Examined by Professor Green, Brown and now referred to Professor Hanandall.

Examined by Professor Annandale to think that there should be...
"Calculation of the Urinary System."

A Thesis for the Degree of M.D.

Submitted by Surgeon

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Bellaire Indiæ

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Calculi of the Urinary System.

After graduation in medicine in the year 1878, I entered His Majesty's Indian Medical Service. About one year after landing in India, I was posted to a Regiment Stationed at Narang, Bundelkhand, Central India. In addition to my military duties at this place, I had medical charge of the Bundelkhand Police Agency. To this agency belonged a civil or charitable dispensary and it was in this institution, that the patients whose diseases have afforded me a subject for this paper, came under my observation.

I may at this point explain more fully my subject. I chose the title Calculi of the Urinary System as it appears to me to include nearly all the varieties of Calculi I am about to treat of. There are: Renal, vesical, urethral, Prostatic, urethral, and rectal calculi. Calculi situated between the glans & prepuce, all three with the exception of Prostatic calculi are derived from the urine, but as Prostatic calculi frequently escape into the urethra or are contained in a pelvic pustule may communicate with the urethra, the latter given above answers well. The cases about to be treated are 36 in number, 26 of the patients were operated on for renal Calculus, one suffered from Urethral calculus, two from Prostatic calculi, one from urethral, and one from Calculi situated between the glans and the prepuce.
Besides these I shall relate the cases of two patients who suffered from symptoms denominated those of stone in the bladder and gave the result of the post-mortem examination of a patient the subject of renal calculus but this applied for treatment too late the benefits of an operation.

to write minutely into all these cases or even into the most important ones would be beyond the scope of this paper so that I shall be brief and enter into detail only when it is necessary.

I will proceed at once to the subject of renal calculus for the relief of which I performed lithotomy on 26 patients 25 of whom were males and one a female. At first I was stated that Renal Calculus was but one of the varieties of Calculus when restored I will first take up the case of a patient who suffered from both Renal and vesical Calculi. That these should be associated in one person can be readily understood from our knowledge of the way in which vesical calculi take their origin.

The patient was an intelligent and well educated young man. He was a Bohemian by birth and was very well acquainted with English and French. He used to read books in these languages and at times four of medicine he had amongst other books a copy of Reynolds System of Medicine. I mention this as it was a treat to meet with a patient who could give an intelligible account
of his illness. All my other patients were inhabitants of places seldom if ever frequented by Europeans.

I will give the history of this patient in very nearly the words I took down from him at the time making notes of his case. He stated that he had had symptoms of stone in his bladder for about a year, but that a year before these symptoms began, he felt one day pain in his kidneys especially the right, and for four days after, his urine was coloured with blood. Pain at one time was so severe that he had to keep to bed for several hours together with the pain he felt nauseated and vomited. He further added "just after vomiting the stone passed into the bladder," while the stone was passing down the urethra the pain made him very restless and he was obliged to walk up and down the room and then to lie down, three or four days after the passage of the stone into the bladder, the blood disappeared from the urine and he felt well again. About a year after this he felt a reoccurring return in the urethra after vomiting, of which he took "a small amount of tincture," but he did not derive any benefit from the use of this drug. About two months after he passed a small stone about the size of a pea which he described as having been of a bluish color, hard, and rough. This can be as dealt from this description that the calculus consisted of a small stone of urine and from the former history it is almost certain that it
descended from the kidney. The escape of this stone however did not give him relief as the followed frequency of urination, pain, interruption of the urine, and at times his urine was mixed with blood. He also suffered from nausea, loss of appetite and he gradually grew thinner.

I asked the patient to allow me to examine him, but he was perfectly sure that he had a stone in his bladder and requested that I should give him chloroform and proceed with the operation if I detected a calculus. As his frame made the same request he was prepared for the operation and on the following morning he was put under chloroform and counted. The stone was at once detected and the operation proceeded with. I must state only that the lateral operation was performed and that the only difficulty encountered was the entrance of the bladder owing to the obesity of the patient. He recovered in three weeks from the date of the operation. The only complication which occurred after the operation was an attack of dyspepsia which complication I will notice with those which occur after lithotomy. The stone removed from the patient was such as one would expect to find after the clear history given, the patient passed about the time his trouble began a stone which was undoubtedly renal origin. The stone removed by means of the operation had a characteristic calcareous gravel or mulberry stone for its denseness.
and corresponded in every way with the stone formed previously by the patient. This nucleus which was about the size of a pea was extensively incrusted with phosphatic deposit, so that the stone of the calculus was about the size of a small lentil. It would seem clear from this case that the patient had suffered from renal calculus, and that two of these calculi had descended into the bladder, one was discharged through the urethra and the other remained in the bladder. Since it became incrusted with phosphatic deposit, it was not extruded, but left as a stone in the bladder.

Distillation in cases of Recurrence of Stone.

I record the following two cases, principally with the object of noticing the side on which to make the perineal incision. Some surgeons prefer to make the incision on the side of the perineum not previously selected for the performance of the operation whilst others have found that there is no disadvantage in operating on the same side. I had the opportunity of operating on two patients who had previously undergone lateral lithotomy. In the one case I chose the same side as was previously selected and in the other I operated on the opposite side. I will here give a brief history of these two patients and then make a few remarks relating to the operation.

The first patient was a young man, aged 20 years. He stated that 8 years previously he had suffered from stone in the bladder. The stone was removed by a native physician in his village, the stone was about the
size of a hen's egg. No anaesthetic was administered to him during the operation. On examining the perineum a well marked scar was seen on the left side of it and the scar was such as one would expect to find after the operation of bilateral lithotomy. The bladder was rounded and a stone of considerable size and soft consistency was detected. The patient stated that since since the last operation he has had symptoms of stone. At the time he came to hospital he had frequency of incontinence, intermission of the stream, passage of blood from the urethra and other symptoms pointing to vesical calculus. The urine on examination was found to contain albumin at the extent of one third. I shall notice the subject of albumin in the urine of patients suffering from vesical calculus hereafter. I will only remark here that such a large quantity of albumin would be considered by some to be a sure indication of an operation in question as it was a sign of extensive disorganization of the kidneys. Considering the time the patient had been the subject of calculus and a condition of the kidneys was very probable. The patient however was a young man and as his health was good the urethra under chloroform and a number 10 stiff grooved in the centre was introduced. The perineal incision was made on the right side - the left, the rest of the former operation being avoided. The right hand was used in sucking the urine and the only difficulty
experiments on the operation was in extracting the calculus which was as large as a hen's egg being phosphate lime, necessitating the removal of the fragments separately. The patient was operated on on the 2nd of April and recovered and was discharged on the 9th May 1881.

The other patient who applied for treatment on account of recurrence of stone in the bladder was a lad whose age was 12 years. He gave the following history of his illness. At the age of 7, a native physician (Hakim) extracted a stone from his bladder. He recovered the effects of the operation in two months. Shortly after, symptoms of stone reappeared and for nearly 8 years he had been getting worse. When I first saw the boy, he had all the symptoms of recurrent calculus, but there were two I should like to mention specially as their bearing is important. The patient continually had a tight grip of the glans and penis and he also had violent irritation of the rectum as indicated by the repeated attempts at defaecation. It lines the straining was so great that blood was passed from the rectum. The patient had a quick pulse, was emaciated, nervous and irritable. On sounding him, a soft large stone was detected. The perineum presented a well marked oval mass which measured 1½ inches in length and 1 inch in breadth. This mass was situated on the right side but judging from its size the tumour has been an extra-urinary one extending beyond the limits considered safe by European physicians.
its regards the urine of this patient except only that it had a turbid appearance and contained some albumen. It was present to the extent of 1/6. On the 10th May 1831 the patient was put under the influence of Chloroform and in this case the incision was made on the left side through the rectum which the result of the former operation. The stone was readily reached. The parts seemed abnormal for the calculus occupied a cavity in the prostate portion of the urethra and was also partly in the neck of the bladder. After the extraction of the stone a few fragments were removed from the bladder. The state of the parts and the position of the stone I think explain the previous symptoms numer of the great irritability of the rectum and the severe pain in the penis for the relief of which the boy continually had a tight grasp of the organ. The first operation having been performed by a quack it is not to be wondered at that the incision was not extensive and not in the right place exactly. The stone was phosphatic, somewhat oval in shape and measured 1/2 inch in length and 1/4 in breadth. Its weight was 8 Drachms and it was. The patient recovered and was discharged on the 1st June 1831 about two months after the operation. It will thus be seen that both these patients suffered from recurrence of stones for a period of 8 years after the first operation.
both had a large quantity of albumin in the urine which quantity would have been considered by some to indicate an operation. Both patients recovered.

As regards the site of the incision the incision should be made in such cases, I think it of immaterial difference whether the incision is made through the cicatrix of the former wound or on the opposite side. In the first case I performed the perineal incision on the right side, so as to avoid the cicatrix on the left. If the right side be selected it will be necessary to use either a staff grooved along the incised line or one whose groove of which is inclined to the right. In any case I used a staff with a transverse groove.

In the second case the operation was performed on the same side as it had been previously. The cicatrix of the former operation was an extensive one and had to be cut through blunt instead of pointed forceps. To divide which would give rise to difficulty in operating it was just the contrary; the perineum was shallow, it was easily reached and which was of considerable advantage there was no bleeding either during or after the operation. The late professor Spencer performed the ordinary lateral operation and divided the old cicatrix in a case that occurs to him. In that there can be no difficulty in cutting through the old cicatrix, on the contrary there are certain advantages.
Litholomy in Children

I performed the operation on 15 children whose ages ranged between 9 ½ and 12 years. Out of these patients, 2 were females. I shall first notice the subject of litholomy in boys and then the operation on the female patient.

As the bladder is situated high in the pelvis, as it is movable, the operation though safe in other respects is difficult and dangerous. Tricker in his Select and Art of Surgery Vol II page 780 (7th Edition) says with reference to this operation: "Hence it is of importance to raise the point of the knife somewhat more than in the adult in making the deep incision, and to be careful that it do not slip into the tissues between the rectum and the bladder which may happen unless the precautions be taken.

I have known this to occur in several instances to Hospital surgeons of skill and experience the forceps being passed into this space under the supposition of its being the bladder and in many cases the patient died unlaid. It falls to the lot of but few surgeons of experience in litholomy to pass through an active professional life without meeting with difficulty and anxiety in operating on boys." Considering however the delicateness of the kidneys and bladder and the rapidity with which the wound heals in the case of children, the operation is not as dangerous as in adults. I think that
the dangers of the operation are considerably diminished, if not altogether removed, if the plan I adopt and which I recommend be carried out. After introducing the stuff and being sure that it has entered the bladder, the operator makes under the external incision and then the deeps. The knife is run along the groove only to such a distance as is sufficient to divide the two layers of the transverse ligament. The left index finger, then introduced into the hounds and the stuff is felt, the finger is then passed over the concavity of the cure of the instrument and is pushed along it into the blood, descending the prostate and entering the entrance into the blood. (by means of the finger only.) The stuff is then withdrawn, the forefinger introduced and the slow to retract. In this way I have found no difficulty in entering the bladder at once.

The external or superficial incision includes the structures generally divided (i.e. superficial fascia, subcutaneous fat and sometimes the external and internal muscles of the pelvic walls). It is in the deep incision that I stop short for after dividing the anterior and posterior layers of the triangular ligament I simply insert the prostatic stuff dividing it through. This plan is to lessen in children that the stuff can easily penetrate through it. The great danger of the operation in boys is first losing the way into the bladder and secondly cutting beyond the prostate into the reflections of the pelvic fascia. Both of
Then mishaps may be avoided by first
simply introducing the prostate and slowly
entering the bladder by slipping the finger
over the concavity of the staff and taking
care that it does not leave it; the prostate
is lacerated as the finger enters the bladder.
In this way the wound through the prostate
is made by the finger rather than by means
of the knife and this part of the operation
becomes more a process of dilatation than
of cutting. The entrance effected by means of
the finger is sufficiently large to admit of
the extraction of the calculi ordinarily met
with in boys and especially those under 10 years
of age. I adopted the measures just mentioned
in all my cases and with the best results.

In young boys (aged 2 to 12 years) a point
of considerable importance is the limited
space between the rectum and urethra
and consequently arises the danger of cutting
into the former unless the size of the
perineum is kept in mind and the instrument
selected accordingly. I have not had the
meriment of cutting into the rectum but
this complication nearly occurred in the case
of one of my subjects. The boy was 11 years
of age. I used the excellest lithotomy scalpel that
was supplied in the lithotomy case of instruments
but even this was too large. In a boy aged
2 to 3 years the perineum is nearly one half
the size of that of an adult. I introduced therefore
the point of the knife 1/2 inch above the anus
and to use a scalpel with a blade of the
ordinary breadth would lead to serious complications. To avoid piercing the wall of the urethra and cutting into the rectum, it is necessary in such cases to select a razor-bladed but strong scalpel and to introduce the point of the knife about one inch above the margin of the anus. Even with this precaution it is well to lateralize the knife and to protect the rectum by pressing it downwards.

In sounding boys for stone I have found it impossible in most of the cases to do so without administering chloroform, it is not unusual however to give more than a few sniffs. If the boy is young the struggles made on attempting to sound the bladder and cause the safety of the parts.

I have also found it necessary in young subjects to give two or three minutes of tough opium after the operation as a recovering from the effects of chloroform the patients are very restless and are almost certain to attempting to rise from their beds.

Lithotomy in Females

The frequency with which vesical calculus is met in females is variously stated. South reports 1 in 72, Cross 1 in 19. In Italy it is stated to occur once in every 19 cases and in France once in 20. I met with only one case out of between 20 and 25 patients who suffered from vesical calculus. It occurs more frequently in young females on account of the narrowing of the urethra which prevents the
The escape of a small calculus which might otherwise be expected if the subject were an adult. The patient was a girl about 5 years. Her parents brought her to Hospital on 9th August 1881. She was put under chloroform, having no struggles, and an ordinary forceps was introduced through the urethra. This at once came into contact with a stone. Of the female urethra, part of a stone of hard consistency and of good size was detected. The parents stated that three months previously she had been quite well. The first symptom they noticed was the frequency, frequency of urination, and that relieved owing to the pain the stone had got into the habit of pressing her hands and the pubis. The pain made her cry and it was observed that she had got a greenish: the urine was examined and found to be slightly albuminous, turbid, and there was a chalky deposit on the bottom of the vessel in which it had been collected. The girl was under a high fever, but was fairly well nourished and healthy. On the 10th Aug. she was put under chloroform and an attempt was made to dilate the urethra by means of the finger, but this was found impossible; the stone was a large one and this fact also made the extraction by dilatation unsuitable. A No. 7 female dilator was passed into the bladder and a history was run along the groove for about an inch only, but this dilatation had to be enlarged in order to admit the finger into the bladder.
By means of this incision the floor of the abdomen and the neck of the bladder were divided. The index finger was then introduced and the wound was enlarged, but even with this somewhat extensive incision it was found difficult to introduce over the removed pair of lithotomy forceps. Two calici were detected—one was the size of a small marble and the other was about an inch and a half in length and an inch in breadth. The incision was already extensive and included the neck of the bladder and most of the vagina which was extremely narrow. The only alternative was to fracture the stone which operated with some difficulty was accomplished by means of a strong forceps. The fragments were then removed separately. The calculus was a hard one and consisted of uric acid, owing to the narrowness and small size of the vagina it was impossible to attempt flushing it clinically and the wound was left as it was. There was little or no hemorrhage during the operation as the large vessels were divided. The girl progressed most satisfactorily there were no complications and nothing worthy of record. On the 20th August ten days after the operation the patient was observed to be able to pass urine through the mother. She had perfect control over the sphincter of the bladder for when she wanted to urinate pass into the called her mother and asked for a vessel for the purpose. On the 28th August as I was in the ward the patient
got off his bed and began to pass water into an open vessel. There can be no doubt that she had perfect control over the sphincter of the bladder. After days of quite
completely recovered and was discharged from hospital.
I do not think that the method of a
female patient, especially of a young person
is so easily diluted as one may be led to infer from some books. With suitable dilators
the urethra of an adult patient may be
dilated but even there only small stones
can be extracted, for dilatation cannot
be carried out beyond a certain limit
on account of the danger of paralyzing the
sphincter and bringing on incontinence of
urine. When it is remembered that the
forceps known under take up a good part
of the lumen of the urethra it will be seen
that this mode of extraction is only applicable
in the case of small calculi, less than an
inch in diameter.
In the adult female the division of the urethra
and neck of the bladder is an easy operation
and sufficient for all ordinary cases where
the stone owing to its size cannot be extracted
by dilatation of the urethra. In adults vesical
lithotomy may also be performed. In both
these cases owing to the size of the vagina
lithotomy can be readily introduced and with
good chances of success as in the case of
vesico-vaginal fistula. But in girls there is
no room for vesical lithotomy and in
very young patients such as the one whose case I have just mentioned & it is impossible to introduce sutures to bring the edges of the wound together, as it was not even easy to introduce the index finger into the patient's vagina. On the other hand it will be clear from this case that a tearing even large incisions have to heal readily and with no injury to the sphincters, so that sutures may be dispensed with. In case the stone happens to be a large one it can be crushed either by means of the lithotome forceps or by means of the instruments made for crushing large vesical calculus.

Various Affections Simulated by Vesical Calculus.

I shall now relate three cases, two of which simulated vesical calculus, and the third at first presented symptoms which were thought to be those of calculus but which were only partly so.

1st. Case. A boy aged 3½ years was brought by his parents who gave the following history. The boy had been ill for 1½ years. He was in the habit of pulling the presence and at the time of consultation he used to cry on account of the pain, he cried during the night also and had little sleep. Whilst taking notes of the case the boy began to pass water and the stream which began still ran and then interrupted and the patient began to cry with the pain. These were the symptoms I had observed in boys who were suffering from stone in the bladder...
The urine was tested but no albumin was detected. On the 21 August 1881, he was given chloroform and the bowels were forced but no stone could be found. It was then thought that intestinal worms were the cause of these symptoms and accordingly on that day one grain of ipecacuanha was given in the morning and another in the evening after which a dose of castor oil was administered. Oxyurus Vermicularis was subsequently seen in the motions and after another a few more doses of ipecacuanha and castor oil the boy was far improved, but the parents requested his discharge, when it is remembered that the above mentioned parasites choose the rectum as their habitat the symptoms of which the patient suffers are easily accounted for. I may here state that the nature of ipecacua as a rule strongly objects to the use of enemata and injections. Now this mode of treatment has to be abandoned when other means are available.

The second case was that of a boy aged 4 years who was brought to hospital by his friends. They stated that they had been told that the boy was suffering from stone in the bladder. There were his symptoms on admission, frequency of micturition attended with pain occasionally the passage of blood from the urethra after micturition, the ordinary symptoms of pulling the presence and holding tightly the penis to relieve the pain & loss of flesh.
He occasionally vomited. The urine was examined and found to be turbid and the amount of albumin in the test tube was about 50% of the total quantity in the best tube. So there were good reasons for supposing that the patient was suffering from stone in the bladder. He was given chloroform and poulticed but no stone ever was detected. On further inquiry into the case it was found that for some time past the boy had been passing blood in his stools or in other words he had been suffering from dysentery. The parents were extremely ignorant and could not give an intelligible account of the case. The boy was an out-patient as he lived in an adjoining village. He was treated with Peri-Urace and so far recovered that the mother came only once for medicines when she stated that the boy was much better. In this case the action being the result of disease there had followed violent irritability of the bladder sufficient to stimulate stone.

The 30th case is important inasmuch as it shows that careful sounding is essential in obscure cases which are apt to mislead the surgeon.

The patient was a boy whose age was 7 years. He was brought to hospital on account of great pain in the bladder while pain was severe after micturition. The parents thought that this was due to a stone in the bladder. The pain had existed for a year and for the same length of time the
boy had been noticed to pull the prepuce and penis - the ordinary symptoms of bowel in boys. In fact, states also that small white worms had been seen in the stool, the boy was soundly but no flaw was discovered. He was therefore treated as in the former case with belladone and castor oil. The boy subsequently passed a number of clumps vermiformis. The patient improved, the symptoms became less marked and he was enabled to sleep at night. All the symptoms however did not disappear he was rounded once again, but on this occasion a small stone was detected. Two days later, the boy was put under chloroform and the lateral operation was performed. A calculus of lime calculus, the size of a large grape was extracted & the boy made a good recovery.

The lesson to be derived from these cases is that parasites infecting the rectum and distending the large intestine may give rise to symptoms which may lead the physicians that the patient has suffering from fecal calculi. And secondly that parasites in the rectum may be present simultaneously with fecal calculi and unless both are got rid of symptoms of either will remain.

Treatment and Post Mortem Appearances in Cases where an operation is contra-indicated. In Great Britain where patients can always consult medical men it must be a
The occurrence for a patient to die from renal calculus without an attempt having been made to save his life.

In India it frequently happens that a person suffers from renal calculus live in jungles and distant villages so that access to a surgeon is extremely difficult. Sometimes when the disease has lasted a long time and the patient has been worn out with pain, his friends, fearing that an effort must be made to save his life, take the patient to the nearest station at which a European surgeon is to be found. It need scarcely be remarked that the patient is quite unfit for an operation not only owing to the emaciation but because of the extensive disease of the urinary organs.

I shall give the notes of the case of one of these patients as it presents features interesting from a clinical point of view and the post-mortem appearances show to what an extent the kidneys become affected in such cases.

The patient came to hospital on the 19th April 1897. He was 21 years of age and was much emaciated. He stated that he had been ill for about a year but as he was too stupid he could not give a history of his illness. He did not seem to be aware that he was suffering from stone of the bladder. He complained of great pain in the penis and pelvis and passes frequently, a dirty, muddy fluid through the urethra. This fluid on examination was found...
to contain serous and pus cells. There was considerable albumin in it as 1/20 of the urine in the test tube, considered on the application of heat and nitric acid. The patient was surrounded and a large soft clot was found occupying the whole cavity of the bladder. From long suffering the patient was weak and emaciated consequently the prognosis was unfavorable, but what was of most importance in this case was the condition of the urine which indicated that the kidneys were extremely diseased. The patient had to be told that an operation was not advisable. In the hospital at the time were two patients from whom stone had been extracted, both were doing well and far on the way to recovery. The patient had reason to believe they had obtained benefit from the treatment and to perform the operation. I think that this is one of the most trying cases to the surgeon. To have to comply with the request of a patient in torture on account of a serious affection whose life is a misery and to know death would be welcome, requires nerve self-control. The temptation to operate is even greater when the surgeon has had a run of successful cases without one death. Often in such occasions I nearly consented to operate. If medical friend however saw the patient one day with me while going through the words and services we used to perform so in this case surgery would be brought into disrepute. The only thing I could do for the patient was to give him large doses
of opium to relieve his agony, pain became
The urine soon, rosy and yielded the
discharge from the urethra being more like
that from an abscess. He gradually lost some
hectic fever set in and he died from exhaustion
eight months and 2 days after admission.
It will be seen that the case ran its
course without operative interference the following
year the post mortem appearance.
The autopsy was made 7 hours after death.
The body was extremely emaciated. Rigor
mortis was well marked.
A slender incision was made through the
abdominal parietes. The alimentary canal
from the esophagus to the rectum was ligatured
at both ends and removed. This brought
the kidneys, ureters and bladder into view.
The peritoneum was in a normal condition.

Right kidney was found to be enlarged and
to weigh 7 ounces. It has attached to it two
ureters. The lower ureter was one inch above
the lower extremity of the kidney and was
dilated like a funnel at its junction with it.
The widest part of the funnel measured \( \frac{1}{2} \) in.
The funnel then tapered downwards for a
distance of an inch and a half till it acquired
the same diameter as that of the ureter,
which in this case measured three fourths of an inch.
The second ureter took its origin from the
other extremity of the kidney in the same way
the two ureters ran almost parallel and
were separate till within one inch of the bladder,
where they blended and entered it as one.
The capsule of the kidney was easily stripped off. Beneath it numerous small abscesses were seen; they varied from the size of a pin's head to that of a pea. The substance of the kidneys when cut into was found to be studded with abscesses, the greatest number being the size of a pea. The kidney was literally a mass of pus, very little of the normal structure could be seen. The pelvis of the kidney was found dilated and filled with pus and the ureters were distended with the same matter. The ureters were wider than normal and their walls were thick. The mucous membrane that lined them was soft and extensively destroyed little of it remaining in the upper part of the ureters. Pus extended all the way to the bladder.

The left kidney was small and weighed two ounces and 12 drachms. This kidney had two ureters also which blended four inches below the hilus; they arose in the same way as those on the right side. The capsule peeled off easily and a few small abscesses no larger than a pea were seen between it and the surface of the kidney. When cut into the substance of the kidney was found to be very deficient. There were abscesses scattered here and there, but they were not as numerous as those on the right kidney. Owing to the absence of cortical substance the kidney appears atrophied and largely made up of connective tissue. The pelvis and calyces were dilated and the ureters were found as
as on the right side, distended with fluid and matter.

The bladder was opened with means of an incision made from the vertex of the pubis. Before opening it, the wall was found contracted and the stone could be felt through them. The calyxes were deeply impacted and immovable and as it fitted into the bladder, accurately an incision 4 inches long had to be made to allow its extraction. The walls of the bladder at the sides were found to be about 7/8 inch in thickness the bladder was contracted and only contained a few drops of fœmoral urine. The mucous membrane was of a dark grey colour, but with the exception of its thickness, there did not appear to be any other abnormality.

The urethra was also open and examined but it was found in a normal condition.

The other organs were not examined except as they appeared in situ in the abdomen and thorax.

The liver was large and pale.

The spleen was larger than normal and was anaemic.

The stomach was dilated.

The lungs were of pale pink colour and very anaemic.

The blood appeared healthy.

The stone weighed two ounces and 4 drachms in dry weight. It consisted of a hard, black and heavy substance of the body in whole.
up of a loose spongy structure which is caused by a dense shell. The colour is grey and the composition is phosphatic. The insecutive points in this case are both clinical and pathological. The stone owing to its size could not have been extracted by the ordinary lateral operation nor could this have been affected by dividing the right lobe of the prostate. No ordinary forceps could have been opened wide enough to grasp and crush the stone so that it would have been necessary to perform the High or Supra pubic operation, this would have been extremely dangerous, so, to remove the stone from within the pelvis an incision between 3 and 4 inches long had to be made into the bladder and from there on to the thickness of the walls of the bladder which were tightly contracted over the stone there was some difficulty in dislodging it. These difficulties would have been great had the supra pubic operation been performed. The pathological condition in which the urinary tract was found clearly proves how valuable an operation would have been. The walls of the bladder could not have returned to their proper place. The kidneys, unless they have been, long before the patient's admission, the seat of inflammatory and other pathological changes so that further successful the operation might have been an operation the case must have terminated fatally. From a purely pathological point of view the post mortem examination it instructive.
in showing how much more dis eased the kidney as in such a case than other parts of the urinary tract. With the exception of thickening of the walls of the bladder from frequent calls to urination there was not much disease there. This is to be expected when the delicate structure of the kidneys is taken into consideration. The condition of the kidneys ought therefore to be the most important point in discussing the advisability of an operation.

Should the patient apply for treatment when the urine has become highly albuminose and the health much weakened what can the surgeon do? The patient and his friends on the one hand beg that the operation may be performed and on the other hand the hopeless condition of the patient is well known to the surgeons. I think it requires considerable self control on these occasions. Should the kidneys be extensively diseased and there be no hope of the patient's recovery he should be treated on the same principle as patients whose disease is incurable. The relief of the pain should be the point of greatest importance and this can be accomplished by the administration of narcotics of which opium is perhaps the best.

Having entered fully into the cases of renal calculus which were important on account of their clinical and pathological aspects I shall now notice the subject of renal calculus generally.
Of the twenty-two patients on whom I operated for renal calculi, 25 left the hospital, so far as I know, cured. The 26th case was that of a lad aged 17 years, who left the hospital when in a precarious condition; this was due to the urgent request of his friends. He was operated on on the 26th December 1881, when four calculi, of which two were of an oblong shape and measured 2 inches in length, were extracted. On the 5th day after the operation secondary haemorrhage occurred and about 3 ounces of blood were lost, after clots were also passed through the wound. One month after the operation (i.e. 25 Jan 82) he was discharged, owing to the urgent request of his parents. He had, however, suffered from pyrexia, and foul, or purulent matter, mixed up with blood escaped from the wound, which showed no tendency to heal. The patient in the meantime became anaemic so that the pyrexia was not favourable. It was difficult to say from what part of the urinary tract the purulent discharge came. The patient complained of pain in the wound and the hepatic region, but not in the renal. Considering his temperature and general symptoms however, I was inclined to think that suppurative nephritis had set in. The secondary haemorrhage in this case was an unfavourable feature and must have lowered the vitality of the part. The patient left for a village in the district as that I did not hear how the case terminated. I have no doubt however that I am
safe in saying that it ended fatally. Of this I saw the mortality amongst my patients was one in twenty five or 3.84 percent.

I had no selection of cases. All the patients who applied for treatment underwent the operation with two exceptions – one was the young man whose case I have given in detail; the other was a child whose symptoms were better relieved by the simple use of the stone than by any other means, but it was not very clear whether they were a stone and consequently the patient was advised to bring the baby to a few months later.

Age. The ages of any 36 patients varied between 2½ years and 80 years. Half were between 12 and 50 and the other half between 2½ years and 12.

Duration of the disease. This varied between 3 months and 8 years. The two cases from whom secondary calculi were removed stated that they had suffered for 8 years before admission to hospital. Looking over the cases I found that two suffered for 8 years, one for a period of 6 years, thirteen for a period varying between 1 and 3 years and nine for a period varying between 3 and 10 months.

Amount of alkaline in the severe.

This is a very important point to consider as it is frequently the one on which the performance or non performance of the operation...
depends of course the patients general health, his age and the duration of his illness are important matters but the amount of albumin taken as an indication of the state of the kidneys surpasses all other considerations for if the kidney are the seat of advanced disease however successful the operation may be as such the termination of the case will be an unfavourable one.

Dochs in his work "The Science and Art of Surgery" (Vol II Page 792) states his opinion that if the albumin amount to one 6th of the back of the urine the case is decidedly unfavourable. I have operated however on patients in whose urine the quantity of albumin was considerably more than that just mentioned. But they were all young. Thus one was a young man aged 30 years whose urine contained albumin in the extent of one third. It being two years ago had albumin to the extent of one fourth and another of the same age to the extent of one third. This would show that in young subjects the kidneys may not be so disorganized as to contraindicate an operation. If the patient is young especially if a young boy, and if the health is not much impaired I think that the urine may contain more albumin than one sixth without the operation being contra-indicated. In these patients the kidneys being considerably affected a large quantity of albumin is detected in the urine.

In 8 of the patients the albumin arose from the
length to one tenth. The urine of ten of them contained a trace and four had no albumen at all.

Complications during the operation

ln only one patient was an uncontrolled haemorrhage occurrs during, and immediately after the completion of the operation, the haemorrhage was arrested and arose from a deep situated artery. The local application such as (cramping the wound with) colchicine or filling it up with a bit dipped in linctus of for, was effective in stopping the bleeding. Digital pressure was employed for four hours, but this failed also. Finally the spot from which the haemorrhage came was touched with the actual cautery and by this means the bleeding stopped at once.

Wound of the Rectum. I have already mentioned a case where I nearly cut out the Rectum and the reason being that the patient was a boy aged 2½ years and I had not in the case of instruments a sufficiently narrow-bladed Knife for so young a subject. This complication is not so serious as it is unpleasant. It is stated that even the best operators meet occasionally with this accident.

Large Calculi. In one case that of the female patient I had to crush the stone in order to effect its extraction. I prorolused the stone by means of an ordinary lithotomy forceps, and as it consisted of uric acid considerable force had to be used.
General phosphatic calculi were fractured unintentionally and owing to their soft consistence. In another case a large oxalate of lime calculus was fractured into three fragments in attempting to extract it. The fragments having can be easily removed and the bladder thoroughly washed out - an operation which cannot be so effectually accomplished after litholysis.

Complications after the operation:
The most common complication amongst my patients was intermittent fever. Several of them suffered from it. Rather coming on after lithotomy would be a most objectionable occurrence and a bad omen, but in this instance is common and must not be considered as alarming although the complication may be bad enough. Chills occurring in a patient who has not undergone a major operation is virtually a serious effect and it is for this reason that it becomes an unwelcome complication after the operation of lithotomy. The effects of this complication were to weaken the patient and to impair the healing process in the wound. The patient becomes feebly and left the hospital with their health inferior to that of those who had not had such a complication.

Two of the patients suffered from orchitis - this is a rare complication and one of which I have not read. The first patient...
was 30 years of age. During the operation there had been a good deal of haemorrhage which had fortunately been checked by means of the local application of ice. On the 6th day after the operation the left testicle became enlarged and tender, the temperature rose and pain was complained of in the organ and along the cord. Two leeches were applied over the testicle. The pain, temperature and swelling soon reduced but for nearly three weeks after the operation the patient complained of slight pain in the testis.

The other patient was 45 years of age and in his case also the pain and tenderness in the testis occurred on the 6th day after the operation.

Secondary Haemorrhage.

In only one case did secondary haemorrhage occur and this was easily controlled by ablution and the internal administration of gallie acid. It is important however, to note that this case was the only one that did not do well and hence I am inclined to look upon this complication as one of the worst that could occur to a patient after lithotomy.

Treatment of the Operation.

In treating the patients after the operation I introduced a tube through the wound as is usually done in England the reason being that such a tube was not supplied to the institution. The advantages claimed for the gum elastic tube are that it prevents the
the wound from being plugged up with tissue and secondly that should secondary haemorrhage occur the wound may be plugged by introducing lint between the walls of the wound and the tube. Secondary haemorrhage may however occur several days after the operation as in my patients case, I found that the cases that came under my observation did perfectly well without the tube so that I do not think it essential.

It's a rule the patients recover in three weeks. In a few the wound showed no tendency to heal and in these cases touching the edge with extract of silver or sulphate of copper was all that was necessary.

The Cause of Fereah Calculus here in India as elsewhere is still not clear. Why is it for instance that in some parts of the same country the affection should be so prevalent while as it seldom occurs in others. Some light may be obtained by referring to the geography of the place and to the diet of the people. It is well known that in Central India and the North western Provinces stone is common whereas the affection is rare in Southern India. The diet of the class of people to which any patient belongs consists of cereals eaten with their hands which contain various salts. They seldom or never eat flesh and the district from which they came was remarkable for the large quantity of the drinking water and which was obtained generally from wells.
An analysis which I made of the notes of the well in different parts of... showed that there was on an average of 1 grain of bile per gallon. A large proportion of the calculi removed consisted of oxalate of lime.

These patients who suffered from phosphatic calculi generally had a weak constitution. In southern India the diet of the people consists of rice frequently and flesh is extensively used by them.

I shall now take up the subject of MочекURETHRAL CALCULUS

By mочекurethral calculus I mean a stone situated partly in the bladder and partly in the urethra, such a case and abnormal case occurred to me not long after my first experience in lithotomy and I was much puzzled during the operation as I shall explain hereafter. Abnormal situation for stone in the vicinity of the bladder or directly connected with it will occur to every surgeon who has had any experience in lithotomy. These cases cannot be very puzzling especially when ureter is not cut in the course of the operation. The perplexity of the operator becomes greater when he is unaccustomed with such abnormal cases. The calculus may be found encysted or in a pouch of the prostate.

The patient was 16 years of age. His mother stated that 5 years previously, at the age of 11, he began to have pain in the bladder and urethra. At times he passed blood
With the urine. Latterly, the urine came away in drops only, the whole day and night. The pain had become very severe and prevented the patient from getting any sleep. He often cried on account of it and his health had gradually deteriorated.

The boy was grounded and a stone of hard consistence and of good size was detected. The impression was that the calculus occupied the neck of the bladder. The urine was found albuminuric. The peritoneum did not present any abnormal appearance. On the 10th January 1851 the patient was put under chloroform. He was grounded again but no other conclusion was arrived at then the former, namely that the calculus was situated probably in the neck of the bladder. A thin staff was easily introduced into the bladder, but there was considerable difficulty in getting it into position as on attempting to do so the stone came in its way. Having adjusted the staff as well as was possible the knife was entered in neck and shelf along the lumen of the anus and the external portion was made, but on the introduction of the point of the knife into the groove of the staff and on attempting to lean it along the groove some hard object came in the way which completely prevented the progress of the knife. The anterior layer of the transverse ligament had however been divided and on feeling...
the parts a hard body was detected which became blue. Soon after cutting the tissues around it, this hard body was found to be a calculus extending into the lumbarous portion of the urethra. It now became clear why the knife could not be pushed on along the groove, the reason being that the calculus came in between the edge of the knife and the soft tissues which in an ordinary case could be divided. The next step was to attempt the removal of the stone. It was accordingly grasped with a pair of forceps and endeavours were made to remove it. The stone however being phosphatic and as will be afterwards seen situated partly in the bladder itself and a fragment about one inch in length and half an inch in breadth came away. The finger was then introduced into the cavity and the remaining portion was touched. This stone was not be moved even by a small dressing forceps as the tissues around were highly in contact and could not be dilated. The staff was if we are to admit an entrance into the bladder as the stone prevented the knife from cutting the soft parts and further to attempt entering the bladder without a guide was a dangerous procedure. The staff was consequently withdrawn and the cyst of the bladder in contact with the stone was stitched by means of a knife; in this
way the light fibres which grasped the stone having been divided the blades of a small lithotomy forceps were inserted one on either side of the calculus and the stone in fragments. On pressing the finger into the wound and space formerly occupied by the calculus it went into the bladder. The prostatic portion of the urethra was sufficiently wide owing to the situation of the calculus to allow the examination of the bladder by means of the finger.

The calculus, on putting the two fragments together, measured 2 1/2 inches in length and nearly one inch in breadth. It was somewhat not shaped and about its centre was a contraction which judging from its situation must have been produced by the sphincter of the bladder. This is one of those rare cases where perplexes the surgeon when he meets with them. There were no means for ascertaining the situation of the stone; the patient presented no abnormality and the sound came into contact with the calculus sooner than in a case of purely external calculus the impression was that the stone occupied the neck of the bladder. The examination of the prostatic may give some idea but even this method could not lead to a definite conclusion as to the exact position of the stone. The inference may be that the calculus was situated...
in the prostate. Supposing however that the calculus was known to be situated partly in the bladder and partly in the urethra, what ought to be the mode of procedure. I think it best and most to adopt the same method as in a case of vesical calculus. The staff having been introduced, the ordinary external incision is made and the point of the knife being been placed in the groove the anterior layer of the transverse ligament should be divided and the knife, run as far as it can till its progress is stopped by its edge coming into contact with the stone. By dilating the wound and pushing aside the soft tissues immediately surrounding the stone an attempt can be made to extract it. Should the dilated extremity be of great size and should the calculus be a soft one it is most likely that during the attempts to extract it it will break. The remaining fragment may then be removed with by cutting the soft tissues around it, being careful simply to divide them without injury to the larger blood vessels in the vicinity, or if this method fail an attempt may be made to enter the bladder by introducing the staff under the stone that is to say between it and the floor of the urethra. There can then be no difficulty in dividing the prostate.
and the neck of the bladder. To be able to do so further will depend on the situation of the stone which may lie immediately in contact with the floor of the urethra, the stone escaping below it and roof of the urethra as far the case in my patient. In this case the staff passed over the stone. Had it been possible to pass the staff under it the soft parts could have been easily divided as in an ordinary case of lithotomy.

Should I meet again with a similar urethral calculus or a case in which I suspect such a rare condition. I should attempt to pass the staff under the stone along the floor of the urethra. It is not always easy to tell whether the staff has passed above or below the stone and much will depend on the channel nature has made for the escape of the urine and which channel the staff will enter whilst passing the instrument.

Prostatic Calculi

Having completed the subject of stone in the bladder, I shall now take up that of Prostatic Calculi. I had two patients who suffered from this affection, but they differed considerably in many respects.

One was an old man who was about 50 years of age complaining of great pain in the bladder and urethra, the pain being worse at the time of micturition which occurred frequently, but urine was voided
with difficulty. At first it was thought that he was suffering from vesical calculus. His urine was examined, but nothing abnormal could be detected in it. The prostate was found to be enlarged and tender, and on attempting to pass a sound the instrument only went as far as the prostatic urethra, when owing to the enlargement of the gland it was with difficulty introduced into the bladder. Before entering the bladder, however, a stone was felt and a grating sound was heard as the instrument entered. As the stone was detected in the bladder, the diagnosis arrived at was that the prostate was enlarged and that it contained a calculus which the sound touched as it passed into the bladder.

During the day whilst passing urine a small calculus was ejected which the patient kept to show me. The stone was of an irregular shape, measured about one third of an inch in length and appeared to consist of Phosphatic of lime. The patient has not relapsed owing to the enlargement of the prostate. The urine accumulated and had to be drawn off by means of the catheter. Two or three days after, the ejection of the calculus, the patient passed another whilst attempting to void urine. The second calculus was smaller, but circular, to the first, in appearance, the patient subsequently improved and he got rid of the pain of which he formerly
complained. It will thus be seen in this case that the patient was an old man that he had enlargement of the prostate which gave rise to retention of urine and that the bladder contained calculi which were dislodged by passing the catheter and sound.

The other case was a most complicated one inasmuch as the patient had suffered, at one and the same time, from a number of diseases. He had in the first place urethral calculi, secondary prostatic calculi, urinary cystitis, suppurative lepiditis, and a purulent as well as chronic peritonitis.

Besides these important features there were other points in the case worthy of notice. The history regarding this patient are briefly these. He was 87 years of age. The complaint of difficulty in passing urine and great pain in the penis and perineum. He stated that he had walked a distance of 2 miles. He was emaciated, had a weak pulse and an anxious expression. Owing to the pain he suffered from he was unable to stretch himself in bed. He passed urine in drops, it was turbid and had an offensive odour and contained albumin and a good deal of albumin. Only a small quantity of urine could be collected for examination. The catheter was found to contain, one stone from the ureter, at least two calculi, the bladder
was detached. The impacted calculi were considered the probable cause. A good
bile catheter, however, passed easily enough.
before the stones but on reaching the
triangular ligament it made no further
progress. At this spot slight decompression
failed to take place. On the following day
(12 August) the patient was given chloroform
and the urethra was incised at the
spot where the calculi were found. By
this operation two calculi were extracted. They
were smooth and oval and each
measured about ½ inch in length and
½ inch in breadth. It was thought that as
these calculi had been removed the
bladder could be more easily reached by
means of a catheter, but on the
introduction of a catheter the same difficulty
was experienced as that on the previous day.
the instrument passed as far as the
triangular ligament and would proceed
no further. On examination of the rectum
the prostate was found not only
enlarged but considerably so that it was extremely hard. This led to the
conclusion that the trouble was probably
due to prostatic calculi or to simple
enlargement of the glands. After having tried
to saw an instrument into the
bladder the effort was given up. The case
appeared to be an unfavorable one in
many respects. In the first place the
patient's health was not at all in a
Satisfactory state, then the print indicated serious disease of the kidneys and bladder. If now the bladder had been reached by a "knife" and had been found the rest of a similar calculus it was not likely that the patient would have survived the operation for the removal of the calculus. On the following day at 3.45 p.m., and about 20 hours after the above-mentioned examination, the patient died somewhat suddenly. His temperature on the previous evening had been 99 and on the morning of the day of his death it fell to 96.

On the 17th, 19 hours after death, a post-mortem examination was held. The body was considerably emaciated and rigor mortis had set in. The incision was made along the linea alba and the abdominal cavity was opened into in the usual way. Portions of the abdominal muscles were found to be of a dark gangrenous colour. Gas was found in the peritoneal cavity and the intestines were matted together. The bladder was distended. The right kidney was enlarged; its capsule pleased off easily and between it and the surface of the kidney several small abscesses were seen. On cutting into this kidney the pelvis was found unevenly dilated. The medulla and cortical substance were not increased. The pelvis of the kidney was filled with purulent matter which extended downwards along the ureter.
Left kidney — there was some difficulty in finding the left kidney owing to its small size. It felt flabby and empty, the impression being that it had been large at one time. On section the whole of the cortex and medulla were found to be absent. The fibrous tissue of the pelvis and the kidney alone remaining. To great had been the destruction of the unreniform structure of the kidney. That the fibrous coat of the pelvis was in contact with the capsule. The wets of this kidney was dilated to such an extent that at first it appeared like a portion of the small intestine. The mucous membrane was soft and the contents were decomposed fetid urine.

The bladder was then cut into from within the pelvis but no stone was detected. Bladder decomposed purulent urine was found in it. The walls at the sides were thick. The mucous membrane was soft and peeled off in sheets.

On examining the bladder the urine had been previously detected in the prostatic was felt and on looking into the cavity of the pelvis, a pocket or sac was found to the right side of the bladder. This was connected with the prostatic. The incision was made into it and its walls were found to be thick. Hence from this cavity were removed two large and calculus each about the size of a small hen's egg and four smaller ones. They were all of a chalky white appearance.
Their composition appeared to the Carbonates of Lime.

It will now be seen that Poletic Calculi of large size may occur in the substance of the gland. Some of the spermatozoa may escape or into the urethra and not finding an exit may remain there giving rise to retention Calculi. These calculi together with the enlarged gland give rise to retention of urine which if not relieved is followed by extensive disease of the urinary organs as was revealed by the post mortem examination of the above case. There is no doubt therefore that the large calculi, mechanically, contributed much to bring on such a pathological condition of the organs as was seen.

It is hardly credible that with all these severe diseases which had reduced the patient to a点了 that he was able to walk a distance of 82 miles (according to his statement) and almost as strange it is that he was under the influence of chloroform for about 20 minutes without succumbing to its effects.

The patient was too weak to give an account of his illness but it is clear that he had suffered for months the disease gradually advancing, one organ after another becoming involved until life was no longer possible. Had this instant applied to a medical man a few months or perhaps weeks earlier his life might have been saved. I have no doubt
many patient die from calculi because they live in kitchens so distinctly situated that access to a lunarium is either very hard or impossible.

Wisted Calculi

These calculi are generally small and of social origin. But they may originate in the kidney, pass into the bladder, and finally into the urethra where they may become impacted thus giving rise to urethral calculi. One of my patients after having suffered from symptoms of renal calculus distinctly felt the stone into the bladder, and shortly afterwards he saw the stone ejected during micturition. Besides those from the kidney and bladder, prostate calculi may escape into the urethra and become impacted there. Such was the case I think with the last patient. The calculi found in the urethra are generally small, but should they remain impacted for any length of time they enlarge by further deposits whilst in the urethra as appears to have been the case with one of the calculi removed from one of the patients I need not refer to the patient whose case I have already given as furnishing one form of urethral calculus. The second patient was a boy whose age was five years. He was brought to hospital because he had difficulty in passing urine. During the three previous months he had had pain in the urethra. His stream of
urine had gradually got smaller until his uresis passed in drops. The bladder was found very much distended and retracted as far as the umbilicus. On examining the urethra a stone was found impacted about an inch in front of the vesicula. The boy obtained relief during his efforts at peristalsis. In addition to the calculus the patient had another abnormal condition of the bladder the meatus of which was found occluded and the urine escaped by means of a hypoplastic opening. With some difficulty the meatus was opened but the catheter could only be passed for a short distance. On introducing the catheter however into the hypoplastic opening there was no difficulty in reaching the stone which completely blocked up the passage. The boy was placed under chloroform and the calculus having been secured so as to prevent its escape backwards an incision about 3/4 inch in length was made one it on the lower surface of the penis by which the calculus was extracted. The stone was the size of a bean and of the oxalate of lime variety. The sutures were introduced and the wound healed without any difficulty. It has been recommended to force the calculus into the perineum if possible and then to perform retrostomy. He doubt he don
cases where the calculus is situated low down in the urethra, this would be the best procedure. This operation has been advocated with the view also of obviating the danger of the non-union of the edges of the wound in the urethra, but if the wound is a small one there cannot be much danger.

Calcium situated between the bladder and urethra.

I shall close this paper with the subject of calcium situated between the bladder and urethra. Such calcium can only occur in patients who at the same time suffer from phlyctoia. The urine not finding an outlet accumulates in the space between the urethra and bladder. The urine becomes purulent and concretion forms in the space just mentioned. Besides any case I am acquainted with only one other, where this rare form of Calculus has occurred. Richer in his Science and Art of Surgery, Vol ii. 75, speaks of the case of an old man who at first was supposed to be suffering from a tumor of the penis, but it was not till the urethra had been divided that the true nature of the disease became evident. The patient was a young man who applied for treatment owing to difficulty in passing water. He was found to be suffering from phlyctoia. The urethra of the prostate had eroded to such a degree that not
a probe or a no. one catheter could be introduced. There was nothing in the external appearance of the prepuce to lead to the supposition that calculi existed beneath the prepuce. He passed decomposed chalky-looking urine in drops and complained of pain in the glans but of no other symptom.

On performing the ordinary operation for the relief of phlegmoneous hid calculi were found embedded in the glans close to the corona. Each was about the size of a large bean and their composition appeared to be carbonate of lime. On removing them two depressions corresponding to their shape and size were seen on the surface of the glans. It was clear from this that the calculi were formed there and had not escaped from the bladder or the urethra of the urinary tract. The history of the patient and the composition of the calculi confirmed this supposition. I need only add that the patient was completely relieved, and left the hospital cured shortly after this operation.

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21st March 1883.