typhoid and other eruptive fevers are falling into the same category, and only await increased human intelligence and determination to become things of the past. And I feel sure you will agree with me that cholera must equally become subject to our control. Indeed, it is impossible that it can

be otherwise. All these glorious conquests belong to "medical" work, conventionally so called; although I protest against this most unnatural divorce between two divisions of the healing art which never can be practised apart, as I shall have occasion incidentally to illustrate. Still, and just as naturally, "surgery," specially so regarded, has not found its function so much in the extermination of disease as in its cure and repair. But on this occasion I desire to claim especially for surgery, and as the result of purely surgical practice, the accomplishment of the great enterprise I venture to set before you.

Before, however, I enter upon that future which I have undertaken to discuss, it is necessary first to sketch briefly the state of surgical practice relative to stone in the bladder during the present century.

Let me say, in general terms, that fifty years ago any man with a stone in his bladder, could have it removed only by the knife; an operation universally allowed to be a very serious one in middle age, and at advanced age to be attended with extreme risk. About this time—that is, in the year 1824—Civiale removed calculi from two patients, in the presence of the Academy of Paris, by a process of drilling and grinding them with instruments introduced through the urethra into the bladder. From that time to this, that process, generally termed lithotrity, has been developed into the now widely different and greatly improved operation which is adopted at the present time. During the first twenty years of its progress it was probably the cause of increased mortality among stone patients; the inevitable result of change from a system of operating elaborated by the hands of masters during many centuries, to one totally different and to which every man's hand was new. Still it

lived on: men had faith in its future. Barbarous as the earlier instruments and the earlier practice might be regarded to-day—indeed it would be really barbarous to use those instruments now—they served during a transitional period as materials to be improved by experience. And so by slow degrees the almost perfect mechanism of to-day—the light, I had almost said agile, yet powerful instrument of to-day—results, after an infinity of suggestions and many long years of trial, from the coarse, heavy, slow tools which were, partly by persuasion and much by force, introduced into the patient's bladder some years ago. And precisely, by equal steps, the demonstrable result by cure became better and better. Meantime those who could not perceive the value of the new method, as I quite readily conceive they might not, sought other modes of reaching the bladder by incision, which should be safe, or at any rate better adapted to the smaller stones with which lithotrity, at all events in prudent hands, alone proposed to deal. And so the bilateral, the ordinary median, or that refinement of it known as "pre-rectal," or some other inconsiderable deviation from the beaten track, was essayed for the purpose. Inasmuch, however, as anatomy remains the same, we can scarcely expect much improvement in the route by which the surgeon is to reach the bladder by the only two outlets at his service—either above or below the arch of the pubes. Who has not studied that great problem in silent thought at night, as well as in the dissecting-room by day? What a long line of devotees to our art have given their best energies to win, if ever so small, some tiny point of vantage ground in the perfecting of lithotomy; seeking how better to approach that canal, or avoid that vessel, or injure least that gland. And what is the verdict relative to that which

is the chief among all the newer modes, as compared with the classical lateral operation? I can scarcely ask you to hear it better than from the lips of my friend, Mr. Cadge of Norwich, who, after a careful and extended analysis of the results at Norwich of the median operation, says: "My present experience teaches me that it is advantageous and suitable only for those patients in whom the stone is of small size . . . . Beyond this limit the path becomes thorny and dangerous," &c.* This expresses the same view I have held in my lectures respecting it, and I think is receiving the general assent of surgeons who are studying the subject by comparison, and among them I include some operators of experience abroad, with whom I have recently had the advantage of conferring on this matter.

I now come to what the lithotrity of to-day is capable of performing, and before doing so I must say a word about the numerical results of calculous cases, in relation to mortality. I find that there are still some persons who persist, in connexion with this subject, in presenting to public consideration numerical results in which the cases of children and of adults are indiscriminately mingled. Now this practice is eminently misleading; and if not due to utter thoughtlessness, there can be only two causes for the usage.

It must be either from gross ignorance of the relative degrees of hazard attaching to the two sets of cases, or from an intent to mix as large a proportion as possible of children's cases with those of adults for the purpose of making a small mortality for the total. Now, in the interest of truth, or for any honest purpose whatever, it is essential to keep apart the cases of stone which occur before puberty

* Median Lithotomy: a paper read at the Annual Meeting of the British Medical Association, London, 1873.

from those which occur after that period.* Before puberty lithotomy is a notoriously safe operation, and at most not more than one death occurs in sixteen cases. Among adults the operation is always hazardous, so that the average results of the best lithotomists (*who treated all their cases by that method, and none by lithotrity*—a very important consideration) is about one death in every six cases from puberty to fifty-eight years ;† and from that to eighty, about one in every three and a half cases.‡ The case of the adult furnishes a condition wholly different from the case of a boy, whose sexual organs are as yet undeveloped, and in whom none of those intricate and subtle sympathies exist between the constitution at large and the reproductive organs. It is these which, in the adult, exercise so great an influence, giving origin to the phenomena we term "urethral fever," sometimes grave, and which we rarely or never meet with among boys and females. Of these I say little or no more to-night. Reject then all figures in all tables in which these two classes are not clearly defined.

It is my business to-night to deal with stone in the adult —the largest and most important part of our subject ; and in speaking of what lithotrity can do, although it is not absolutely powerless for children, being only useful for very small stones, I beg you to bear in mind it is solely a question

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* Cheselden speaks of the importance of always giving the age, and does so in each of the 213 cases he published. Of these, 167 were under twenty. He only cut 14 persons above fifty years of age, of whom 6 died. (Cheselden's Anatomy, 5th edit., pp. 322-3. 1740.) Martineau's well-known run of 84 cases, with two deaths, contained 34 cases under fifteen years of age, and 6 of females ; only 12 were over sixty years. See also p. 214.

† A series of 528 cases.

‡ A series of 271 cases. See author's Lithotomy and Lithotrity, 2nd edit., p. 142.

now of stone in the adult, and that necessarily means stone in the adult of advanced age.

To pursue my subject. I place before you four trays from my cabinet, holding about two hundred calculi removed by lithotrity: the mean age of these two hundred cases is upwards of sixty years; there are very few below forty, many between seventy and eighty. To be exact, there is a tray of sixty-three rather small stones, two trays containing ninety-nine stones of middle size, and a fourth tray containing thirty-five stones of rather larger size; in all, one hundred and ninety-seven. I could have brought you many more, but these will suffice for my illustration, containing as they do several remarkable individual specimens.

Let me now consider the single question—What is the object we propose to attain in lithotrity? I answer, in brief, to reduce the stone to such small fragments that they may pass easily by the urethra, and to do this by exerting as little mechanical action as possible.

We are to aim at applying force to the stone in such a manner as not to injure the delicate canal which must be traversed, and the sensitive organ, the bladder, in which it lies. And the force should be so applied that the minimum of irritation should accrue from the fragments that are made. In fact, the sources of danger in lithotrity are but two in number: injury to the soft parts by the instruments employed; and injury to those same parts from the sharp edges and angular forms of the fragments which are produced by the process. When we have reduced the mechanical action to the minimum of capability to inflict mischief, and have learned to make fragments in such a manner that they shall produce the least amount of irrita-

tion, why then we shall have arrived at perfection in lithotrity. Hence it is that I have always endeavoured to work with the fewest and most simple instruments possible, and to reject preliminary injections always, and subsequent washings-out as far as possible.

How far have we solved the problem in question? I answer, perfectly, in relation to calculi of a certain size. With a calculus of certain weight and dimensions, whether of uric acid, phosphates, or oxalate of lime, say not exceeding the volume of an ordinary nut, a perfect result may be ensured. I call your attention to that tray containing sixty-three stones, and in which, let me remind you, the patients were of a mean age of over sixty years. There was not a single death among those cases. The size I name was not exceeded. And I assert that I have never yet had a death following the operation of lithotrity in which the stone was within the limits of that size. Nor have you any right to expect anything but success with such stones, requiring, say, two sittings, or perhaps three at the most, if you only take care to act with the utmost gentleness.

So far, then, is the problem solved, and triumphantly. But it is another thing when the stone much exceeds these dimensions, and where not two, but five sittings are necessary for its removal; and, *à fortiori*, danger still increases when the requisite number of sittings rises to eight or ten.

In the next two trays are about a hundred stones of middle size. At this size, which is that, say, of an almond in its shell, the result is still most excellent, far superior to that of lithotomy, but not a sure success as before. Hence a certain small proportion of deaths was met with—about one in twelve or thirteen cases.

In the last tray of larger stones, the mortality was more

considerable, perhaps one in eight or ten cases. With regard to some of the latter, it is quite possible that some of them would have been better cut. No man is always wise, and errors of judgment must be admitted; he is the best who makes the fewest, and marks well his errors, when they are made, for future guidance. After the event, also, with the fresh light of the past on the case, it is easier to know what should have been done. Then there must always be a number of cases in which the choice of operation hangs on the slightest circumstance. There is a wide border-ground, so to speak, which is common to both operations. No man, whatever be his experience, can lay down a hard and fast line, and say, "On this side lie the circumstances which determine lithotrity, and on the other side are the circumstances which make lithotomy imperative." The border-ground is much broader than I often like, and there are a good proportion of cases in which it is impossible to predict which operation of the two will be most successful: stones which are just large enough to be crushed, which are certainly not outside of the limits of size for lithotrity, and in patients of a certain class for whom a half-dozen sittings will not tell heavily. On the other hand, the crushing of the same stone in the sensitive patient with a worn-out nervous system, may make too large a demand on his endurance. I do not *know* that. I only say it may; for, after all, the hale and hearty country squire, "who has never been in bed a day in his life," and who never ailed anything until he had a stone, often bears confinement and attacks of irritation less easily than any other patient whatever. Indeed, it is most difficult sometimes to decide; and sometimes the patient who is approached from sheer neces-

sity, with fear and trembling for the consequences of interference, turns out the best of all, and astonishes you with his capacity for getting well. Thus you see the only certainty of attaining success lies in getting the stone to operate on when it is small. And success being absolute then, as I think I have been able to prove beyond all manner of doubt, it follows as a matter of necessity—

That the Diagnosis of the presence of stone in the bladder, and of its size, is a matter of the highest importance.

I affirm that it is not less important to be capable of finding a stone when small and determining its size, than it is to perform the operation properly afterwards. I might almost go further: I think I shall find you agreeing with me before I conclude, that the diagnosis I speak of is the more important matter of the two; and that I may venture to say that I would rather, for the sake of calculous patients at large, and for the future of lithotrity, have keen diagnosticians than expert handlers of the lithotrite, if I could not have both. Because, as we shall see, all progress depends on the *early* diagnosis; for when the stone is really small, no man worthy of the name of surgeon, and with a fair experience of instruments in the bladder, will fail to crush it safely. You see it is lithotrity that has brought this question of diagnosis home to us. When there was but one mode of removing the stone—when it was necessary to cut from the perineum to the bladder for every stone, no matter how small or how large, it mattered very little whether we made an exact estimate of its size, if we only were quite certain a stone of some sort was there. What, again, did it signify whether it were mulberry, uric-

acid, or phosphatic in its character? It was nothing to the lithotomist whether one would crush easily and the other with difficulty or not at all.

Nor is there any real difficulty about making the diagnosis on which I lay so much stress. Nothing is more easy, as I shall soon have to show, if only you follow the right method. Granting me this, and the unrivalled success of lithotrity for small stones, already proved, it logically follows—

That the operation of lithotomy must in future be rejected for all stones which are of moderate size.

Now this is a most important fact, and it is one, I believe, which has not yet received its full consideration from the profession. For it follows, further, that all those attempts which have been made during the last fifty years, and may still be making, to perfect lithotomy for small stones are useless and obsolete. We cannot require an operation by cutting for small stones. And I am quite safe in saying that the results of that tray, with sixty-three cases of elderly adults without a death, never have been, and cannot be, equalled by any cutting operation whatever.

But it may be said that there are still some exceptional cases of small stones to which lithotrity is not applicable; such, for example, as cases of narrow stricture, preventing the introduction of a lithotrite into the bladder. Perhaps there may be such, but I have not yet lived long enough to find one. During the last few years I have crushed several cases of small stones in presence of narrow stricture, and in this manner: nothing is easier than to dilate temporarily any stricture if you only permit a gum catheter to remain lying in the urethra a sufficient number of days, and this is what I have done in the wards of University College Hospital with the best result. I tie in a very small catheter,

and having arrived, after a few days, say at about No. 9, the patient is submitted to chloroform, the instrument withdrawn, a small lithotrite introduced two or three times, the stone crushed, débris removed, and the catheter is replaced. In three days or so the process is repeated, and so on until all is finished. There is no difficulty in thus dealing with a small stone, however resilient be the stricture. Such cases, happily, are very rare, but when they do occur such an operation is usually preferable to lithotomy for, I repeat, a small stone.

Well, then, these matters being held as proven, lithotrity being answerable for the successful issue of all cases of stone of moderate size, it follows that there are two desiderata, and two only, to bring us to the perfect practical solution of the great question.

1. We want the best operation for the removal of large stones from the bladder.

2. We want the best method of discovering the existence of small stones in the bladder.

Now, the first I do not intend to discuss at length here; that would not be within our limits. I shall assume that for most cases the lateral operation is probably the best. It is no new question, and need not come up again here. But the second is, I declare, a new question. It may seem trite to say so, but practically, I repeat, it has engaged no one's attention at all adequately—that is, compared with its surpassing importance. I find people again and again with small stones in their bladders which have been overlooked. Not because any one is to blame for not finding them; first, because the early signs of stone, the evidence of the presence of the small stone, have not been sufficiently considered and taught; and, secondly, because the para-

mount importance of the discovery did not exist until the power and value of lithotrity in these cases had been demonstrated. Why, I have myself witnessed the sounding of a patient, and heard the results stated in such terms as these :—"I am glad to tell you that you have nothing considerable in your bladder ; there may be a small stone perhaps ; just possibly, but you have nothing considerable there, so all is well." The patient is congratulated because he has not a stone as big as a hen's egg ! But suppose there should be one the size of a bean? Why then the discovery of that stone would actually be a fact of greater importance to that man than the discovery of a big one ; because, in the case of the large stone, there is but one thing that you can do, and the issue is doubtful ; but find that man's stone when it is small, and you are *certain* to save him. This is a matter I cannot exaggerate the weight of. And it is by following the clue that this gives us, and no other, that we shall arrive, as we certainly shall some day, at the end I have in view—viz., the extermination of stone in the adult.

This brings us to the practical mode of looking for the stone early, and discovering its presence when small. How is this to be done ?

First, respecting the mode of sounding. It is absolutely essential to employ a light sound, which can be easily turned in the bladder and urethra. Nothing but a quick and delicate movement will elicit an audible note, or produce a sense of contact, with so small a body as a pea lying in the interior of the bladder. Therefore it is better to have an instrument which will roll easily between the finger and thumb, and not require the wrist or the arm to create the movement. Hence the handle should be cylindrical, like

the handle, but smaller, which I originally designed for my lithotrite, and which is now much used here, and is almost universally employed abroad. The beak should be very short, so as to be turned with the utmost facility. To find a small stone the bladder should be empty, or nearly so. I prefer a patient to make water a few minutes before sounding, and certainly never to be injected or prepared in any way, which only tends to defeat our object. Let him lie down, with his pelvis a little raised, and then let the instrument gently glide down the urethra; it is five to one, however small the stone may be, that it is just grazed as the beak passes through the neck of the cavity into the bladder. This is perceived easily if the sound is only guided lightly by the faintest touch of the finger and thumb. Held and guided by the wrist and arm so slight a graze may be unnoticed. If not felt, let the sound make two or three quick semi-rotations right and left; if still nothing found, depress the handle slightly to turn the beak below, close to the neck of the bladder, and make two or three similar movements there. That is where the stone will be found, if there is one, in the nearly empty bladder; and in the same manner a small fragment will be found at the close of a case.

Now look at the sounds which were formerly used—heavy, large, with considerably curved and long ends, like those of an ordinary catheter, or nearly so. No doubt you might find a large stone with such a tool, but a small one never, except by accident. I have repeatedly demonstrated, not only here, but in Paris, the presence of a small calculus, or fragment smaller than a pea, by producing an audible note from it by means of the small sound with cylindrical handle, passing a lithotrite to the spot immediately after-

wards, and withdrawing the bit uncrushed as proof. Pray permit me to say that I don't adduce this as any instance of fancied dexterity on my part—far from it; for you see it would defeat my very purpose to do so: it is merely an illustration of what is possible equally for you as for me, if only you pursue the rational system of seeking the small stone with an appropriate instrument. If it be not so I will sit down and give up my case in favour of lithotrity, because it is altogether a worthless operation if it is not capable of removing the whole stone. If lithotrity means only crushing a stone to pieces, and does not mean also making sure to remove the last, then by all means let us do lithotomy, and nothing else but lithotomy. Lithotrity is quite equal to its object in nineteen cases out of twenty. I do not mean to say that a case will not now and then happen in which the last fragment will not yield to our search, and may give some trouble. In all operations, however perfect, some *contretemps* may present itself. But I contend that it is very rare to miss the last piece. Seek it in an empty bladder with such a lithotrite as this; no danger whatever to the bladder exists. It is useless to seek it in four or more ounces of water, which is simply "looking for a needle in a bottle of hay;" currents and counter-currents are produced in all that water by the opening of the blades and the action of the bladder, which keeps your little bit in a state of constant movement.

Secondly, the early signs and history of vesical calculus are to be carefully noted. This brings us to what appears to me a very striking and suggestive question,—How is it that the existence of a calculus in the bladder, a product almost always of slow growth, and giving abundant signs of its presence, can ever attain anything beyond a certain size

without being discovered? That it does so is too true; but that it should ever grow to be of large size is to me astonishing. I assert that more than half the stones I operate upon are found in cases in which no suspicion as to the real malady has arisen until the sound has been employed. Now, with the utmost deference to others, and only after the acquirement of a profound conviction on my part, I venture to say that it is my belief that the early signs of calculus are not generally sufficiently recognised. In the whole course of my experience I have not met with more than two or three cases in which the obvious early signs of calculus were absent. To me they appear quite unmistakable. They may be present, or nearly so, in cases in which no calculus exists; but when these signs are present, then always ought the sound to be used. So far have we been from recognising who are the real calculous patients that we find it stated in our classical works on the subject that stone is most prevalent in children. Not at all. Stone is uncommon in children compared with its frequency among elderly adults. I am quite aware that, in most large hospital records, half the entire number of cases are found below the age of puberty; and it is that which leads to such surprising statements about the small mortality of the lateral operation, as I have before alluded to. But then among the poor stone is comparatively frequent in children. Among the well-to-do it is very rare to find a juvenile case at all. The latter class, however, furnish it abundantly at the other end of life, and here it is that the bulk of stone cases is to be found.

And what is the ordinary or typical history of a stone case? I speak, as any one, of course, may understand, of uric acid and oxalate of lime. The phosphates are mostly

of local origin in a bladder incapable of emptying itself, and belong to another category. You will find a healthy-looking man with good family history as to longevity, but mostly tainted with gout, one or two cases of it existing, antecedent or collateral, or in its absence some record of gravel or stone in an ancestor. At middle life he finds uric acid in his urine, as a brickdust deposit, more or less persisting. Soon after a small bit of gravel passes, with or without a marked attack of renal pain; if the latter, he is at the time much relieved by medicine; but often no special treatment or regimen is adopted at this critical point in his life to check the tendency now fully developed; so, after an interval, another and another pass, and then no more for a few months; and although some little suspicious symptoms appear, they are thought very lightly of, especially as he has not during the last nine or twelve months passed any gravel as he used to do. Whereupon he congratulates himself and is congratulated—not prudently; and the suspicious symptoms are credited so often "to that little weakness of the bladder which all people have as they get onwards in years." Delusive axiom! But what are these suspicious symptoms? Not very marked, but ample to render almost certain to the experienced observer that that interval of freedom from passing gravel only marks an advancing stage of the malady, and shows that the gravel is now too large to pass the urethra; that it is in the bladder and is growing by accretion, consuming surplus uric acid for that purpose day by day. For on inquiry you will find that the frequency of micturition is greater by day, during movement, than by night, during rest—condition altogether contrary to that "weakness of advanced years" (prostatic hypertrophy) when the frequency is almost always greater by

night than by day. You will find a slight pain—a mere passing sting—is mostly present at the close of the act of micturition and in the end of the penis, while in the "weakness" the pain, if any, is from distended bladder, before micturition, and is relieved by the act. Next, it will probably be ascertained that some day lately, after an unusual walk, or it may be after an hour or two in the saddle, a little blood was observed in the next urine; soon forgotten, or, if named, was followed by the recommendation not to do it again, but which unhappily aroused no suspicion of the true cause; so, not being done again, the occurrence did not reappear, which again comforts everybody. Well, after listening to such a history, I am always morally certain that one or two small stones exist, and of course the sound is introduced at once, and almost invariably a small stone or more are discovered. No anxiety need arise, and the patient may now with reason be congratulated, since a small stone is certainly the safest solution of his symptoms; for, as I have already said, the malady for the most part occurs in people of otherwise good health and strong constitutions. I have no hesitation, then, in saying that from fifty-five to seventy-five years of age is the favourite term for calculous diseases, at all events in this country.

I cannot ignore the fact that there are a few persons who so dread the discovery of a stone that they will suffer almost anything before confessing their symptoms to their medical attendants. This fact is due to the popular dread of the operation as it used to be, and is a tradition of lithotomy, which increased knowledge of lithotrity and its special applicability to small stones will in time tend to dissipate. These are exceptional instances to the rule that stones may be always found when small.

I am now about to tread on delicate ground; and nothing but an absolute sense of duty drives me there. I may gravely offend some of those who hear me. I express my most sincere regret if I do so. But those who have deep convictions and are earnest in their work know full well that it is not the sole end of life to make themselves agreeable to all men. It is this importance of diagnosing the early symptoms of calculus which compels me to say that no man can properly treat diseases of the urinary organs who does not use the catheter and sound. Now, I know that it is not conventional with us at present that our brethren, the physicians, should do so. I do not say they should not. I speak of the use of these instruments for diagnostic, not for operating, purposes. The diagnosis of a urinary case very often depends on the employment of one of these two instruments, and cannot be made without it. At all events the power to use one well—that is, with gentleness and facility—when necessary, is essential to the man who would arrive at a right understanding of these maladies; as essential as is a knowledge of the chemical qualities and microscopical phenomena belonging to the urine in health and disease, and without which, I take it, no modern surgeon would consider himself qualified to exercise his art. It may be said that, when the physician suspects stone in the bladder, he can always send his patient to the surgeon to be sounded. No doubt, provided only he sends him soon enough. But why this division of labour? Why does the physician use the stethoscope?—a mechanical contrivance to lengthen the ear, just as a sound is one to lengthen the finger. Who would dream of diagnosing chest disease now without that instrument?—and why should not physicians equally send their patients to

surgeons to be stethoscoped, since it is a mechanical process, and act on the report they receive? Why should the physician consider the symptoms and objective signs of a patient with urinary disease, examine the external surface with care by inspection, palpation, and percussion, and forbear to add the one most essential exploration—that of the interior? What will our children think of us and of our common sense, learning that, in this nineteenth century, it took two separate men to diagnose a case of urinary disease: one for the outside of the body and the symptoms, and another for the inside! Of course it is needless to say that I am quite indifferent to which side, medical or surgical, these maladies are conventionally consigned; but, in the interest of progress, I am much concerned that they should go to one, and to that one which can and will make a thorough and complete examination of the entire case. Otherwise, as I am too well aware, the stone will not be always found small: between two stools, to use a homely proverb, the patient not seldom coming to the ground.

I now think I have fairly proved that the operation of crushing the stone is safe and successful for all small stones, and I think I have also proved, or have gone far to do so, that a stone may be always found when it is small. It follows then, if you admit these things, that lithotrity must be the future operation for calculus in the adult.

It is impossible also to overlook the increasing power which an enlarged acquaintance with dietetic and therapeutic agencies—a subject which time does not permit me to consider here—and amongst these, by no means the least, the growth of abstemious habits, affords against the production of uric acid in its earlier stages; and I believe that much more than has hitherto been done may be accom-

plished in preventing the formation of calculi by appropriate treatment at this period.

Such, then, is the future which I confidently predict in regard of that dire malady which has been the cause of so much suffering to humanity, and which has perhaps more than any other exercised the skill and courage of a great race—I had almost said a great hereditary priesthood—of surgeons from the earliest time to the present day. I know that its arrival is only a question of time and of human progress, and if we can together afford the smallest aid in hastening the era I speak of we shall have lived to some purpose. For my own part I envy no man, whatever his calling, a better or a nobler purpose for his life.

LECTURE XX.

ON OPERATIVE MEANS FOR THE RELIEF OF PATIENTS SUFFERING WITH ADVANCED PROSTATIC DISEASE.

GENTLEMEN,—I propose to call your attention to an extremely distressing and painful form of disease, for the relief of which our resources are very inadequate. I refer to the last stage of complete or permanent obstruction existing at or about the neck of the bladder. By obstruction, I mean, to the outflow of urine by any natural efforts. In speaking of its existence "about the neck of the bladder," I of course exclude stricture of the urethra, which, moreover, opposes only a partial or temporary obstruction to the passage of urine. When obstruction is not only complete but permanent, disease of the prostate is mostly the cause.

We have studied together the diseases of that organ, and especially that common form hypertrophy, and will not therefore go over that ground again. I will merely remind you that very many individuals between fifty-five and sixty years of age begin to be unable to expel entirely the contents of the bladder. The act of micturition is more frequently performed, and requires some effort; the stream grows feeble, and, under the influence of external cold, or of some diuretic action distending the bladder, or other cause, it often happens that complete or nearly complete retention is established. In such a case the bladder is generally not emptied at any act in the most favourable

circumstances; and if, immediately after an attempt to do so, a catheter be passed, a notable quantity, say from three or four to twenty ounces, will be left behind, and is drawn off by the instrument. Consequently the patient is taught to use the catheter, and does so periodically, say twice, three times, or more frequently, according to his necessity, in the twenty-four hours. As the patient increases in age the bladder often requires relief six, seven, or eight times per diem—a number by no means uncommon.

But in some cases, which happily are only exceptional, a more advanced stage arrives, by gradual steps, associated with a greatly diminished capacity of the bladder, so that the use of the catheter becomes necessary from sixteen to twenty-four times, or more, in the twenty-four hours—a condition of extreme misery for the patient, inasmuch as it entails loss of rest, fatigue, and often also increased difficulty in passing the instrument from injury to the urethra by frequent catheterism. At this period, too, the augmented volume of the prostate sometimes makes the canal difficult to traverse alike for the patient and the surgeon; and if a false passage be made by either at this crisis, a fatal result almost of necessity follows.

A patient in these circumstances, then, exists for little else than to pass his catheter. No sooner has he obtained a half-hour's relief than he begins to feel the warning of another approaching call, and on each occasion he experiences some minutes at least of suffering in his endeavour to sustain as lengthened an interval as possible. His powers are tasked to the utmost, for continuous sleep is out of the question, and health rapidly declines. This hourly recurring task and the brief interval of rest which fall to the lot of such patients is a test of endurance of the severest kind.

I have often been reminded that theirs is very much the same condition as that which exists as one of the chief athletic feats—first accomplished by the famous Captain Barclay, and often repeated since—that of walking 1000 several miles in 1000 consecutive hours, a task of no small magnitude; but with this wide difference—viz., that in the latter case the subject was in good health and training, knew the limits of his task, and expected a reward, whereas the patient is aged and infirm, and has small ground for hope as to the future of his trial. Indeed, "the odds" are largely against the latter in the struggle, and without a very decided change in his condition, he must lose miserably, and with inexpressible suffering, his "race against time."

The arrival of this stage, then, is the almost certain prelude of death to the patient. Hence I have naturally asked myself, having seen not a few of these cases, "Can nothing be done, by any operative measures, for their permanent relief?" And I think it will be admitted that, if these should be somewhat difficult or even be attended with some risk, the gravity of the situation warrants an attempt, if only a moderate chance of affording relief appears to be attainable. I say "permanent relief," because a temporary remedy exists for some in the employment of an in-lying catheter. To tie in an elastic or india-rubber catheter is an expedient which may avert the fatal result a little; but it can be only temporary, and it may even aggravate the malady and hasten the end. I assume, also, that medicinal agents, including especially opium, have ceased to suffice for the exigences of the case. The bladder is, indeed, so organically thickened and diminished in capacity that hourly relief has become a *physical* necessity.

I propose, then, in these circumstances a proceeding similar to that which we employ in the trachea when death is imminent for want of air—viz., the introduction of a tube beyond the seat of obstruction—one which is to be permanently retained there as the constant channel for urine, just as the tracheotomy tube has been for many a patient the only channel during years for air to the lungs. In other words, I propose to puncture the bladder above, or rather behind, the pubes. The proceeding which I have practised differs from ordinary puncture, and more resembles the high operation for stone, being rather a compound of the two. For, in the cases described, it must be remembered that the bladder is by no means distended with fluid, but may, indeed, must be nearly empty—a widely different condition, as regards operation, from the ordinary puncture. Moreover, the viscus is usually altered in position and largely deformed by masses of prostatic growth rising into its cavity, and sometimes even nearly filling the pelvis. I believe that puncture has never been done or recommended with this end in view—viz., to avert death by establishing a *permanent* outlet for urine when the urethra is no longer practicable through disease of the prostate and bladder. I do not overlook some interesting examples of retention of urine from stricture which were relieved by suprapubic puncture by my friend Mr. Thomas Paget of Leicester, and in which the tube subsequently became for years the permanent channel by which all urine passed. These operations, however, were not performed with that end in view, nor were they for prostatic retention at all; but it was the comfortable condition of these patients, whom I saw, which led me to think of the analogous proceeding which I now desire to put on its trial.

The operation, which I have now performed three times, consists in passing a large sound, hollow throughout, with a strongly marked curve; that represented at A in the adjoining figure (Fig. 58), I have found as good as any, but

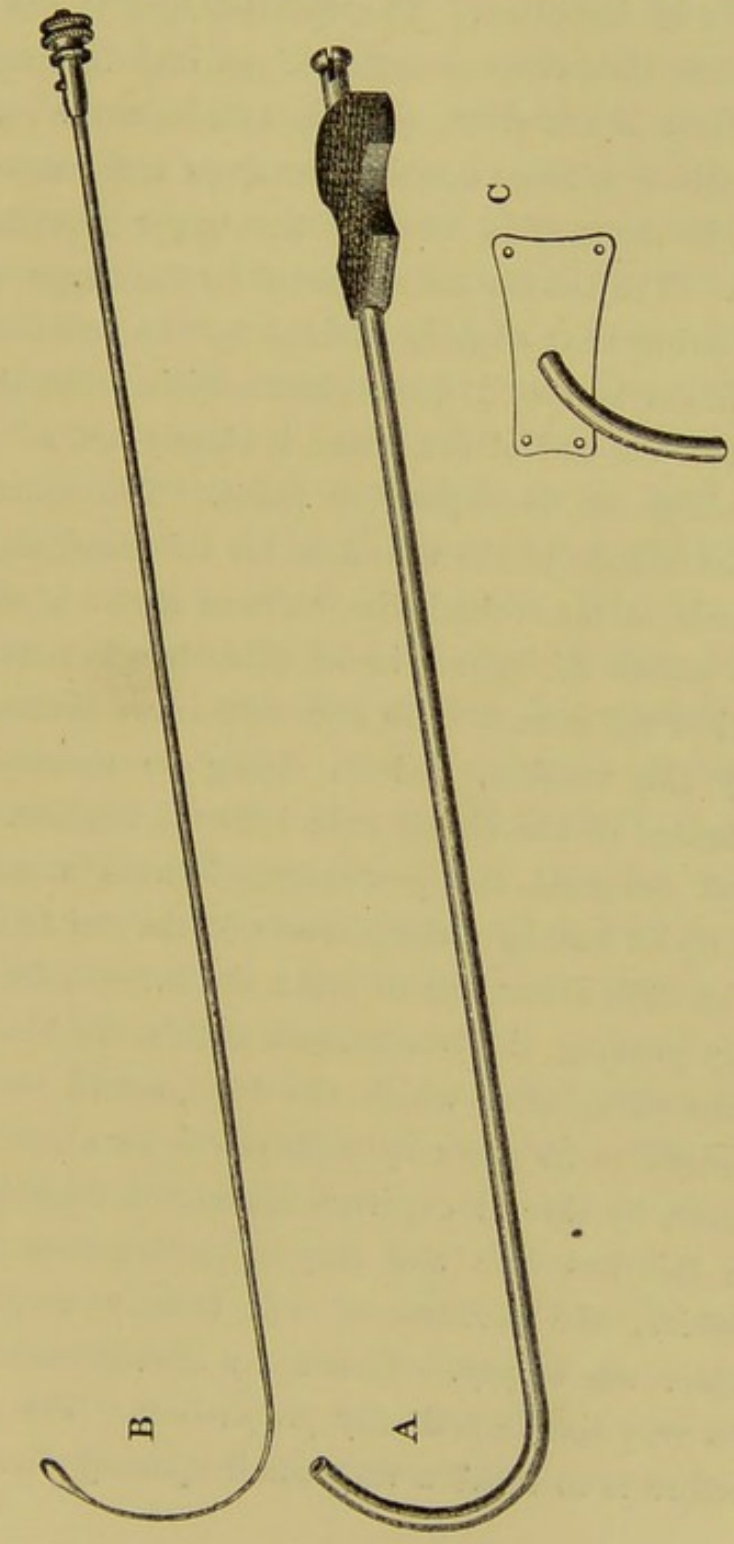

FIG. 58.—A, Hollow sound, the end of which, when stopped with the stylet (B), forms the point which guides the operator in finding the bladder in the last incision. Size about 12 or 13.
B, Bulbous-ended flexible metal stylet.
C, Suprapubic tube of elastic gum about 2½ in. long, with silver plate, introduced in its whole length into the sound when the stylet is removed. The withdrawal of the sound leaves the tube in the bladder.

it may be modified somewhat, according to the case, and closed by a bulbous-ended stylet (B). The instrument is introduced by the urethra until the end can be felt just behind the symphysis pubis. It is then confided to an assistant to retain in its place. The operator now makes an incision not more than three-quarters of an inch in length, less if the patient is not stout, enough to admit the index finger tightly (since a large opening becomes embarrassing subsequently), in the median line at the upper margin of the symphysis. The tissues are separated by the finger, and the linea alba being next slightly divided by the point of a bistoury, the finger is passed down closely behind the symphysis, and when the end of the sound is clearly felt, a little opening is made so as to expose its point. The operator now, taking the handle of the sound in his left hand, makes the end protrude in the wound, the bulbous stylet is withdrawn, and he passes the tube c in its whole length into the hollow channel of the sound. He now withdraws the sound completely by the urethra, and in doing so necessarily ensures the passage of the elastic tube into the bladder.

When I first designed this proceeding I used a sound with a second stylet having a sharp trocar at the end to take the place of the first, intending to make the incision for the tube by merely pushing the trocar from within the bladder outwards to the skin, after which the tube would be inserted and lodged in its place by withdrawal as above. I learned, however, by several experiments on the dead body that although this was safe and easy of performance in a distended bladder, the peritoneum was usually wounded when the bladder was empty. Hence my abandonment of what seemed a very simple and easy proceeding. The path of safety therefore is to make a very small opening directly

above the symphysis, then to find the way close behind it to the end of the sound there, and incise only just enough to allow this to be pushed up into view. The insertion of the tube into the hollow of the sound, and the withdrawal of the latter, as already stated, brings the tube into its place. But it may be remarked that the urine may not at first flow through it, for the withdrawal of the sound may carry the tube, not only into the bladder, but, when this is empty or very contracted, even through it into the prostatic urethra. If so, the tube has only to be withdrawn a little and the urine flows. Indeed I have found that the tube is usually improved, especially in the subsequent progress of the case, by being a little shortened. It is then to be fastened securely with tapes and plaster, and to be worn a few days in bed until the parts are consolidated, and the patient can move about with safety. If the tube escapes during the first two or three days it may not be easy to replace it, but when the passage is established it may be removed and replaced easily enough. A very important injunction is to make the wound as small as possible so as to be nearly filled by the tube. A large wound is more painful, and is constantly traversed at first by the urine.

I will now briefly sketch the three cases in which I have done this, and give you the results.

The first patient was a man sixty-three years of age, admitted into this hospital January, 1869. He had for several years passed all his water by catheter, and for a long period had done so every hour and a half day and night, sometimes oftener. Examination by rectum showed the existence of a large prostate, the coats of the bladder were thickened, the urine charged with inflammatory products. He remained three months, and notwithstanding

rest and treatment, but slightly improved. It was evident that his troubles were not due to temporary irritation, but to organic changes greatly diminishing the capacity of his bladder as a reservoir. I need hardly enlarge on the importance of carefully drawing this distinction. Having explained to him fully in presence of the class the nature of his case and the design of my operation, he gladly accepted my proposal that I should do my best to relieve him. The operation was easily performed on the 12th of May, in the manner described, with immediate relief to the patient. Unluckily, on the third or fourth night the tube escaped, and the house-surgeon was unable to introduce it. The urine issued freely by the wound. The next day, at my visit, it was but too obvious that the walls of the new passage had not been yet sufficiently consolidated to protect the surrounding parts, and that extravasation had taken place into the scrotum. I at once made free incisions and tied in a catheter. It was a severe trial for the patient, but he came triumphantly out of it. The following six weeks, however, were occupied with this unfortunate accident and its results; meantime I had at an early period, and without difficulty, put the tube in its place, and made it fast there by tapes and plaster. A week or two after the route was established and the tube was removed, washed, and replaced with the greatest ease every day. During the summer his health continued feeble; no catheter was necessary, the urine passing by the tube, but from insufficient attention to changing and cleaning it, phosphatic deposit formed on it, and gave much trouble. I lost sight of him in July, and he gradually failed in strength, and died in September.

The second case was that of an old and well-known

medical friend, on whom in 1867 and in 1869 I had successfully operated by lithotrity. For a long period he had passed all his urine by instrument; he was now upwards of seventy-five, and had, after many years of trouble, arrived at the latest stage of frequent and painful catheterism. I was called to him in January, 1870, suffering from such extreme sensibility that he dreaded passing the catheter, which was necessary twelve times in the day and night. He was clearly approaching his end, and I agreed to perform this operation solely with the view of making his last days more comfortable. Mr. Clover gave him chloroform, and I did it on February 7th. All went well; he never required the catheter again; he kept his bed, was comparatively free from suffering, and died three weeks afterwards.

The third case was probably seen by some of you here last spring. E. P——, aged fifty, was admitted to this hospital April 22nd, 1874, having suffered from severe symptoms four years, the last two and a half of which he has withdrawn all his urine by catheter. Of late his sufferings have been great; his catheter is passed every half-hour in the day, and he sometimes retains one for a part of the night. The prostate was "hard, nodulated, and enlarged"—a condition of very bad augury, occurring as it did before the age at which hypertrophy of the prostate appears. On May 7th I performed the operation described, with the view of diminishing his pains and affording him rest. It was followed by relief, especially after the first day or two, and he gained long periods of sleep, which he had not had for months before. Nine or ten days after the operation he showed signs of failing strength, and he sank on the 21st instant. The autopsy showed cancer of

the prostate and adjacent part of the bladder, of the scirrhus kind—the only case I have ever seen. The iliac glands, those about the base of the lungs, and the lungs themselves, showed the presence of the same deposit to a considerable extent. The only other authentic case on record is that reported by Mr. John Adams.* The word "scirrhus" has, it should be remembered, been often erroneously used, particularly by ancient authors, to denote organs which are enlarged by hypertrophy.

I have thus put the bare facts before you relative to these three cases. Little need exists for remark. In two of them, the second and third, the operation was adopted solely as a last resource, to mitigate the sufferings of patients whose fate was already sealed. In the first I operated at a somewhat earlier period, with the view of prolonging and rendering more comfortable a possible year or two of life. The unfortunate accident of extravasation was too great a demand upon the resources of the patient, and, although he recovered, yet his stock of vitality was largely exhausted. We must recollect that it was the first experience, and I gathered from it useful lessons. I made the opening much smaller afterwards, took redoubled care to retain the tube at first, and subsequently I should in such a case remove and wash it daily. The operation itself, properly performed, makes little or no demand on the patient's powers. I have no doubt I shall give it further trials. Thus prepared by past experience I have faith in its utility for appropriate cases.

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* *The Lancet*, 1853, vol. i. p. 394. I made the most careful researches several years ago in relation to this subject with the result stated above. Encephaloid cancer of the prostate is far less rare.

LECTURE XXI.

ON CYSTITIS AND PROSTATITIS.

GENTLEMEN,—It is quite possible that you may see little or nothing, even during a considerable experience of general practice, of those diseases which have occupied our last few lectures. Some men never meet with a case of stone in the bladder during a lifetime, and of those who do, very few undertake themselves to treat it. But the very reverse of this is the case with the subject which comes before us to-day. Fraught with much less of what one calls "interest" for an operator, its attractiveness to the student must be found in the fact that cystitis, or inflammation of the bladder, is the commonest affection of that organ, that it is certain to occur in his practice, and probably not unfrequently. For whatever else you may have in connection with the urinary organs, you are certain to have cystitis. If a man has stricture severely, or disease of the kidney, or disease of the prostate, sooner or later he has cystitis, either acute or chronic, the symptoms of which are often the most prominent features in all these diseases.

Then I beg you to remember that cystitis has almost always some ascertainable cause, and that it very rarely indeed appears in what is called an idiopathic form. You will find that there is, or has been, gonorrhœa, or stricture, or disease of the prostate, or retained urine, or urine altered in character, or some other such cause; and if you have readily come to the conclusion that any case before you is

"idiopathic," suspect that you have not discovered the cause, for the probability is that you have not searched deeply or carefully enough. Here and there the true pathology of such a case will elude our best efforts. Possibly you may be forced to attribute it to a gouty diathesis. A very refuge in time of trouble for practitioners of feeble diagnostic power is gout, particularly "suppressed gout;" therefore beware of it. And while, I think, it must be admitted that inflammations, both of the urethra and of the bladder, may be sometimes mere local developments of the ubiquitous influence so named, I am sure that this cause is of exceedingly rare occurrence. Certain irritant poisons also—amongst which cantharides is the most prominent and likely to be met with—occasion cystitis, which I have seen severe in character, and lasting from ten to twenty hours, as the effect of an ordinary blister.*

First, then, I shall call your attention to acute, and secondly, and chiefly, to chronic cystitis.

Acute cystitis appears in two very distinct forms: one which is severe and dangerous, the other which is much less so.

The dangerous form is that which acccompanies the most severe lesions to which the bladder is exposed. The first breaking up of a large and hard stone into large fragments, either spontaneously or by the lithotrite, has sometimes caused it; violence to the bladder in lithotomy and the like are causes. Rigors, bloody urine, extreme pain and irrita-

* I think it may be useful to suggest that this possibly never occurs, except where the blister is applied to a cutaneous surface which has previously been broken, or from which the epithelium has been previously removed. The only instance in which I have seen it—referred to in the text—was one in which the blister was applied over a knee-joint, whose cutaneous surface had been just strongly acted on by iodine.

bility of the organ announce the fact, and unless the patient is soon notably relieved it is probable that he will succumb in a few days. At the autopsy the lining membrane is seen to be of a dark crimson hue throughout, or nearly so, and there are often spots where it appears to be sloughing and exposing the muscular fibres.

The less severe form of acute cystitis is common enough. There is reason to believe that the neck of the bladder is the part mainly affected in these cases; and the reason for this is that, what we call cystitis is often really inflammation of the prostate mainly, or of the urethra passing through it, entirely so perhaps at first, and that the mucous membrane of the bladder is affected by extension. And as, anatomically, I don't know how we can make an accurate separation of these two organs, it is often legitimate to speak of this affection as "inflammation of the neck of the bladder." After gonorrhœa, or from external cold and damp, and in connection with many circumstances of no apparent importance, a man becomes the subject of frequent and painful micturition, and has a sense of aching or gnawing pain above the pubes; while the urine is cloudy from an increase of the natural mucus of the bladder (not the tenacious viscid secretion, mind, which I shall speak of under the head of Chronic Cystitis); and there is usually some constitutional sympathy with the local disturbance, evinced by loss of appetite and general feverishness.

The treatment consists in mild laxatives and diuretics, demulcents, hot hip-baths, local poultices, and anodynes, if necessary; and rest in the recumbent position as far as possible. Besides these, the use of certain infusions, and decoctions, of which I shall speak hereafter.

But that which most requires our attention is the chronic

form of the disease. It is that which requires the most care and judgment, and for which we have most to do in the shape of treatment.

Chronic cystitis also appears in two distinct forms.

In the simpler form of chronic cystitis, there is little else than some increase of the natural mucus from the bladder mixed with the urine. Just as when you have a common cold, there is inflammation of the mucous membrane of the nose and towards the frontal sinuses, with increase of its secretion, so the mucous membrane of the bladder adds mucus to the urine; and the inflamed mucous membrane, being more sensitive, will not permit itself to be much extended by accumulating urine, but forces the bladder to expel it as soon as possible: hence the frequency of making water.

But, besides this, there is another form of chronic cystitis, in which the mucus has a distinct character. It is often spoken of, and not very wisely, as "catarrh of the bladder" —another example of an unfortunate term leading to error in practice. The mucus is very tenacious, and when you empty a vessel containing the urine of such a patient, it runs off first, and then a quantity of ropy mucus follows in a mass. You may see a pint or more of this material passed in the course of the day, and it acquires the viscid character on standing. Some patients pass it for months together, and such are said, especially on the Continent, to have "catarrh of the bladder," which, and there especially, is said to be a dangerous and very incurable disease. Indeed, to tell a foreigner that he has "catarrh of the bladder" is to alarm him exceedingly. Now, this is because it is regarded as an essential disease, instead of as a symptom of some lesion, for the most part easily curable. Catarrh of the bladder is

no more to be regarded as a disease than, for example, is dropsy. Formerly, you know, dropsy was talked of as a formidable malady, and it still is so to the popular mind; but no intelligent student would now, I suppose, be satisfied to think of it except as a symptom. He would say: "What is the cause of it? Is it due to cardiac, to renal, or to hepatic disease?" Precisely so it is with this "catarrh of the bladder." You inquire what is the cause of it, and you find in nine cases out of ten there is a very distinct cause, and mostly a removable one. You are not to be stopped by this name, and ask me what is good for catarrh; but you must carry further the diagnosis, and ascertain the precise condition which has occasioned it. And the most common cause is one but too often overlooked, as I shall repeat—viz., inability of the bladder, either from atony of its coats or prostatic obstruction, to empty its cavity. This peculiar muco-purulent secretion, called "catarrhal," does, however, by no means necessarily occur in these circumstances, and I cannot tell you at present how it happens that in some cases of retained urine, otherwise apparently similar, it contains only some light flocculent mucus, and that in others there shall be a very large quantity of the characteristic tenacious matter.

With regard to the treatment, the first thing is to take care that the bladder is emptied by a catheter once, twice, or three times a day, in the easiest manner possible, of which I treated in the seventh lecture. And this is necessary because decomposing urine is a source of great irritation to the mucous membrane. The urea contained in the secretion which enters by the ureters in a healthy state is soon decomposed into carbonate of ammonia, and the ammoniacal salt is an acrid and irritating substance. You explain to

your patient that his bladder, not having been emptied for many months perhaps, has acquired somewhat the condition which a badly-washed utensil would have done in like circumstances—a useful and sufficiently accurate illustration for the lay understanding—and he will appreciate it when he finds, as he probably will, that the mucus diminishes considerably after a few days of this treatment.

But suppose it does not do so, or does so but slightly, what then? I will tell you what sometimes happens, and I am not sure that the fact I am about to ask your attention to has been observed or recorded. It is this: *you cannot completely empty every bladder with the catheter.* When the prostate is irregular in shape, and throws out protuberances into the bladder, there are sinuses or spaces between them, which retain one, two, or even more drachms of urine. Again, there are not unfrequently numerous small sacculi in the coats of the bladder which act in the same way. When obstruction at the neck has existed some time, the daily straining—although not considerable—necessary to expel the urine, produces hypertrophy of the muscular bands which form that coat of the bladder. Now, you know hydraulic pressure is equal in every direction, and in course of time the expulsive act, more powerful than in health, gradually forces the mucous lining between the interlacing muscular bands, and little pouches result. In these it is not very uncommon for calculi to secrete themselves, and thus in time encysted calculus is formed. In any case, however, those pouches form receptacles for urine, which becomes stale, and irritating in consequence, and not at all unfrequently they attain a large size; such an one is depicted at Fig. 59. Now, the mere withdrawal of the urine by catheter by no means empties the reservoir in these

circumstances, and enough of noxious fluid is left in these pouches or sacculi to maintain the unhealthy condition of

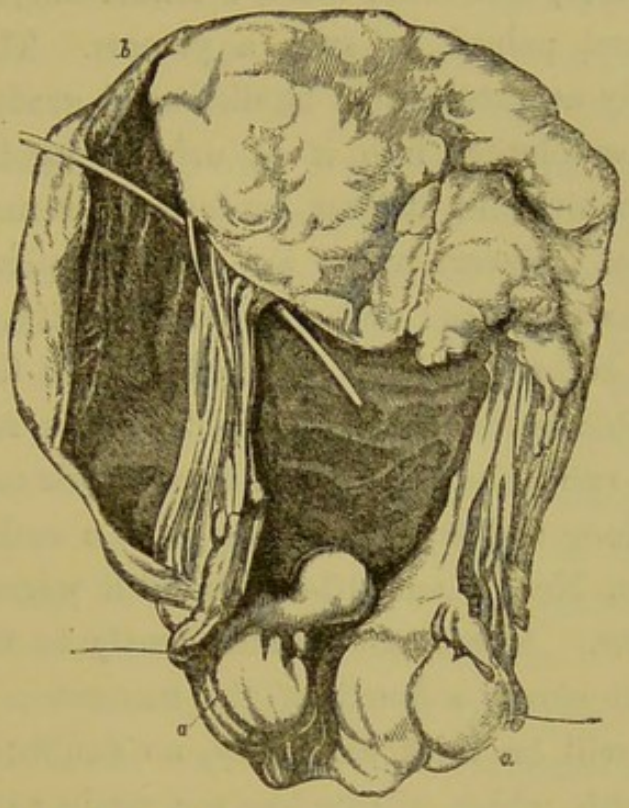

FIG. 59.—Section of bladder and prostate. A large sac of the former, marked *b*, produced by long-standing unrelieved retention of urine; a bougie lies in the small opening by which it communicated with the bladder.

the lining membrane. What you have to do, is to wash out the bladder at least once a day with a little warm water before the catheter is removed. I am very particular indeed as to the manner of doing this. Washing out the bladder may be a very valuable mode of treatment, or a mere contrivance for seriously irritating that organ, according to the mode in which it is performed. A common mode—indeed that which I always saw employed some years ago—was to attach to the catheter (which was often of silver, and it is unnecessary to repeat my views about that) a large metal syringe, and to throw in with considerable force six or eight

ounces of water. I wish you to cherish a wholesome horror of that proceeding, and in no case can it be necessary. A healthy bladder, and much more, a tender one, can only be disturbed and pained by such a process. This sensitive organ is only accustomed to be distended gradually by the continued percolation into it of urine from the kidneys. Let your washing-out at least conform in some respect to that process. Never, under any circumstances, throw in more than two ounces: and even this quantity, for efficient washing, is better avoided. Proceed then as follows: You have a flexible catheter in the bladder; have ready a four-ounce india-rubber bottle—with a brass nozzle and stopcock, the nozzle long and tapering, so as to fit a catheter of any size between Nos. 5 and 10—filled with warm water, say at 100° Fahr. Attach the nozzle gently to the catheter, and throw in slowly a fourth of the contents; let that run out, and it will be thick and dirty, no doubt; then inject another fourth, which will be less so; again another, which will return clearer than the preceding; and the fourth portion will probably come away nearly clear. Now, these four separate washings of an ounce each will have been really more efficient than two washings of four ounces each; and you will, in obedience to my never-failing injunction, have reduced the amount of instrumental irritation to a minimum. Ten to one but the patient will regard your performance as soothing to his feelings. There are other methods of effecting the object, but this is the *principle* I want you to understand; and the mode of carrying it out which I have described is one of the simplest.

What if this washing-out has not accomplished all we wish? We may then, and often with great advantage, try medicated injections. Perhaps the best mild astringent,

when the urine is alkaline and depositing phosphates, is the acetate of lead, in the proportion of one grain to four ounces of warm water, not stronger; to be used once a day. After this comes the dilute nitric acid; one or two minims to the ounce of water. Then you may try nitrate of silver in small quantity—certainly not more than one grain to four ounces to begin with; even half a grain to that quantity sometimes answers better, increasing gradually if necessary, to about half a grain, or one grain at most, to the ounce. You may also use, especially where the urine is offensive, carbolic acid; one or two minims to four ounces is quite strong enough. Then there is a soothing injection well worth your remembering—viz., biborate of soda and glycerine. It may be used where there is no great occasion for an astringent, or it may be combined with one. The value of this for sore mouth suggested to me its use for an irritable bladder, and experience has confirmed my expectation. Here is my formula: Two ounces of glycerine will hold in solution one ounce of biborate of soda; to this add two ounces of water. Let this be the solution, of which you add two or three teaspoonsfuls to four ounces of warm water. I arrange all these solutions for four ounces, because the four-ounce india-rubber injecting bottle already described is a convenient and portable instrument. Somewhat recently much has been said of the value of a solution of quinine as an injection, from one to two grains to the ounce of water, with a drop or two of acetic acid to insure solution, in presence of mucous and offensive urine. I have tried it frequently, and may, perhaps, have derived some advantage from it.

In circumstances of great pain, you may inject anodynes into the bladder if you please; but they are of little value.

And you need not be afraid of the quantity; for the mucous membrane of the bladder appears to have no absorbing power, unlike the neighbouring tissue which lines the rectum.* And there, indeed, is your place for action, if spasm and pain greatly disturb the patient; a suppository of cocoa-nut butter, containing from half a grain to a grain of morphia, is often of the greatest service. Counter-irritants play a small part among our remedies; perhaps the best and safest is a hot linseed poultice, well sprinkled with strong flour of mustard, above the pubes. I cannot say much for croton oil, nitrate of silver, &c., there. Hot fomentations, in the form of bran or sand-bags, hot flannels, &c., alleviate pain materially; so also hot hip-baths and the hot bidet.

Then there is a host of infusions and decoctions reputed to exercise a beneficial influence in cystitis. I will name some of them in what I think to be about the order of their value for the cases one commonly meets with: Buchu, Triticum repens, Alchimella arvensis, Pareira brava, and Uva ursi. Now, for the doses of these, your conventional tablespoonful is a miserably inefficient measure. Of the first, fourth, and fifth, give half a pint daily; of the second and third, a pint, that is, of their infusions or decoctions, as the case may be.

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* Some one thought proper to question, in one of the journals, the accuracy of this statement relative to the effect of narcotic injections into the bladder, and even to caution my readers against relying on me too implicitly. It might have seemed otherwise almost unnecessary to say, that this statement was the result of very numerous experiments and observations; and its object was of course to show that such injections were of small service, and, therefore, not to be recommended. My only reply to the critic was to inject *four drachms* of Liq. opii sed. into the bladder of a patient with chronic cystitis, in one of my wards in Univ. Coll. Hospital, on four separate occasions, in presence of the students, who verified for themselves the absence of any sign of the presence of opium in the system. Subsequently, a dose (*by mouth*) of twenty minims, produced them all most notably.

The underground stem of the Triticum repens, or the common couch grass, was introduced some years ago by myself. Of this I will only say that it maintains its credit, and is undoubtedly very useful in many cases. For use, boil slowly from two to four ounces in a quart of water until reduced to a pint; the strained liquor to be taken by the patient in four doses in the twenty-four hours. It was a favourite remedy in the old herbals; and it formed the staple medicine against what was called "strangury," which, a few centuries ago, meant everything like pain or difficulty in making water, no matter what the cause; for the art of diagnosis then was in its earliest infancy. The "Parsley piert" (derived from "percer la pierre," and not a parsley or umbelliferous plant at all), or Alchimella arvensis, has proved in my experience an admirable remedy in obscure cases. Use it as an infusion: one ounce to the pint. Besides these there are the resins, which have a certain amount of influence upon the mucous membrane of the bladder; such, for instance, as copaiba, sandalwood oil, Venice turpentine, &c. You should not, however, give the dose which you would give in gonorrhœa. Five minims of copaiba, three or four times a day, in mucilage, is sometimes useful. I may say the same of the oil of cubebs.

One word about alkalies. As a rule, no doubt, alkalies, in neutralizing highly acid urine, help to control chronic cystitis; and I like the liquor potassæ, as well as the bicarbonates, tartrates, and citrates, which appear to have more diuretic action, and to increase the quantity of urine, when you would rather avoid this action and lessen the frequency of micturition. The old combination of liquor potassæ and henbane, affirmed to be a union of incompatibles, nevertheless seems to me about the most valuable form in practice.

It may for ought I know be sufficiently correct that both henbane and belladonna are deprived of certain specific activities when mixed with liquor potassæ. Chemically, perhaps, that is so. But I am perfectly satisfied that this combination materially controls painful and frequent micturition in the complaint we are considering. Hence I have of late gone back to it, and for the reason stated.

Now as to acids. Remember that these are by no means the complement of alkalies in relation to the urine. Beware of the current notion that it is possible to produce an acid reaction on urine by giving mineral acids by the mouth. By giving alkalies, you can make the urine neutral or alkaline to any extent you please, but you cannot do the converse with these acids. Yet I constantly hear it said, "The patient's urine is very alkaline; had we not better order acids?" My reply is, "By all means; give an ounce or two daily, if you like, but it will not change the reaction of the urine." I have given these quantities, greatly diluted, of course, without the slightest effect on alkaline urine. No doubt mineral acids are useful in giving tone, and so do good; but don't prescribe them with the view of directly acting on the urine. The acids that do act on the urine are benzoic acid and citric acid, but you have to give so much of these that I do not know whether the remedy is not mostly worse than the disease. The benzoic acid, having some balsamic character, is doubtless useful in some cases of chronic cystitis. The best way to give it is in pills, as it is not soluble in water. Three or four grains, with one drop of glycerine, is a good form; and you must give as many as ten or twelve pills a day if you wish to do any good. At all events, it is useless to give less than six; that would be twenty-four grains in the day. Lemon-juice has

also an acid influence on the urine, and if it agrees with the stomach, may be taken in large quantity. But here is the important fact for you to remember: Surplus of acid in the urine is a constitutional error, and it enters the urinary passages at the kidney. It requires constitutional treatment, of the digestive rather than of the excretory organs, and mere alkaline treatment does but mask the acid, does not prevent its production. You have to remodel the patient's habits, control his diet, and take care that his liver and bowels act freely. On the other hand, persistent alkali in the urine is, in nineteen cases out of twenty, a *local* formation in the bladder. If you take pains to get a specimen of the urine direct from the kidney before its alteration in the bladder, you will find it acid enough. Such alkaline urine requires local treatment, as by catheter and injecting-bottle, and not physic. Now and then you meet with neutral or alkaline urine, milky-looking, with amorphous phosphates, as a constitutional condition; but this is very rare as compared with the cases I am now describing.

I shall close this lecture with some brief remarks on acute and chronic prostatitis.

Acute prostatitis occurs in different degrees of severity, and often comes first before the practitioner's notice when it causes retention of urine by obstructing the neck of the bladder. How this emergency is to be met I have described at some length in the eighth lecture. The organ is often considerably swollen and very tender, and the inflammation may give rise to abscess in the substance of the gland, or adjacent to it; and the matter may burst either into the urethra, its most common course, or into the rectum.

Chronic inflammation of the urethra passing through the

prostate, and more or less affecting the prostate itself, is a condition less generally known or recognised. Nevertheless, it is a common and important affection. We see it frequently, not always, as the result of obstinate gonorrhœa. I have already referred to it as the cause of symptoms resembling, more than any other malady, those of calculus in the bladder when mild in degree. Thus a patient of twenty or thirty years of age tells you that the following symptoms have rather gradually appeared :—Undue frequency of micturition; pain following the act, and felt in the end of the penis; occasionally a little blood seen with the last few drops of urine, which may be somewhat cloudy with muco-purulent deposit; a sense of heat and weight in the perineum and rectum; there is, perhaps, also some gleety discharge in the urethra. All these conditions are aggravated by exercise. You see he gives you a complete sketch of the symptoms of calculus; and how are you to distinguish them? By the history and by sounding. Thus, there is no history of the descent of calculus from the kidney, nor of gravel previously passed. But there is the fact of a chronic gonorrhœa resisting, perhaps, months of treatment. And if the patient shows no improvement, you must not decline to sound him. You do so, and find nothing, but that the prostatic urethra was very sensitive, and you make him worse, perhaps, for a day or two.

What is to be done? First and foremost, as a rule, having thus settled the question of calculus, abjure all instruments, which, in most cases, can only do mischief. Treat it as you would a chronic inflammation of the ear or eye—*i.e.*, blister an adjacent surface; make a small blister every four or five days on either side of the raphé of the perineum, by applying with a brush the liq. epispast. of

the Pharmacopœia, not so freely as to distress him or prevent locomotion, and continue the plan for four or six weeks. I have found the best results from this method, combined with a tonic medicine and regimen, and you will find the patient himself gladly exchanging the dull weary aching in the perineum for the smart of the blister, and cheerfully noticing how the former gradually subsides under the influence of the latter. In exceptional cases, where chronic gleet is a prominent symptom, the application of a solution of nitrate of silver, not more than five or ten grains to the ounce of water, to the prostatic urethra, may be very serviceable.

I shall in my next lecture proceed with diseases of the bladder.

LECTURE XXII.

DISEASES OF THE BLADDER: PARALYSIS; ATONY; JUVENILE INCONTINENCE; TUMOURS.

GENTLEMEN,—On two occasions recently a patient has been sent to my ward affirmed to have "paralysis of the bladder;" such, at least, is the statement that accompanied them here. On examining one of them we found a not unhealthy-looking elderly labouring man, from whom, by much questioning, we elicited the following facts: That he is nearly sixty years of age; that he has passed his water much too frequently for four or five years; that he was much disturbed at night to do it, although lately it has come away without his knowledge during sleep; that when he makes an effort at work the same thing often happens; that the stream is weak, falling almost perpendicularly; that he has "no particular pains," but is not so strong as formerly, having become weaker of late; and that for the last few months the urine has been cloudy, and has had a disagreeable smell. With all this his ordinary functions had been fairly performed, and he had followed his daily labour until three weeks ago.

The man was desired to unfasten his dress; as he did so you remarked a urinous odour, and that certain cloths, which did duty for an india-rubber receptacle—a luxury beyond the means of our patient—were wet with the secretion. Two conditions only could cause this unhappy state of things: either the bladder was incapable of performing

its office as a reservoir, and permitted the urine to escape as fast as it entered from the ureters, or it was unable to expel its contents, so that it was over-distended by them, the surplus oozing out, or being forced out, in the manner described.

Now a glance of the eye might have nearly sufficed to settle this question. I pointed out a marked protuberance above the pubic symphysis; and after placing the patient on his back, the dulness by percussion corresponding with that spot, and the clear bowel-note all round, diminished the doubt that this was a collection of fluid, if any such doubt yet existed. Still this was not quite all that it was necessary to know; it was just possible that the swelling might be a solid tumour of the bladder, occupying its proper space and much more, and so destroying its function as a reservoir. To the hand, however, the protuberance was clearly made up of fluid; but even this is short of absolute demonstration, for the most practised hand has been known sometimes to "lose its cunning," or to have found a too deceptive quality in the object handled. Finally, you saw that a well-curved gum catheter glided into the bladder, and upwards of 40 ozs. of somewhat stale urine flowed off. I then examined the prostate, and found no very obvious enlargement.

Now, was this a case of "paralysis of the bladder?" Certainly not. His history showed that he had had no seizure of any kind, and I beg you to understand that without some change in a nervous centre there is no paralysis of the bladder. Recall, if you please, what I said in my seventh lecture on this subject. This term is applied, or rather misapplied, every day to such cases as the one before us, and with the result not merely of masking the true patho-

logical state, which ought always, if possible, to be indicated by a nosological term, but of misleading the inquirer, since it indicates a condition which by no means exists.

What, then, is the defect or disease occasioning the symptoms in this case? Probably, atony of the bladder. I will speak presently with more precision. The bladder fails to expel its contents in the two following conditions: either a growth from the prostate, by no means necessarily large, obstructs the neck, so that the natural power of a healthy bladder—which may, moreover, have been reinforced for the difficulty, by hypertrophy of its fibres rendering it stronger—cannot propel the urine by or over the obstruction into the urethra; or, these muscular fibres of the bladder are so enfeebled, or even atrophied, that their propelling power is lost or greatly diminished, and the organ becomes a thin flaccid bag, and can exert no expulsive force upon its contents.

The two conditions sometimes coincide. We may have hypertrophy of the bladder following obstruction from stricture of the urethra. On the other hand, with obstruction from the prostate, the vesical coats sometimes extend and become thin. But atony may be produced without any disease of the prostate, and then mainly from the subject of it having been placed in circumstances which obliged him to retain his urine for a too considerable period, so that the bladder became over-distended, and has failed subsequently to regain its tone. Unfortunately, a single error of this kind will sometimes produce an atony, which becomes irremediable if discovered too late.

Now, on further questioning our patient, we did not find that he could recall any such instance, nor that he had ever formed the habit of permitting such over-distension. Neither

did the affection occur suddenly; on the contrary, the symptoms appeared gradually. What is still more significant is, that they occurred at that time of life when prostatic hypertrophy mostly commences, if it appears at all. Still, the prostate was not obviously large on examination by the bowel. We arrive, then, at the following conclusions:— That this man has some enlargement of the prostate, which, though not obvious in the rectum, consists in a small nipple-like projection of the median portion, occluding the neck of the bladder, and that, from the size of the bladder, as just now demonstrated by percussion and by its contents, its walls are thin, and have lost their contractile power; in other words, are in a condition of atony.

I think there is no escape from these conclusions, and I beg that you will not only never permit yourselves to allude to this condition as "paralysis," but that you will protest against so loose and improper a use of the term when you hear it thus misapplied by others. Now, true paralysis of the bladder occurs from injury to the spine, and also as one of that large group of symptoms which result from disease in the cerebral or cerebro-spinal centres. You find it associated with slightly unsteady gait, with impaired articulation, or with some of the slighter signs of such central mischief, as well as with those which are most obvious; and I have even found it persisting after all other signs have nearly—I cannot say quite—disappeared.

In all cases, as in that of this patient in the ward, it is essential to empty the bladder by means of the gum catheter three or four times daily, to remove the urine completely, and at least to offer the possibility to the muscular coat of re-acquiring power, which does not exist so long as that coat remains constantly distended by the retained urine.

Next, for pure atony and for slight paralysis, uncomplicated with prostatic enlargement, a little aid may be sometimes afforded to the patient through the agency of electricity, by cold douches and injections, and by tonics; but less advantage is to be derived from these means, in my opinion, than some have appeared to believe, although I by no means say they are not sometimes serviceable. I have seen an increase of expulsive power attained rapidly during the daily application of an electro-magnetic current to the bladder, and in the following manner:—To one pole the ordinary handle and moist sponge are attached, which is placed over the lumbar vertebræ; an elastic bougie, containing a conducting wire, and tipped with metal, is attached to the other pole, and is introduced into the bladder. A weak current is set going, and its effects watched. Thus a slight sensation only is to be produced. This accomplished, you should move the bougie about gently in contact with the walls of the bladder, the urine having been just withdrawn; and, finally, let it rest a little in the neck of the bladder, where greater discomfort is felt: in all, allowing the current to pass for eight or ten minutes before withdrawing.

A very different condition to that just described sometimes results after severe lesion, and also after local injury —viz., inability on the part of the bladder to act in any way as a reservoir. In this unfortunate situation the urine leaves the organ by the urethra as fast as it enters by the ureters. This is complete incontinence, in the true sense of the term. Little else than mechanical contrivances are of any avail. And these consist of making a reservoir outside instead of inside the body; one which can be emptied at the patient's will. Happily, such cases are very rare.

But there is a partial incontinence which is very common, and which is, moreover, amenable to treatment. You will be consulted by an anxious mother who, bringing her boy or a girl, of any age below puberty, and occasionally above that period, tells you that every night, or nearly so, this young person wets the bed. Examples of this are frequently seen in my out-patient room. You know that, in a child with a busy, excitable brain, muscular movements occur during sleep of a much more active character than those which usually occur in the adult, or in children of a more placid temperament. Anything up to somnambulism may take place during sleep in a child whose physique is weak, and who is the slave of a restless, ceaseless activity of mind; and micturition during sleep often occurs in connection with this state. Clearly, however, not only in such cases; for in some very dull and stupid children, in whom intelligence appears to be below the average, the same thing may happen. And it must also be admitted that there are cases which do not fall into either of these classes. For such unfortunate patients all sorts of remedies and all kinds of management are adopted, including even a periodical employment of the birch—a species of "cytisus" which I trust you will never admit into your own therapeutic scheme. Depend upon it that "punishment" for this form of youthful frailty will not answer; and whatever of strength to the moral faculty may be communicated in obedience to the ancient injunction not to spare the rod—a question beyond our province to discuss—do not regard it as binding on us who practise the healing art. The child's attendants often lose patience at the perpetual recurrence of the disagreeable infirmity, and believe it to be the result of wilfulness or of carelessness. I have seen much cruelty

practised, even by the nearest relatives of these unhappy offenders. Give it no countenance whatever.

Now for treatment, briefly, and as much as I can on general principles. For class the first you will cultivate the physical side of life; remove as much as possible the sources of over-mental stimulation; strengthen the constitution through the agency of diet, country air, or sea-bathing, if possible, and give steel-wine and cod-liver oil. For class the second—those of torpid and deficient intelligence—you must show the importance of developing mind. Endeavour to call the will into play as much as possible, and enlist it to aid you in preventing the act. These are the children who are usually ill-treated; instead of which they must be made sensible of the degradation of the habit, so as to get a stimulus for volition in relation to it. Here remedies which act specifically on the organs are most appropriate; although these agents are useful in both classes.

First and chiefest is belladonna; which apparently paralyses the expulsive muscles of the bladder and the sensitiveness of the organ at the same time. Thus, in elderly people, who have feeble power to expel the urine, a dose often produces complete retention, lasting occasionally some time, and unaccompanied by consciousness of inconvenience from it. To these young patients you should give small doses, at first, of the tincture, in the afternoon and at bedtime, increasing them gradually to a considerable extent, if necessary, until the influence of the drug is quite manifest. If thus the bladder is made to retain the urine all night for a time, a new habit is formed in place of the old one, and the probability is that it will persist on discontinuing the medicine, which, however, should be done by degrees. This remedy is so excellent a one that it has

almost superseded blisters to the sacrum and such counter-irritants. After it, nux vomica may be tried. A combination with belladonna of strychnia, say 1-48 to 1-36 of a grain, has succeeded with me after failure by the latter alone. Then, for confirmed cases, after the failure of other treatment, especially for those who have arrived at puberty, or thereabouts, a mild caustic solution to the prostatic urethra—say ten grains to the ounce of water—has answered in my hands; to be repeated with a stronger solution if necessary. This for either sex; but I have found for boys the frequent passing of a soft bougie, which is left in the urethra for two or three minutes at a time, suffice to arrest the habit. When the prepuce is very long and cannot be easily retracted, it is most desirable to perform circumcision.

In all cases inquire carefully for derangements of digestion, in all its stages, from primary stomach symptoms to worms in the lower bowel—not unfruitful in their adverse influence. Of course you will take care that the child has not too much fluid, nor takes too much of solid food containing much water in its composition, during the latter third of the day; and that it is taken up to pass water late in the evening, when its attendants go to bed.

A short sketch of Tumours proper to the bladder and prostate will finish this part of our subject. First, you are distinctly to understand that all those outgrowths from the prostate which come under the head of hypertrophy, since they are more or less composed of structure identical with, or very similar to, that composing this organ, however much they may project into the cavity of the bladder, are not to be included in the present class; although it is not an uncommon error to do so.

Tumours proper to the bladder are of rare occurrence. I wish you to know what they are—what it is possible you may meet with, so that you may have the chance of recognising an example if it falls in your way. As with those in other parts of the body, they are classified according to the amount of force which they manifest to invade surrounding structures, or to reproduce themselves elsewhere.

Thus, first, we have simple fibrous growths, chiefly in the form of polypi, springing from the walls of the bladder, and wholly unassociated with the prostate; the rarest of all forms—in short, exceedingly rare, known to me personally only in museums.

Secondly, there is the "villous or vascular tumour" of the bladder, miscalled "villous cancer;" for it has no invading or reproductive power beyond the organ in which it arises.

Thirdly, there is epithelioma—the lowest type of malignant formation, and slowest of development.

Fourthly, true scirrhus occurs in the walls of the bladder; and, much less commonly, encephaloid.

Respecting the prostate, it may suffice to say here that the tumour to which it is chiefly subject, the tumour-form of hypertrophy put aside (*vide* p. 103), is a malignant tumour, and that of the encephaloid variety. Scirrhus is so rare that I have seen but one case in my life, and know but of one other besides that. There are no examples in any of the museums. Common hypertrophy has often been termed "scirrhus" in error.

Now, putting the first form of vesical tumour, or polypus, out of the question, it may be said in general terms of all the rest, that the single and most certain characteristic of the presence of a tumour is *persistent vesical hæmaturia*, no calculus or other obvious cause existing.

But never arrive hastily at the conclusion in your own mind, nor even too readily admit the suspicion that tumour is present: for you will remember, in the first place, that it is exceedingly rare, compared with other causes of similar symptoms; and, secondly, that there are no early positive signs, or almost none which can be so regarded, of its existence. It is only by a long process, and after much careful watching of any case, and consequently when the disease is in a somewhat advanced stage of development, that you can, and mainly *per viam exclusionis*, conclude with some reason that a tumour is present.

The symptoms of vesical tumour are almost identical with those of calculus, and the patient is certain to be sounded more than once or twice before tumour is even suspected. Suppose, then, that you have verified the absence of stricture, of prostatic enlargement, of chronic retention of urine, of calculus, of primary renal disease, and you are at a loss to know why your patient passes water with great frequency and pain, the secretion containing more or less muco-pus, and having blood in it often or continuously, the quantity of which is increased by exercise,—you direct your inquiries to the existence of vesical tumour. And you will proceed thus: First, you will introduce into the bladder the short-beaked sound, and with a finger in the rectum you will carefully explore the thickness of the structures intervening between the finger and the sound. Next, the sound being still in the bladder, you will not find much difficulty, provided the patient is thin, in gaining some information of a like kind by palpation above and behind the pubic symphysis. Further, by movements of the sound itself, you may detect a hard mass of scirrhus on either side of the vesical walls, the sound not turning over readily to the left or right, as the case may be. You will not discover a villous tumour thus,

for it is much too soft, and will elude the most delicate traversing of the cavity which can be achieved. Even an epithelial growth, which is usually wide in its base, of flocculent surface, and sprouting into the cavity, although not very luxuriantly, is so deficient in induration as not to be readily discoverable. It scarcely destroys the flexibility of the vesical coats, which is the fact you have to ascertain.

In nine cases out of ten you will, as the case advances, discover by rectal examination, a mass in the bowel, not globular and homogeneous in density, like most hypertrophies of the prostate, but a dense and irregularly formed tumour, by no means symmetrically placed, and extending far back, often beyond the power of the finger to define. Inequality in surface as you explore it, unevenness in texture, while it is for the most part hard and unyielding to pressure, are the characters which will compel you to form the gravest conclusion as to the nature of the growth. Most rarely, the tumour is at the apex of the bladder, and beyond our reach in the bowel. Almost invariably is that portion of the bladder involved which can be touched by the finger. I have lately verified the fact of exception in one case, and therefore record it.

Next, you may search for enlarged glands in the iliac regions, but they are palpable only in advanced cases of scirrhus; and you will also obtain such light on the subject as a search for cancerous growths in other parts of the body may afford you. Thus, not long ago, I had my diagnosis of cancer of the bladder in the case of an elderly patient made certain by the appearance of a secondary growth, springing from the cranium.

Again, you will repeatedly and carefully examine the deposits in the urine for the appearance of organic materials

cast off from the growth, which may serve to indicate its nature. Thus I have detected under the microscope the peculiar structure which the processes of the villous tumour present to the eye. But what of the cells of epithelioma, and what of "cancer-cells?" I am compelled to resign to others—and I am well aware that several writers on this subject have proclaimed the value of microscopic examination of the urine in vesical cancer—the good fortune of absolutely identifying malignant disease by this means. First, suppose you have caught your "cancer-cell," are you prepared to swear to its identity? As students, I will assume you have examined, say a few hundred specimens of urine, not many, but enough, at all events, for my purpose, and that you have, therefore, not a little perplexed yourselves, if you are of an inquiring turn, with all that fruitful progeny of cells, epithelium of different parts and in all stages of growth, &c., which are desquamated in health, but especially under the influence of any morbid action in those passages, and which appear therefore in the urine. Some of the best "cancer-cells" I ever saw in my life were collected from a patient's urine, and placed under the microscope by an eminent microscopic observer, for the purposes of a very important consultation, at which I assisted. After a careful local and general examination of the patient, I admitted the beauty and perfection of the microscopic observation, but on larger grounds denied the existence of cancer in the bladder; and the ultimate result, happily for the patient, confirmed that view, and disproved the cell. Most valuable as is the microscope in this great class of maladies, ranking next, and very near to, the sound itself, never let it obscure for you those broad features of the case which are to be determined by the unassisted eye

and touch, as applied to the body, and to the urinary secretion itself through the means of reagents. But when you find, as sometimes happens, distinct masses of soft, almost semi-translucent structure of considerable size, passed by the urethra at micturition, and discover on examination that these evidently consist of rapidly-formed cell-growth, the cells of large dimensions, and containing two or three nuclei, the observation will go far to confirm your suspicions of cancer aroused by pre-existing symptoms.

Lastly, you will, in endeavouring to determine the particular kind of growth, observe the nature of the hæmorrhage and the character of the pain. In malignant disease, the hæmorrhage is irregular in its occurrence, long intervals being sometimes observed in which no bleeding appears; and when it does take place it is often in considerable quantity, and it may persist for some time; moreover, the blood is usually of a florid colour. In villous growths the urine is generally more persistently coloured, and presents a reddish tint, resembling the juice of raw meat—not dark or smoky in hue; occasionally, however, rapid and considerable hæmorrhage takes place. The pain of cancer is more constant and severe than that of villous growth, the latter not being necessarily accompanied with great pain, unless obstruction to the outflow of urine is produced by the tumour.

What shall I say here respecting the treatment of vesical tumour? That it must be shaped according to the existence or predominance of certain symptoms, which may be regarded as three in number: hæmorrhage; painful and frequent micturition; retention of urine.

For the treatment of hæmorrhage, I shall first name the internal astringents, I mean those administered by the

mouth, as gallic and tannic acids and the acetate of lead, for which I have little to say by way of commendation. The agents which have been most valuable in my experience are alum, iron alum, and an infusion of matico,—of these the alums have been associated with the best results; you may give from ten to fifteen grains of either three times a day, with ten, fifteen, or twenty minims of sulphuric acid, adding syrup to make it palatable; and it certainly is so, and does not generally derange the stomach at all, which cannot be said of gallic acid or of lead. Of the infusion of matico, not less than two ounces should be taken every three or four hours if bleeding is considerable.

For the local treatment of vesical hæmorrhage, when it is chronic and constant, I know of nothing so good as injections into the bladder of nitrate of silver, commencing with one grain to four ounces of distilled water, most gently and carefully used, for it is almost unnecessary to state that by such local treatment it is very easy to provoke more bleeding if your handling is rough. You may throw in an injection daily, in the manner before described (page 332), permitting an ounce to remain when the catheter is withdrawn: and the quantity may be augmented gradually as far as to one grain to the ounce, provided that undue pain is not caused. Few can bear this quantity without considerable uneasiness, and this sign of its action should, I think, be reached if the bleeding remains still unchecked. When hæmorrhage is considerable, absolute rest in bed, cold applications, and avoidance of instrumental interference, unless absolute retention renders it necessary, are the main additional elements of treatment. If instruments are really necessary to withdraw blood and urine, then the slow injection of iced water, or better still, of iced infusion of matico, may

be useful. Even a mild solution of the tincture of the perchloride of iron as a cold injection I have known in one case to succeed when all others have failed. The proportion was one drachm of the tincture to four ounces of water.

For alleviation of pain or frequency of micturition do not spare opiates—trying any form, or all forms in turn, until you find that which most assuages it and least disturbs the digestive organs. Give them by mouth, subcutaneously, or by suppository. Never mind how much, in order to act effectually. It is not a question of saving life, but a question of mitigating that most frightful of human miseries—prolonged, continuous, severe bodily suffering; and this for a patient whose doom is certain, and to whom life has come to be for the most part a dire calamity. While you are bound, therefore, on the one hand jealously to guard life, I hold that you are equally responsible, on the other, that it shall be rendered fairly endurable. I confess that I have felt sometimes almost indignant at the sight of a poor fellow-creature, worn out with anguish, praying for death, who, thanks to a well-meaning but weak timidity, is permitted only such small comfort as fifteen or twenty minims of liquor opii, or of a solution of morphia, once or twice in the twenty-four hours can afford.

For the relief of chronic retention of urine, such catheterism must be applied as the case requires, whether periodically or continuously, as the comfort and the exigences of the patient render desirable.

LECTURE XXIII.

ON HÆMATURIA AND RENAL CALCULUS.

GENTLEMEN,—I propose to-day to complete the programme I originally designed for this course by considering a phenomenon of common occurrence known as Hæmaturia.

Let us define the term. What is Hæmaturia? The outflow of urine containing blood in admixture. Thus bleeding from the penis at other times than that of micturition is of course not hæmaturia. Bleeding coincident with micturition from chordee or operation, or from any known injury in the course of the urethra, is also not to be included in the meaning of the term. The blood then usually issues by the side of the stream of urine, and is only partially mixed at its line of contact, or it may follow rather than accompany the urine.

Hæmaturia, then, is a symptom. Its presence is, in all cases of urinary disease, to be sought. Hence the inquiry forms one question—the third—of the necessary four which I instructed you always to ask in forming a diagnosis. Here is a glass of urine, evidently containing an admixture of blood. What is the source of it? Now, it is often not an easy thing to state at once what point of that long and complicated organic apparatus, which commences in the Malpighian corpuscles and ends at the external meatus, is the source of the blood in question. Sometimes it is exceedingly difficult to define its source. Thus it is that in medicine, you will often find some symptom, the pathological

cause of which is not very obvious, getting a specific name, and coming at length to be erroneously regarded as a distinct disease; and just as you will be asked, as I told you the other day, what is good for dropsy, you may also be asked what is good for hæmaturia.

Now, the consideration of this question, besides affording us new material for inquiry, will bring us over some of the ground we have already travelled together. I don't regret that—for your sakes, I mean. It will stand in the same relation to the past as the arithmetical "proof" does to the already worked sum. It is in some respect a synthetical operation following an analytical one. When, therefore, you see a specimen of urine containing blood, you will, as a matter of course, make a rough mental note of the proportion of blood present, and you will mark the colour. And as you can count on your fingers the ordinary sources of blood, these will pass rapidly in review at the same time. Let us name them as follows:—

1. The kidneys, where it may be from diseased action more or less temporary, as inflammation; or from disease more or less persisting, as degeneration of structure; or from mechanical injury, as from calculus there, or by a strain, or a blow on the back. If the hæmaturia is the result of inflammation, there will be general fever denoting its presence; if produced by slow organic change, there will be the history of failing health, and probably urine changed in quality otherwise than by the mere admixture of blood. When blood is in very small quantity, as it will naturally be at times, note the character of the urine proper—whether of low specific gravity, pale, with albumen in greater proportion than blood or pus will account for; perhaps renal casts may be found; and look out for dropsies in any degree. In

both the preceding forms, if blood is present, it will give the smoke tint to the secretion. Perhaps it may be affirmed that such urine, associated with very little if any local pain, is more likely to come from the kidney than elsewhere. In malignant renal tumour, blood may be large in quantity at times; the rapidity of growth and considerable size attained, are the marked characteristics of the disease. If mechanical injury be the origin of hæmaturia, there will be the history of a blow or strain; or there may be the signs and symptoms of renal calculus, of which more detail presently.

2. Then, putting aside the ureters, you will remember the bladder as the second source of hæmorrhage; and here it may be due to severe cystitis, calculus, or tumour. The first is obvious enough from muco-pus in the urine, and through other signs; while the second may well be suspected by the symptoms, and its presence realized by the sound. Here the hæmorrhage is usually florid, and in proportion to the patient's movements. But the third condition—namely, that the hæmorrhage arises from tumour—is not always so readily to be affirmed. As a rule, however, blood from such a source is larger in quantity than from stone, and may be associated with less of muco-pus. If the tumour is malignant, it may be felt by examination, and the pain is often severe; if villous, it gives an even pale-red tint for days together to the urine; and in both cases the blood is florid, unless it is long retained in the bladder, when dark sanies, like coffee-grounds, results.

3. In hæmorrhage from the prostate, the third principal locality or source, the same thing occurs, if the organ is hypertrophied and the blood is retained; but here the age of the patient, the history of gradually increasing trouble, and the ascertained condition of the organ from the bowel,

aid the diagnosis. A slight appearance of blood mixed with the last few drops of urine is not a rare occurrence in chronic prostatitis.

4. When bleeding arises from stricture of the urethra, the patient's history and the cause of the bleeding, almost always instrumental, leave no room for doubt. From the use of instruments also in the bladder, hæmorrhage sometimes arises.

5. Lastly, it is not to be forgotten that occasionally blood is found in the urine as the result of violent diuretics, from purpura, in fevers, and in the hæmorrhagic diathesis.

Now for the treatment of hæmorrhage. When you have determined that its source is above the bladder—that is, in the kidney or in its pelvis, probably the first and most influential remedial agent is rest in the recumbent position. Whether from a lesion affecting the intimate structure, or from the mechanical irritation of a calculus in any part of the organ, rest is the first and the essential condition. The patient is, moreover, to be maintained in as cool and tranquil a state as possible.

It is in renal more than in any other form of hæmaturia, perhaps, that direct or internal astringents or styptics are useful. I shall do no more than name those which are most commonly used—namely, alum, gallic and tannic acids; lead and turpentine; equal to them is, I think, the infusion of matico, say in doses of two ounces every two or three hours. The tincture of iron, and also sulphuric acid, may sometimes be taken with advantage. But see page 353, in the preceding lecture.

It is, however, in cases of severe hæmorrhage from the bladder, or more commonly from an enlarged prostate, that active and judicious treatment is necessary. You will be

called sometimes to a patient whose bladder is distended with coagulated blood, or who is passing frequently a quantity of fluid in which blood is the predominating element. Usually this has arisen from some injury inflicted by the instrument, although it may also be from tumour of the vesical walls. Here you will keep the patient on his back, and forbid the upright position, or any straining, so far as you can prevent it, in passing water. To this end give opium liberally, to subdue the painful and continued action of the bladder. Apply cold by means of bags of ice to the perineum and above the pubes. Better still, introduce small pieces of ice into the rectum. Do not use an instrument if it is possible to do without it. There is a great dread in some people's minds about the existence of a large coagulum in the bladder. I have even known a bladder to be opened above the pubes by the surgeon, for the mere purpose of evacuating a mass of clotted blood. Leave it alone: it will gradually be dissolved and got rid of by the continued action of the urine; while if you are in haste to interfere with instruments, and are very successful in removing it, you will succeed also most probably in setting up fresh hæmorrhage. The bleeding vessels have a far better chance of closing effectually if they are not subjected to mechanical interference. Meanwhile, support the patient's powers by good broths, &c.

But it sometimes happens that hæmorrhage occurs in a patient who has long lost all power of passing urine except by catheter. This is a very different position. Here the coagulated mass which fills the bladder must sometimes be removed, or no urine can be brought away. Thus you introduce a catheter, and none appears, for the end of the instrument passes into a mass of coagulum, and nothing

can issue. Sometimes sufficient may be removed by attaching to a large silver catheter a six-ounce syringe or a stomach-pump. Clover's lithotrity apparatus has answered remarkably well with me in two or three instances. Let me caution you, as a rule, not to inject styptics into the bladder in these circumstances; the irritation does more harm than good. There are some few exceptions, but it rarely happens that the injection of any powerful styptic does not produce painful spasm of the bladder, a condition in which hæmorrhage is more commonly increased than diminished. (See pages 353–4.)

In passing to another subject, I beg to call your attention to a glass before you containing some urine of a dark and somewhat unnatural tint. Let us interrogate the case of the patient from whom it came. In obtaining this specimen I took care that he should first pass about an ounce into a separate vessel, to clear his urethra—a precaution always absolutely necessary to avoid error, as I have before warned you—and the remainder into this. It is less translucent than average healthy urine is, and has a deeper colour. The hue is not red, but slightly orange, with a dirty grey-brownish tint, commonly and very well distinguished by the word "smoky." That tint denotes blood to an ordinarily practised eye. Why is it not red? Because blood, after a certain term of contact with urine, loses its red colour and becomes brown; and you see it in that condition, or according to the quantity, producing any depth of hue from this up to that of London porter. Put it under the microscope, and you will find abundance of blood corpuscles. We get this broad principle, then, to start with: bleeding from the more distant parts of the urinary system, unless in very large quantity, will almost certainly make the urine brown,

while urine which contains red blood has almost certainly issued recently from some source in the bladder, probably at or near its neck, these being the more common sites of vesical hæmaturia.

In the case before us, then, we proceed easily and rapidly to eliminate many of the sources of bleeding by physical exploration, and by the account which the patient gives of his sensations. His age is forty-five years. He makes a good stream when a fair amount of urine has accumulated in his bladder, but this does not often happen, for he passes it every two hours, or less, in the day, not so frequently at night; no straining is necessary. Pain in the course of the urethra is experienced during and after micturition; not severe. He is uneasy about the pelvis and loins on taking exercise, and more blood passes afterwards. He is somewhat emaciated, and so presents a good condition for examination by the hand. He is subject to variation in the intensity of the symptoms, having now and then attacks of a few days' duration, in which they are aggravated and especially the left renal pain; and he dates their commencement from an attack which occurred seven years ago, which was accompanied by vomiting; this or nausea has recurred sometimes on these occasions since. He has never passed gravel. He is less robust than formerly; his digestion is not good. A full-sized bougie passes easily into the bladder; no stricture; hypertrophy of prostate at his age not possible. On sounding, he is manifestly more tender than usual; nothing is felt, nor any deviation from the natural condition by simultaneous examination by the rectum. Palpation of lower part of abdomen shows nothing. Arriving close under the last ribs of left side with one hand, the other pressing firmly on left renal region, he flinches unmistakably; that

is the spot, he says, where he feels pain at times and on movement; right side, nothing. We examine his urine: sp. gr. 1018, acid, small brownish deposit on standing: under microscope, blood-corpuscles, some pus-corpuscles, epithelium, no crystals, no casts; albumen, a little, but only corresponding with organic matters present.

What is the seat of the lesion in his case? You say, perhaps, the bladder: we found it tender to the sound, and it acts with undue frequency. Yet remember this is by no means sufficient evidence of any primary morbid change there, this symptom constantly accompanying diseases affecting primarily the kidneys or the upper part of the ureter while the bladder is healthy. Much more probably the kidney. The history, the manifest local tenderness, the repeated attacks, the impaired health, the absence of all the more common causes of cystitis in any form point to the left kidney as the seat of mischief. The absence of albumen and renal casts—a fact of not much weight, although their presence is of the utmost importance—lead us to believe him free from organic changes affecting the renal structure. I conclude that his left kidney is the seat of calculus, although he has never passed one, and has at present no crystalline deposit in his urine—a fact by no means essential to the diagnosis; and that this calculus is the source of the blood and pus found in his urine.

It is sometimes not easy to say what kind of calculus exists in these cases, of which this is a fair type. When any calculous matters have been passed which can be examined, or when the crystalline deposit in the urine is constant, the inference is pretty clear. Add to this that the probability in any case is strong in favour of uric acid, from its known frequency of occurrence—taking large numbers,

say at least fifteen to one as compared with oxalate of lime.

For treatment: Alkaline diuretics and diuretic vegetable infusions, before named, for a period of time; attention to the digestive functions and to that of the skin, for the kidneys are probably working too much vicariously for some other function acting lazily; some mild form of counter-irritation over the renal region, moderation in highly nitrogenized food, a considerable proportion may be advantageously vegetable; mild alcoholic drinks if any,—in most cases none should be permitted, in others only a light and mild Bordeaux. Of all medicinal remedies, perhaps none are so valuable as mineral waters, especially those which have sulphate of soda, largely diluted, as the main ingredient. For two well-known remedial agents, which are very popular, each among its class, I am bound to tell you, I have very small esteem. Here, in town, it seems to me that every man advises his neighbour, and on every pretext, to drink Vichy water—advice which is cheap, and of which the value in most instances by no means exceeds the cost. In the country, where perhaps the fairer sex more usually dispense similar aid to their suffering neighbours, the prescription is mostly gin-and-water. Of the first, or natural product, which is a strong solution of carbonate of soda, I must say that, if not absolutely injurious, it is at least greatly inferior to potash; and of the second, or artificial one, that it is about as serviceable to the kidneys as a pair of spurs to a jaded horse—makes him travel for a time, but takes it out of him in the long run. This subject has, however, been treated in detail in the sixteenth lecture.

For the paroxysms of severe pain which denote the passage of a renal calculus, you will find hot hip-baths, prolonged

or often repeated, of the greatest service; the temperature may be increased to anything the patient can bear. The application of a hot linseed poultice, the surface of which has been sprinkled with flour of mustard, an excellent rubefacient at all times for this region, may intervene, or be substituted for the bath. The patient should be allowed large doses of opiate, also, to assuage severe pain; and abundance of barley-water, potash-water, or the like, for drink.

I shall here, by way of episode, refer to a mode of determining the true characters of a patient's urine, which is of extreme value in some doubtful cases—a mode which has never to my knowledge been recommended or practised, and which I have systematized for myself. I have already told you how essential it is to avoid admixture of urethral products with urine, if you desire to have a pure specimen, and how you may attain this object by the use of two glasses. It is sometimes quite as essential to avoid its admixture with products of the bladder. And I defy you to achieve an absolute diagnosis—by which I mean a demonstration, and never be satisfied with less, if it be practicable—in some few exceptional cases, without following the method in question. When, therefore, it is essential to my purpose to obtain an absolutely pure specimen of the renal secretion, I pass a soft gum catheter, of medium size, into the bladder, the patient standing, draw off all the urine, carefully wash out the viscus by repeated small injections of warm water (before shown to be rather soothing than irritating in their influence), and then permit the urine to pass, as it will do, *guttatim*, into a test-tube, or other small glass vessel, for purposes of examination. The bladder ceases for a time to be a reservoir; it does not expand, but is contracted

round the catheter, and the urine percolates from the ureters direct. You have, virtually indeed, just lengthened the ureters as far as to your glass. And now you have a specimen which, for appreciating albumen, for determining reaction, and for freedom from vesical pus, and even blood, and from cell-growths of vesical origin, is of the greatest value, and has often furnished me with the only data previously wanting to accomplish an exact diagnosis.* Mind never to be satisfied to guess at anything; make, very cautiously, if you will, your provisional theories about a doubtful case—indeed, the intellectual faculty must constantly do this, and without reference to the will—but arrive at no conclusion, take no action, except so far as you are warranted by facts.

I have reserved these few words to the last, as the most important. The first words I uttered in this course were designed to convey to you my strong sense of the importance of acquiring the habit of making an accurate diagnosis, and a rapid one, if possible. My last shall be to express once more the same conviction. Not because I undervalue the subject of treatment, but precisely with the opposite view; being anxious, above all things, that you and I should afford some essential service to those who have confided to us the care of their maladies. I adjure

---

* Now and then, although very rarely, in some states of the bladder, the presence of the gum catheter itself will occasion a little blood to exude from the mucous membrane lining the cavity. This being obvious to the eye will show a source of fallacy, and it is never to be forgotten that a very small proportion of blood-admixture with urine will give rise to a large albumen deposit, on the application of the usual tests. The value of the experiment, however, is not in the way of making manifest the presence of albumen in any doubtful case, but in showing that when it is largely present in the urine ordinarily passed, the urine drawn direct from the kidney may, nevertheless, be without a trace of it, a most important fact to determine.

you to spare no pains to obtain the most complete knowledge of the complaint itself, since it is the only mode of arriving at a knowledge of what will be sound and efficient treatment.

I beg to thank you for the extreme attention and assiduity with which you have followed me during this course, and to assure you that such a manifestation on your part has rendered our meetings for these colloquial discourses some of the most agreeable relaxations which have fallen to my lot, to vary the routine of an anxious and very active professional life.

[The next lecture, so called here, was not adapted for oral delivery, but is the reprint of directions for the examination of the urine which I drew up several years ago and printed separately for the use of my class.]

LECTURE XXIV.

THE EXAMINATION OF URINE FOR CLINICAL PURPOSES, CHIEFLY IN CONNECTION WITH THE SUBJECT OF DIFFICULT MICTURITION.

Healthy Urine.

THE common or generally prevailing characters of healthy urine may be first stated, as affording the standard of comparison by which to estimate deviations existing in any specimen submitted for examination.

Healthy urine, recently passed, is transparent; possesses an amber colour, which may be faint, pale, full, or dark, with a tint of orange-red, according to the degree of dilution in which the colouring matter exists. While fresh and warm, it has a characteristic odour. After standing a few hours, a faint light cloud is seen in the liquid, occupying about the lower fourth or third of the vessel in which it stands. Its specific gravity, at 60° Fahr., may be approximately regarded as varying between 1·010 and 1·030; the mean density being from 1·015 to 1·020.

Its reaction is slightly acid, and remains so until decomposition of the organic matter contained in the liquid has commenced. Heated to ebullition, its transparency remains. Mineral acids throw down no precipitates.

The quantity voided varies in different individuals, and in the same individual at different times, from the influence of season, food, exercise, &c. &c. From twenty-five to forty ounces in summer, and from thirty to fifty ounces in winter, may be considered as the average quantities; but

considerable variations in quantity are consistent with perfect health. The solid matter contained in either case generally ranging between 700 and 900 grains in weight.

Rules for Examining Urine for Surgical Purposes.

I.—The urine to be examined should be in quantity not less than two or three fluid ounces, and for the most part a portion of that which has been passed on first rising in the morning (urina sanguinis). Or a specimen of that which has been made at night (urina chyli) may be preserved also.

But no specimen is worth examining, inasmuch as it cannot be relied on as affording trustworthy indications, unless the urine has been separated in the act of passing by the patient, into two portions. The first portion is to consist of a small quantity, say an ounce or so, sufficient to clear the urethra of any discharge which may happen to be in the canal. The second quantity is to consist of all that remains, which being passed through a urethra just flushed by the preceding portion, will be the true product of the kidneys, plus only any matters derived from the bladder itself. This is the portion which is to be submitted to the tests hereafter described. Purulent matter originating in the urethra is often mixed with specimens of urine sent for examination, in which case it may be erroneously estimated as albumen by the chemical test; or as pus under the microscope may be supposed to have its origin from the deeper passages.

II.—Supposing it to be contained in a glass bottle, let the vessel be placed upright, with the cork downwards, allowing it to stand at least an hour, or two if convenient, for the purpose of permitting matters held in suspension by the urine to subside and adhere to the end of the cork:

better still, place the urine in a tall conical glass; the deposit can be easily obtained by a glass pipette. But before the fluid is disturbed, let the following particulars be noted from simple inspection by the naked eye:—

The colour of the liquid; which may be pale straw, yellow, orange, red or brown.

The degree of transparency.

The characters of the deposit; such as, whether it be floating, flocculent, and scanty; ropy, viscid, and tenacious; dense, heavy, and abundant; dark or light in colour.

Its composition may frequently be predicated from this inspection alone by attention to rules hereafter given.

III.—Next, remove the cork carefully, to the under surface of which a portion of liquid and deposit will be found adhering, sufficient in quantity for examination under the microscope. Transfer it by dabbing the wet cork upon a glass slide; immediately cover it with a piece of thin glass, and view under a good half or quarter inch object-glass. Generally speaking, I prefer the latter power, under which the accompanying illustrative drawings were made.

IV.—We may now proceed to test the bulk of the urine as follows:—

Decant it into the ordinary hydrometer glass, observing the odour, which may be fresh and normal, ammoniacal or "fishy," or fœtid.

Determine the reaction by litmus paper, which, if the urine be acid, will be turned red; the intensity of the colour corresponding with the amount of free acid present. If reddened litmus be restored to its natural colour, or turmeric paper be rendered brown, the urine is alkaline. But urine, which is acid when passed, may become alkaline by keeping, from the decomposition of the urea, and the con-

sequent production of carbonate of ammonia. When mucus is present this change takes place with greatly increased rapidity. But sometimes urine will become more acid by keeping. The urine passed shortly after a large quantity of tea or coffee has been taken is often neutral, or slightly alkaline.

Take the specific gravity, bearing in mind the influence of temperature, if very accurate observations are required. For example, there is a difference of 6° in the sp. gr. of the same urine, at the two temperatures of 40° and 70° Fahr., which may be considered as representing those of winter and summer respectively. Temperature of 60° is always *understood* in all urinary reports. The specific gravity of healthy urine generally ranges between about 1·010 and 1·030. If the sp. gr. be lower than 1·010, water is present in large proportion to the solid matters, a condition very commonly occurring in health.

The urine should next be examined for albumen in solution, the presence of which may be ascertained by adding nitric acid, or by applying a temperature of not less than 160° or 170° Fahr. In either case albumen is deposited in an insoluble form. The best method of applying these tests is, first, to heat a small quantity of the urine in a test-tube over the flame of a lamp, to the boiling point; if a flocculent whitish precipitate falls, it is either coagulated albumen, or an excess of earthy phosphates. Determine which, by adding a little nitric acid, which instantly dissolves the phosphates, but has no such effect on the albumen; bearing in mind that when the latter is present in very small quantity, too much nitric acid will dissolve the precipitate. But when the urine is alkaline, albumen is not precipitated by heat; in which case a small drop of nitric

acid, that is, *just sufficient to faintly acidify the mixture,* should be added. For it is not sufficiently pointed out in the directions ordinarily given for the performance of this test, that the presence of free nitric acid, in the proportion of one or two per cent. in albuminous urine, will prevent coagulation taking place when heat is applied. But if the necessary acidification is made with acetic acid, no difficulty will arise, as the presence of this acid will not hinder the coagulation of albumen. In all cases where the presence of albumen is suspected, the application of both heat and nitric acid is to be made, the effect of either being insufficient alone to constitute unquestionable evidence of its existence. The quantity of albumen may be approximately determined by observing the proportion which the coagulated deposit bears to the supernatant fluid, after the test-tube and its contents have been set aside for a time; and the time should be a constant one, such as fifteen minutes, to obtain similarity of results.

If the sp. gr. be high, as 1·030 or more, either the presence of sugar or excess of urea may be suspected. Or the urine may in such case be only a concentrated specimen, in which the fluid constituents exist in small proportion to the solids.

Diabetic urine has generally a sp. gr. of 1·030 to 1·045 or 1·050. Moore's test is a simple and efficient one for sugar. Boil the urine in a test-tube, with nearly half its bulk of pure liquor potassæ for two minutes, when, if sugar be present, the liquid acquires a brown colour of greater or less intensity. Trommer's test, and that by fermentation, may also be used as corroborative tests. The former consists in the addition of about a third of its bulk of a solution of sulphate of copper [10 grains to one ounce of

distilled water] to the urine in a test-tube. Sufficient liquor potassæ must then be added to produce a precipitate of the oxide of copper, and to re-dissolve it. Heat the liquid, which has a full greenish-blue colour, until it boils, when, if grape sugar be in solution, a red precipitate of the suboxide of copper is thrown down. The manner of performing in detail the fermentation test it is unnecessary to describe at length, as the previous examinations ordinarily suffice for all practical purposes. It consists of course in the production of the Torula cerevisiæ.

The presence of urea is thus determined. To a small quantity of urine in a test-tube, add half the quantity of pure nitric acid. Place the tube in cold water; flat rhomboidal or hexagonal crystals of the nitrate of urea soon appear in the fluid, if urea is present in excess. The acid gives no such result in urine of the normal composition.

If the urine be unusually high in colour, the cause may be an admixture of blood, when it will be either red or brown; or of bile, when it will have an orange or a bright "burnt sienna" tint.

If it be due to the presence of blood, the colour, which may vary between that of porter and the faintest tint of red, disappears on simply boiling some of the fluid in a test-tube, the contents of which at the same time become opaque, and a deposit of dark coagula will take place, proportioned in amount to the quantity of albuminous matter present. Blood corpuscles will always be seen under the microscope.

If not due to blood, wet the surface of a white plate with some of the urine to be examined, and let fall a few drops of nitric acid upon it, and if the colouring matter of

bile be present, a brilliant play of colours (green, violet, red) around the acid will be instantly observed, which is transient in its duration. But if the bile be small in quantity, the appearance described will not be well exhibited unless the urine be concentrated by evaporation.

V.—Examination of the deposit by the naked eye.

If a dense deposit be white, yellowish, or pink, and disappear by heat, it is almost certainly urate of soda. Sometimes this deposit has a dark red or brown colour. The urine in any case is almost invariably acid. The deposit of urate of soda completely disappears on heating the urine containing it.

If a dense white deposit do not disappear by heat, it is almost certain to be composed of the triple phosphates, in which case it will be dissolved by either acetic or nitric acid, and remain unaltered by the addition of ammonia or liquor potassæ. The urine is generally neutral or alkaline.

An orange or red deposit, which is visibly granular, sandy, or crystalline, is uric acid.

Oxalates do not form a visible deposit, although when large and numerous, the naked eye will often detect innumerable small glittering points of light floating throughout the specimen containing them. They differ from the triple phosphates, small crystals of which they might be perhaps confounded with, by being insoluble in acetic acid, although dissolved by nitric and hydrochloric acids.

If a deposit be slight and flocculent, and unchanged by nitric acid, it consists chiefly of healthy mucus and epithelium.

If a pale, opaque, homogeneous layer, easily miscible with the urine, settle to the bottom of the vessel, and the urine be acid or neutral, it is almost certainly pus. If so,

albumen may be detected in the deposit by heating it, and adding nitric acid, and in the supernatant fluid also, in small quantity. Lastly, agitate an equal quantity of liquor potassæ with a portion of the deposit, and if the latter be pus, a dense gelatinous mass will result; while if it be merely mucus, it will be less dense than before. If the deposit be more or less transparent, and gelatinous, ropy, glairy, and tenacious, perhaps containing minute air-bubbles, and is not miscible with the urine, it is probably mucus or muco-pus, only, and the urine is generally alkaline. If the urine is acid, such a deposit is certainly mucus. But in alkaline urine, pus forms an opaque and glairy deposit. A glairy deposit may be opaque from the presence of phosphates; if so, a drop or two of nitric acid will dissolve them and render the deposit comparatively clear. The microscope will most readily decide the question, especially when the deposit is small in quantity.

Liquor puris contains albumen. Liquor muci does not.

Acetic acid has no visible effects upon an admixture of pus and urine. Added to urine containing mucus, a wrinkled membrane-like matter is seen floating through it, presenting a very characteristic appearance.

VI.—In examining the deposit under the microscope, any doubt respecting its elements will be cleared up.

Under the quarter-inch object-glass, the ordinary appearance of the deposits commonly met with are as follows:—

Uric Acid. (Pl. I., Fig. 1.)—Primary form, rhombs, of which numerous modifications are seen (*a a*); the most common exhibiting angles which are truncated or obtuse. It occurs most commonly in lozenge-shaped crystals, and rhomboidal prisms, of which the size and thickness vary

greatly. Colour, usually pale amber, like that of barley-sugar, but the tints range between faint straw and deep orange-red. Sometimes in shapeless masses of cohering prismatic, or lozenge-shaped crystals (*b b*); these are the "red sand" and "cayenne pepper" deposits which are seen by the naked eye.

Urate of Soda generally appears as a dark amorphous deposit which a high power shows to consist of minute particles cohering to a greater or less extent, in strings or masses. Plate I., Fig. 2 (*a a.*) This is, perhaps, the most frequently occurring precipitate which is deposited from the urine. Rarely it assumes the form of minute opaque balls of a reddish or reddish-yellow colour, either with or without little projecting spiculæ, which latter appear to be composed of uric acid (*b*).

Small globular masses with irregular hooked projections have been recognised as urate of soda; these are rare. Fig. 2, *c*.

The Phosphate of Ammonia and Magnesia, or Neutral Triple Phosphate. (Plate I., Fig. 3.)—In colourless, transparent, three-sided prisms, usually of large size, which it is not easy to mistake. The summits of these crystals exhibit great variety in the form and number of their facets. Occasionally it occurs in the stellar form, from the coherence of several small prisms, or as a rosette, where the crystals are acicular and in great number. Very rarely the neutral triple phosphate appears in double penniform crystals.

The basic form of the triple phosphate occurs in foliaceous and stelliform crystals, and is found in stale and highly alkaline urine, never in that which is acid. It appears to be a secondary formation occurring in the urine

after it has been passed, and very frequently to be developed from pre-existing prismatic crystals of the neutral phosphate by gradual change. First, the prismatic crystal becomes cleft at each extremity, then slight indications of the foliaceous markings are seen diverging from near the centre to each angle, so that by degrees four branches are developed, somewhat in the form of a cross, while the angular outline of the original crystal disappears. Two new branches are frequently added afterwards, and thus the six-rayed form of this salt is produced; *a, a, a, a,* indicate these crystals in different stages of development, sketched by myself from two specimens at different periods in the course of three days.

Phosphate of Lime occurs sometimes as a pellicle on the surface of alkaline urine, usually of minute granules; and it is often deposited with crystals of the neutral triple phosphate, adhering to them, and lying free in the field. Fig. 3, *b*.

Oxalates.—Common in sharply-defined octahedral forms, colourless and transparent; of all sizes, some being exceedingly minute. (Plate II., Fig. 2, *d*.) Very rarely indeed in a dodecahedral form (*e*). This deposit is sometimes replaced and sometimes accompanied by small crystalline bodies, described as possessing a "dumb-bell" form (*f*). Their appearance is rare as compared with that of the octahedra. Probably their constitution is not the oxalate, but the oxalurate of lime, a closely-allied salt.

Red Blood Corpuscles. (Plate II., Fig. 2, *a*.)—Small circular flattened disks, with a faint yellowish tint; smooth, semi-transparent, and non-granular; slightly concave on each face, but plump and almost spherical in urine of low specific gravity from endosmosis; sometimes shrivelled, with

serrated edges, or burst (*b b*). The diameter is about the $\frac{1}{3500}$ of an inch in the natural flattened state, but when distended, in urine, is somewhat less. There is no nucleus in the red corpuscle. The white blood corpuscle is larger, varying in size from the $\frac{1}{3000}$ to the $\frac{1}{2000}$ of an inch in diameter; it exhibits a tripartite nucleus on the addition of acetic acid.

Pus Corpuscles. (Plate II., Fig. 1, *a, a.*)—Variable in size, generally larger than blood corpuscles; from about $\frac{1}{3000}$ to $\frac{1}{2000}$ of an inch in diameter, white, rather opaque, granular aspect externally, with two or three nuclei, sometimes four, often faintly seen, but made distinct by the addition of acetic acid (*b, b*).

Mucus contains no specific corpuscle. Any such bodies in it are probably pus corpuscles, with which it is most frequently mixed.

Exudation, Plastic, or Compound Granular Corpuscles; the presence of which is indicative of inflammatory action in some part of the urinary tract. Large cells from $\frac{1}{1500}$ to $\frac{1}{1000}$ of an inch in diameter, full of granules, with or without a large distinct nucleus. Seen in the urine when any degree of cystitis exists, and when chronic organic disease of the kidney is present. (Plate II., Fig. 2, *c, c.*)

Epithelium; from various parts of the urinary passages; flat and spheroidal (Plate II., Fig. 2, *d*) from the urethra; columnar (*e*) from the bladder.

Urinary Casts of the uriniferous tubes of the kidney (Plate II., Fig. 3). In acute nephritis, epithelial casts are always thrown off in abundance; and blood corpuscles may often be found in the cast. The character of the cast is more "granular," with less of epithelium, in chronic nephritis. In fatty degeneration of the kidney, the cast

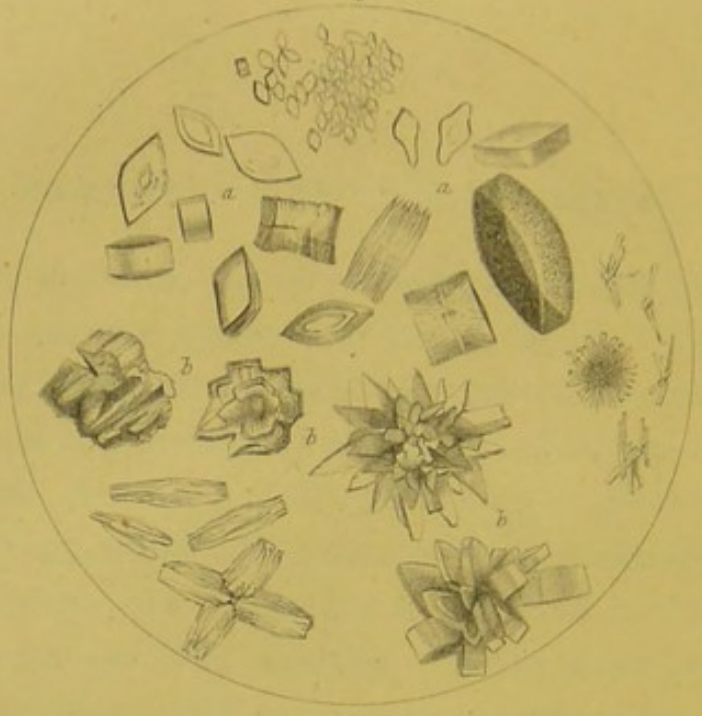
contains oil globules. A semi-transparent cast, containing few or no organic corpuscles, known as the "hyaline" or "waxy cast," appears in renal changes of a chronic kind. No doubt an occasional cast may be found in the absence of renal disease; but when their appearance is persistent, some organic change, either acute or chronic, is certainly present.

Spermatozoa are frequently to be found in the urine of those who are perfectly healthy. When their presence is constant, and then only, is the circumstance to be attributed to disease.

Vegetable Fungi appear in urine very soon after it is passed, in certain conditions. In acid urine, the "penicilium glaucum" appears: the "Torula cerevisiæ," or yeast-plant, in diabetic urine.

Vibriones appear very quickly in urine soon after it has been voided, especially in hot weather. Under this term are included both vegetable and animal organisms, endowed with spontaneous movements. In some specimens of urine they exist before it leaves the bladder.

Accidental Bodies, met with in the microscopical examination of the urine, are chiefly hair, cotton and flax fibres, feathers, woollen, silken, and woody fibres, forming dust introduced into the vessels which contain the specimen to be examined. When these have been once seen and identified, they cease to puzzle the student; and as they are very abundant there is no difficulty in observing their specific characters.



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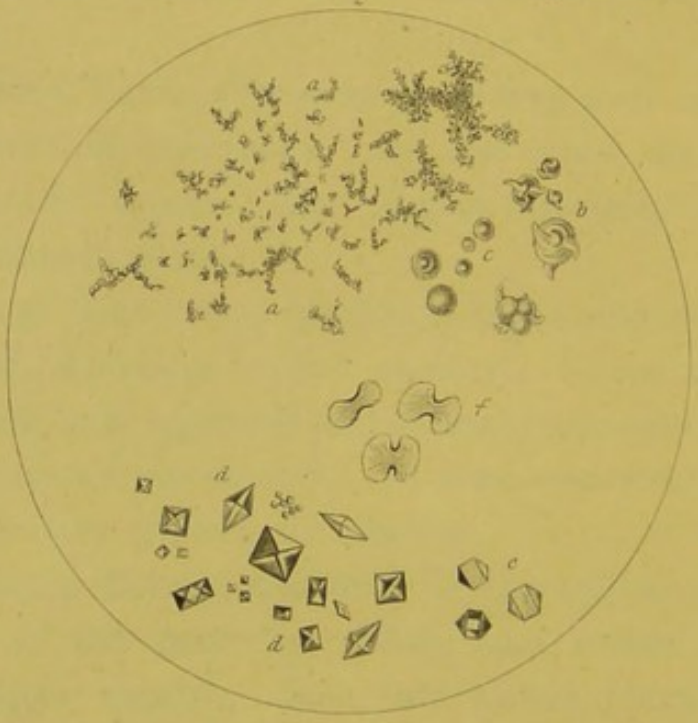

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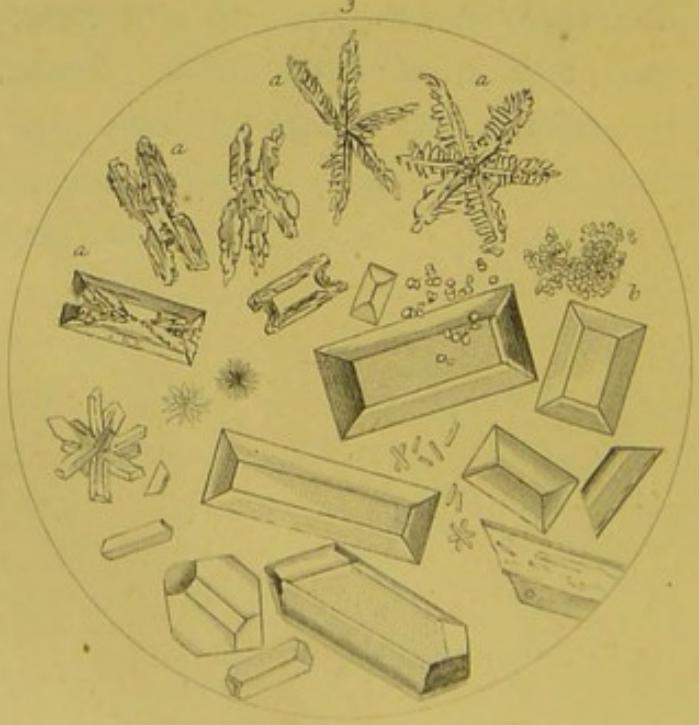

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PLATE I.

Microscopical appearances of urinary deposits.

FIG. 1.—Uric acid, in its chief varieties of form and appearance, as occurring in the urine.

2.—Urates of soda or ammonia.

Oxalates of lime.

3.—Phosphates of ammonia and magnesia.

Phosphate of lime.

PLATE II.

FIG. 1.—Pus corpuscles.

Ditto, after the application of acetic acid.

2.—Blood corpuscles, natural; after immersion in urine. Epithelium. Exudation corpuscles.

3.—Urinary casts.

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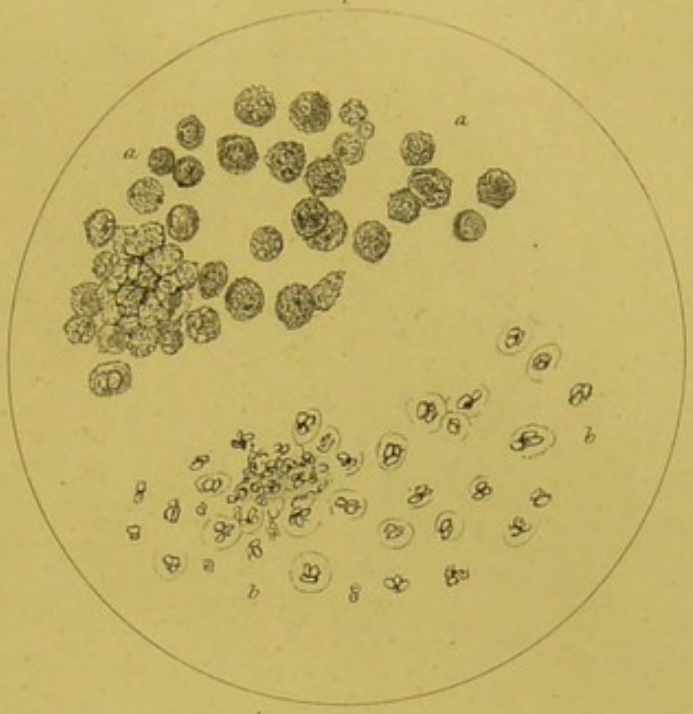

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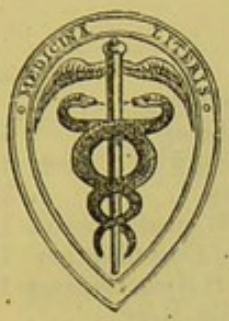

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