THE BRADSHAW LECTURE ON VESICAL STONE AND PROSTATIC DISORDERS.

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[AFTER some preliminary observations the lecturer passed on to the consideration of the important changes that have taken place in the operative treatment of the affections of the urinary organs within recent years.]

CYSTOTOMY.

The almost entire disappearance of lateral cystotomy, using this term in its more extended application to various affections and injuries of the urinary apparatus, is a turn of affairs which I venture to think cannot be viewed entirely with satisfaction, though the use of this operation in stone cases is daily becoming more restricted by reason of the substitution of other methods. For by what other means that have yet been devised can a surgeon, by an opening from the perineum in the male, secure the removal of a stone, the incontinent and dependent drainage of a diseased bladder, without the use of apparatus, together with the necessary infliction of a wound on the prostate which there are reasons for thinking has not infrequently been the means of arresting its growth, if not of inducing its atrophy when enlarged? In certain forms of injury involving the neck of the bladder, complicated as this sometimes is with fracture of the bones constituting the pelvic arch, as in instances of extraperitoneal rupture of the bladder, an incision as for lateral cystotomy has frequently been the means, by at once establishing free and untrammelled drainage for the urine, of alone bringing about a successful termination to the case.

Lateral cystotomy has, to a large extent, been displaced by the revival of the suprapubic or high operation on somewhat altered lines, and with this substitution I am not disposed to find fault. By this method an easy access to the bladder for the purposes of exploration and drainage not requiring a dependent opening, for the removal of growths from the interior of this viscus, as well as pendulous excrescences from the prostate, is provided. In the case of small stones, both in the adult and in the child, its substitution for crushing in uncomplicated cases is often unnecessary, whilst in the instance of very large calculi, though no other course may be open to the surgeon, the risk to life, it must be remembered, is considerable.

BIGELOW'S CRUSHING OPERATION.

There can be no doubt that the anticipation of the author of the term "litholapaxy" that the crushing and evacuation of stone from the bladder by an uninterrupted and completed process, with hardly any reference to its size or constitution, would be followed by a largely-diminished mortality, has been more than realised. I do not, however, think it would be right in thus alluding to the greatly-diminished mortality that has followed successive improvements in the crushing operation for stone or whatever other name we may call this proceeding, were I to omit to refer to the impetus given to this direction of work by Civiale and Guyon in France, and by Sir Henry Thompson in this country.

RECURRENCE OF STONE.

In his Hunterian Lectures delivered before this College in 1886 Mr. Cadge observed that, "although the immediate and direct mortality of lithotripsy is small, the recurrence of stone is lamentably frequent." A decade has now elapsed since this criticism was offered, and there can be no doubt that within this period, and directly arising out of the further development and more general adoption of Bigelow's work, the liability to recurrence after these operations has greatly diminished. Improvements in the construction of lithotrites or breaking machines, so far as relate both to trituration and speed, the more general substitution of fenestrated for smooth-bladed instruments, the use of evacuating cannulae permitting of the

more ready withdrawal and escape of the broken-up fragments from the bladder, and the employment of aspirators or wash bottles more capable of sluicing the bladder and any irregular pouches it might possess are the means which have chiefly contributed towards this end.

Still, even with the best appliances and skill recurrences not infrequently occur, and, if we analyse the causes of stone relapses after crushing operations, there can be no doubt that a failure to remove all the fragments from the bladder in the first instance is by far the most frequent. It is in reference to this very important matter that lithotomy, however performed, irrespective of the question of mortality, shows to an advantage, and at the same time suggests an explanation why this distinction should exist.

The general experience of the crushing operation, "litholapaxy"—in this country, at all events—seems to indicate that the liability to recurrence after this operation increases considerably as age advances. Recurrences before 60 years of age are rare, and are usually traceable to some exceptional circumstance, such as urethral stricture or obstruction attended with pouching or trabeculation of the bladder. Hence we may conclude that hypertrophy of the prostate and the structural complications arising out of this, in conjunction with atony or imperfect powers of urine expulsion, are frequent concomitants in by far the larger proportion of stone relapses after lithotripsy. This explanation applies only to those recurrences in which the calculus is mainly phosphatic and of vesical origin. In persons who have been in the habit of passing renal calculi for years it is frequently found, when the prostatic age is reached, that the ureters, no doubt much dilated by previous attacks, allow stones of considerable size to descend into the bladder comparatively painlessly, which are subsequently trapped by the enlarged prostate; otherwise they might as previously have been spontaneously voided.

PROSTATIC HYPERTROPHY AND VESICAL CALCULI.

The Means of Diminishing the Enlarged Prostate.—The surgical measures which have been followed by atrophy or shrinkage of the hypertrophied prostate are (1) simple incision into the prostatic ring as in the second stage of lateral lithotomy; (2) puncture of the bladder through the enlarged prostate with retention of the cannula for some weeks; (3) double and single castration; and (4) double and single vasectomy, or division of the vas deferens. This list does not include cases of partial or complete removal of the prostate gland now known under the name of prostatectomies. Prostatic incision or puncture, apart from the limited number of the observations where atrophy seems to have followed them, would hardly be applicable in cases otherwise suited for lithotripsy.

CASTRATION FOR ENLARGED PROSTATE.

John Hunter¹ appears to have experimented on animals in reference to this point, and more recently Griffiths² has added importantly to these researches. Decimus Hodgson,³ of Glasgow, wrote in 1856, "in persons who have been castrated, the prostate dwindles down almost to a rudimentary condition." The inference, however, that what is true relative to the normal state of these parts also applies in varying degrees to the hypertrophied prostate does not appear to have been utilised systematically for practical purposes until Dr. William White, of Philadelphia, drew attention to it in 1893.⁴ Since this paper appeared, the operation of castration and other proceedings arising out of the same train of thought relative to the enlarged prostate have been somewhat extensively employed.

Reading one of the most recent communications on the subject, of which Dr. Cabot,⁵ of Boston, is the author, and which includes about 100 well authenticated cases in illustration, I was struck not so much with the somewhat high death-rate as with the uncertainty as to the kind of result, physical as well as mental. Dr. Cabot's opinion, that castration seems especially efficacious in cases of large tense prostates, when the obstruction is due to the pressure of the

¹ Works edited by Palmer.

² *Journ. Anat. and Phys.*, vols. xxiii and xxiv.

³ *On the Prostate Gland*, Glasgow, 1856.

⁴ *Trans. American Surg. Ass.*, 1893 and 1895.

⁵ American Surgical Association, May, 1896.

lateral lobes upon the urethra, and is of but little use in myomatous and fibrous glands, is warranted, I consider, by the records to which I have referred.

Scattered, however, through the cases which have been recorded are some few where it has been utilised for recurrence of stone after crushing operations with advantage. I cannot quote a case of my own in illustration, as I have not had occasion to resort to it under these circumstances, but I am acquainted with one in which it well served this purpose.

It was that of a male, aged 75, who had stone recurrence after lithotomy on three occasions, at intervals of a year or so. On the fourth time of relapse the urine and bladder were in so foul a state from cystitis and great enlargement of the prostate that a suprapubic cystostomy was performed, by means of which a phosphatic stone was again removed, and the bladder was drained for some time. The patient, however, was intolerant of all the methods that were tried with the object of keeping the wound open by various drainage appliances, and eventually it closed before the latter process was completed. This was followed by a speedy return of all the symptoms of cystitis and the commencing formation of more phosphates. To meet this condition the bladder was again cleared by means of the lithotrite and the aspirator, and double castration was performed. The relief was now complete, and is, I believe, permanent, as the patient has been free of his stone and his symptoms for nearly two years, and has no need either of his catheter or his irrigator.

It is under circumstances such as these that castration may occasionally find a place in the treatment of recurring stone complicated with enlargement of the prostate. In selecting it, however, apart from other considerations, the surgeon must be reasonably clear in his opinion that the case is not one either of encysted or pouched stone, otherwise, as castration affords no opportunity of making either a digital or ocular examination of the interior of the bladder, a suprapubic prostatectomy would, in the face of these presumed complications, be preferable.

VASECTOMY FOR ENLARGED PROSTATE.

After reading Dr. White's first paper, to which I have already referred, I took an early opportunity of raising the question as to whether somewhat similar results, so far as the enlarged prostate was concerned, could not be induced by dividing either one or both of the excretory ducts of the testicle. I based my suggestion partly on a case⁶ in which I had casually, though at the urgent desire of a patient, divided the vasa some years previously, under somewhat exceptional circumstances, which I narrated, with good results continuing over a considerable period of time. Further, I drew attention, in connection with the subject of injuries to the vas deferens, to certain cases recorded by Hilton and Birkett,⁷ in which atrophy of the corresponding testis was proved to have followed the accidental division of this tube, either by section or laceration. My contention was that if division of a vas brought about atrophy of the corresponding testis, it was logical to conclude that the remote effects on the prostate would be the same as if the testis had been actually removed. That is to say, the division of one vas should be followed by unilateral atrophy, first of the testis and afterwards of half of the prostate. Whereas, if both vasa were divided, both testes and the whole of the prostate should subsequently undergo shrinkage. I think I may claim that this has now been demonstrated to be the case.

In the course of a recent discussion⁸ in reference to the treatment of prostatic hypertrophy by these means, I took the opportunity of saying that from some experience of my own, the results of vasectomy depended very much on attention to certain details connected with the operation. In the first place I do not think it is well to operate on both vasa at the same time, as any risk connected with the proceeding is increased, and mental effects of a serious nature may follow such as have been observed after castration. I have not met with an instance where any ill effects resulted, when a sufficient interval was allowed to elapse between the two operations. I think the interval should be not less than a month. I have seen instances where the relief following the division of one tube was so sufficient as to render division of the opposite one unnecessary. In some of my cases I found that after one vas had been divided the prostatic symptoms subsided at once, and then, after an interval of three weeks or so, began to reappear coincidentally with some hypertrophy of the testicle of the opposite side, where the tube had not yet been divided. The second operation was then proceeded with, and it was in

the group of cases in which this incident was observed that I obtained the most satisfactory results.

Prostatic atrophy or inactivity by section of the ducts is brought about through the medium of a double process, or rather by the induction of an atrophy by an atrophy. Hence the effects of vasectomy upon the prostate are longer delayed and more gradual than when the testes are primarily removed. In some of my cases of double vasectomy it was observed that the division of these ducts was not immediately followed by cessation of sexual desires, and months sometimes elapsed before these sensations finally ceased and atrophy of the testes was marked. I am not aware, however, of an instance where these effects, though delayed, were not finally attained. Though vasectomy must be regarded as a slower process than castration, relative to prostatic changes, in this I believe lie its comparative safety and advantage.

MODE OF PERFORMING VASECTOMY.

Pavone,⁹ who has recently reported 28 cases out of 34 in which the patients were either cured or improved after vasectomy, advises that, in addition to excision, the ends of the canal should be twisted so as to ensure complete closure. The possibility of the restoration of the occluded vas when a ligature only has been used has been illustrated by Dr. Bransford Lewis.¹⁰ Here, on the return of prostatic symptoms, it was found that the continuity of the duct had been re-established after the ligature had come away.

The simplest way of performing the operation seems to consist in exposing the vas by a short linear incision over it, and protruding it between the finger and thumb. An aneurysm needle is then slipped under the isolated duct, by means of which a loop about an inch in length is withdrawn. The latter is then included in a silk ligature, when the free portion is removed by scissors. The small wound usually heals quickly. If the prostate has passed into a fibrotic condition or if the obstructing third lobe represents in structure a fibrous tumour, the prospects following either castration or vasectomy are unpromising. Here McGill's operation is usually indicated.

CARCINOMA OF THE PROSTATE.

There are, however, other conditions of the prostate which must be taken into our reckoning. I have long thought that slowly progressive carcinoma of the prostate, resembling in some features the more ordinary forms of hypertrophy, is far more common than is generally believed to be the case. My attention was first called to this matter in 1886, when I recorded a case,¹¹ which I will briefly refer to.

It was that of a man, aged 59, whom as a private patient I had the opportunity of watching for two years, up to the time of his death. In the first instance he suffered from some irritability of the bladder, which he could not completely empty. He was losing flesh, becoming pale, and, though the mental faculties remained vigorous to the last, he constantly complained of pain in the loins, nates, and thighs. In the course of a few weeks he became entirely dependent upon the catheter. His prostate as felt from the rectum was hard, nodular, and almost insensitive to the touch, though it was not much enlarged, nor were any neighbouring glands found to be involved. As his general health slowly declined minute petechial spots appeared on various parts of his body and his feebleness gradually increased. Occasionally he passed a small quantity of blood with his urine. He appeared to die of exhaustion, the result of prolonged blood vitiation. After death his prostate was examined by Mr. F. Paul, who reported it to be an unmistakable example of carcinoma. There was no evidence to show that this was other than the primary disease. I remember Mr. Paul remarking to me at the time that the precise nature of the disease would probably have been undiscovered had it not been carefully looked for, as there was apparently to the naked eye but little to distinguish the specimen from ordinary hypertrophy.

I have since met with many instances of this kind in practice, and have been able occasionally to confirm the diagnosis by pathological examination. Clinically this group of slowly progressive carcinomata may be distinguished by the following indications:

In the first place, they are generally met with in persons who are rather under what I would speak of as the prostatic age; that is to say, they occur chiefly in males of 55 or thereabouts. When felt from the rectum, the gland is found unusually hard, bossy, and rather insensitive. They seldom bleed much or ulcerate unless damaged by a catheter or sound. Though the use of the former is generally required more or less constantly before the case terminates, there is

⁶ BRITISH MEDICAL JOURNAL, September 23rd, 1895.

⁷ Holmes's System of Surgery, 1st ed., vol. ii, p. 739.

⁸ BRITISH MEDICAL JOURNAL, October 10th, 1896.

⁹ *Il Policlinico*, No. 15, 1896.

¹⁰ *Journ. Cut. and Gen. Urin. Diseases*, New York, 1896.

¹¹ *Op. cit.*, p. 509.

seldom either sudden or complete retention, or even distension of the bladder. Reflected pain in various parts, such as the thighs, nates, and rectum, are often complained of in addition to much painful irritability of the bladder. Death is usually caused by blood vitiation and exhaustion, with well-marked signs of what we used to speak of as a cachexia. For fibrous and carcinomatous prostates neither castration nor vasectomy is at all likely to be of any avail. Together they represent a by no means uncommon condition of this part, and their treatment must be conducted on the principles which are applicable generally to growths involving the interior and neck of the bladder. In going over the recorded cases of castration and vasectomy it is not difficult, in reading between the lines, to see that amongst them are included instances of the two conditions to which I have just referred. These we must endeavour to exclude, and then I think we shall find that division of the vasa deferentia will be found an efficient and fairly reliable means for relieving advanced forms of prostatic hypertrophy, without incurring the additional risks, not to mention other drawbacks, which naturally attend such an operation as castration.

INDICATIONS FOR VASECTOMY.

I have in three instances employed division of the vasa in recurring stone with cystitis due to much enlargement of the prostate with great, and I believe permanent, advantage. Apart from the non-recurrence of the stone, after fair intervals of trial, a general improvement in the function of micturition has been maintained, and this is in correspondence with what other surgeons have illustrated in the records to which I have referred.

It will, of course, be understood that the operative expedients I have drawn attention to as worthy of consideration are only applicable to grave varieties of prostatic disease, whether complicating vesical stone or not. Such measures as those I have been discussing can only apply in any degree to the exceptions and not to the rules.

PERINEAL LITHOTRITY.

A small proportion of stone cases will be met with where, by reason of the condition of the bladder and the urinary apparatus generally, the ordinary operation of crushing is not applicable. In these cases not only must the stone be removed, but provision made for the drainage of the bladder, and for the latter purpose lithotripsy in no way adequately provides. Where the stone is between 2 and 3 oz. in weight, and the prostate and bladder more or less involved in supuration and chronic inflammation, various substitute proceedings are adopted which have to be considered. Guyon and others have estimated the mortality of suprapubic cystotomy in males of advanced age who are generally the subjects of these complications at about 50 per cent., and my own impression is that this is correct.

On reviewing the various operations employed for removing stone from the bladder, other than by crushing alone, it appeared to me that there was much in Dolbeau's¹² method of perineal lithotripsy to recommend it. The objections against it chiefly centred in the employment of forcible dilatation of the prostatic urethra and the neck of the bladder, and in the instruments used in crushing and evacuating the stone fragments. Further, no provision appears to have been made by Dolbeau for draining the bladder systematically, after the stone had thus been withdrawn. These objections, however, seemed to be capable of removal, and I proceeded to practise this operation from time to time, as suitable cases presented, in the following manner.

In the first place an ordinary *boutonnaire*, or median perineal cystotomy is practised on a grooved staff sufficient to admit the introduction of the finger into the bladder as for digital exploration. This represents all the dilatation of the prostate or neck of the bladder that is attempted.

The next step is to withdraw the index finger and substitute a pair of crushing forceps specially made for this purpose, though in other respects resembling an ordinary pair of lithotomy forceps, either straight or curved. These have been constructed for me by Messrs. Krohne and Sesemann. They are made in different sizes, the most powerful having a screw at the handle by which the full

crushing power is brought into play. In circumference the combined blades correspond in size with an average index finger, and contain well within cover a strong cutting rib running down the centre of each, by which the fragmentation of the stone or stones is chiefly accomplished. By means of these forceps the stone is sufficiently reduced in size as to be either easily withdrawn in fragments from the bladder these instruments or to be sluiced out with a cannula and an ordinary wash bottle as used for litholapaxy. Straight cannulae such as these will be found the most convenient for this purpose. After the stone has been withdrawn and the bladder and the prostate carefully examined either with the sound or the finger, the drainage tube is introduced and retained for as long as necessary in accordance with the nature of the case.

In one case the hardest kind of urate stone, the fragments weighing over 3 ozs., was broken up and withdrawn in this way in something like five minutes, a process which would have occupied an hour or more had it been expedient to substitute lithotripsy. I also removed with my finger, quite easily, a grape-like third lobe which was in my way. The patient made a rapid and complete recovery.

I have in one or two instances tried a short lithotrite, such as Surgeon-Major Keith has described, passed into the bladder through the perineal wound, instead of crushing forceps, but find the latter more effective and convenient for use in this position. I have selected this method in fifteen instances out of considerably over 300 cases of lithotripsy, and have so far had no deaths or recurrence of stone following it. The chief points in its favour are these:

1. It enables the operator to crush and evacuate large stones in a short space of time.
2. It is attended with a very small risk to life as compared with other operations, such as lateral or suprapubic lithotomy, and is well adapted to old and feeble subjects, when, for any reason, crushing is inadmissible.
3. It permits the operator to wash out the bladder and any pouches connected with it more effectually than by the urethra, as the route is shorter, and the evacuating catheters employed of much larger calibre.
4. The surgeon can usually ascertain, either by exploration with the finger, or by the introduction of forceps into the bladder, that the viscus is cleared of all *débris*.
5. It enables the surgeon to deal with certain forms of prostatic outgrowth and obstruction complicated with atony of the bladder in such a way as to secure not only the removal of the stone, but the restoration of the function of micturition.
6. By the subsequent introduction and temporary retention of a soft rubber drainage tube, states of cystitis due to the retention of urine in pouches and depressions in the bladder wall are either entirely cured or are permanently improved.

To lock up unhealthy ammoniacal urine in a bladder that cannot properly empty itself after a lithotripsy is to court the formation or recurrence of a phosphatic stone. Hence it is well suited to some cases of recurrent calculus. I have never known the wound to remain unhealed, except in those instances in which it has been desired to construct a low-level urethra. It is well adapted for some cases of stone in the bladder complicated with stricture in the deep urethra, as it enables the surgeon to deal with both at the same time.

In a recent paper by Mr. Herbert Milton, of Cairo,¹³ I see that the operation of perineal lithotripsy figures prominently and successfully amongst the 200 cases of stone he records. He has employed it much on the same lines as I have described in 21 instances with 1 death. Though speaking of Bigelow's operation as the more brilliant of the two, he evidently has reason to regard perineal lithotripsy as now revived as the more generally useful. [A specimen made by Messrs. Down of the breaking forceps Mr. Milton employs was submitted for inspection.] Taking Mr. Milton's 21 cases and 15 of my own, we have a total of 36 with 1 death, which, considering the size of many of the stones and the complications that were present, gives, I think, a very satisfactory result and one that will compare favourably with other operations, either crushing or cutting, used in the treatment of stone. I have a growing impression that in countries where, by reason of the great age that is often attained by persons suffering from stone in the bladder and where the opportunities for practising litholapaxy are not very frequent, perineal lithotripsy will be more generally utilised.

The employment of litholapaxy in male children by our distinguished Fellow, Dr. Keegan, whose work has been importantly supplemented by my colleague, Mr. Freyer, has led to a change in practice. Sudden retention of urine in young males is most frequently caused by the impaction of a small stone in the urethra. Such an incident, apart from the ex-

¹² *De la Lithotritie Périnéale*, Paris, 1872

¹³ *Lancet*, April and May, 1896

treme urgency of the symptoms thus produced, has not infrequently led to ulceration of the urethra, and serious, if not fatal, extravasation of urine into the neighbouring tissues. In earlier days, when the catheter detected a stone was thus impacted, the practice was either to cut down and remove the calculus from the position it occupied in the urethra, or, if possible, to push it back into the bladder, and then to extract it by some form of lithotomy or cutting operation. Though either proceeding was usually successful, it entailed an operation which necessarily required a period of convalescence. Amongst some of my earliest lithotomies in male children were cases occurring under these circumstances. In illustration of the importance of this change in practice I may be permitted to mention, very briefly, the particulars of a recent case.

It was that of a boy, aged 4 years, whom I saw with urgent retention of urine due to the lodgment of a stone in the urethra just behind the scrotum. I pushed the stone back into the bladder and the retention was at once relieved. On the following morning I had the child placed under an anæsthetic and crushed the stone. As I found at the moment I had not an evacuating catheter sufficiently small to enter the bladder without more force than is desirable, I contented myself with more completely pulverising the calculus with the lithotrite than I should otherwise have thought necessary to do. The *débris* was discharged in the natural course of micturition, and the patient was practically well without any delay, as the urine was never even tinged with blood. Sir William Roberts was kind enough to examine the fragments of the calculus [which were exhibited], and reported that it consisted of uric acid with a coating of oxalates, and weighed a little over 5 gr.

A short time ago the patient would undoubtedly have been submitted to a more serious operation. I may incidentally mention that I reported¹⁴ a very similar case, where I practised lithotritry in a male child aged 11 years in 1881, and I have since from time to time successfully adopted this proceeding. I believe this was one of the first recorded examples in so young a subject, a circumstance I had forgotten until recently reminded of it by my friend Dr. Keegan. I have not met with an instance of recurrence of stone after litholapaxy in children.

THE APPLICATION OF THE ROENTGEN OR X RAYS.

To what extent this means may be utilised in matters which have occupied a considerable portion of this lecture has yet to be demonstrated. In its application to the diagnosis of calculus situated within any portion of the male or female urinary apparatus from the kidney downwards, I am not aware that it has been sufficiently successful in indicating either the form or position of the stone. From some experiments made chiefly outside the human body—I refer to such as those of M. D'Arsonval¹⁵ in Paris, and Mr. Henry Morris¹⁶ and others—it is quite possible by the shadows thus cast to distinguish various kinds of calculi. At present I do not think more than this can be said or has been sufficiently demonstrated. Though I have had several patients skiagraphed, I have not yet succeeded in obtaining results which were of help in making a diagnosis, independently of such means as we are in the habit of using.

In thus referring to this method of investigation it is with the hope that in its further development and application it will, amongst other aids, enable us to dispense with the use of the sound as a means of diagnosing stone in the bladder. I cannot recall an instance in the child, woman, or young adult, extending up to what I would call middle age, who was ever seriously damaged by the judicious use of this instrument; but in males of a more advanced age, in whom the prostate was large and access to the interior of the bladder, by means of a rigid instrument, by no means easy, we have seen, both where a stone had been discovered, as well as where one had not, serious and even fatal consequences ensue. A cystitis, for instance, has thus been aroused with considerable general disturbance which has sometimes taken a long time to overcome, not to say anything of being the means of postponing a necessary operation indefinitely by reason of the acute septic conditions under which it would have been undertaken.

Nor is this all. How few surgeons, in whatever degree they may be engaged in work of this kind, can feel that the skilful employment of the steel sound is an absolute guarantee against the possibility of a stone escaping their vigilance! When we look at the shape the diseased bladder and prostate

often assume, it is astonishing to me that this somewhat primitive mode of examination so rarely fails us. But it is in just this particular class of cases that we rely upon it most, and where our disappointment is the keenest, if it falls short of our expectation, whatever the explanation may be.

Under these circumstances I have for some time past been in the habit of including under one process, with great advantage, the administration of an anæsthetic, the use of the sound for the first exploration of the bladder, and the immediate removal of the stone, by crushing if practicable, if one is discovered. Just as in earlier years a preliminary paracentesis of an ovarian tumour was often found to be an unfavourable antecedent to an ovariectomy, so may the passing and use of a sound be a preface, which we would avoid, to the subsequent removal of the stone, however this may be effected. No more desirable object can be wished for in connection with the practical use of these rays than their adaptation in determining the presence, position, and constitution of the various stony concretions that have their habitat in the human urinary organs.

I have some confidence in expressing the belief that the time is not far distant when, under the circumstances I have mentioned, these Roentgen rays will enable us to see the stone instead of feeling it, just as in a recorded case,¹⁷ where a Murphy's button, lost in a remote corner of the intestines, was thus found by my old friend and colleague, Mr. Mitchell Banks.

NOTES ON THE COMPOSITION OF THE BLOOD SERUM IN PERNICIOUS ANÆMIA.¹

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As far as we can learn, the chemical analysis of any very large quantity of blood or blood serum from cases of pernicious anæmia has so far never been made, and, although we freely admit that objections may be taken to the following analysis on the ground that the blood was not obtained *intra vitam*, nevertheless, we think the following analysis of the blood serum obtained at the necropsy upon a typical case of the disease deserves to be placed upon record. This analysis was made from the serum obtained from an extremely distended right heart, removed five hours after death in the month of February. It may be noted that the mean temperature in Montreal in February is several degrees below freezing point, and that the body in this case had been placed immediately after death in a room the temperature of which was close upon freezing point; the room indeed was so cold as to make the performance of the necropsy somewhat of an ordeal. The body was found not completely cold.

HISTORY OF THE CASE.

Before giving the analysis it will be well to say a few words in reference to the history of the case.

The patient, a man of 53, began to feel weak in March, 1892; there was a numb sensation in the lower extremities as from "pins and needles," and he soon noticed that his knees were liable to give way under him. He had lived in England until the age of 42, when he came to Canada. For the greater part of his life he had been a carpenter; the last two years he had undertaken work as a shorthand reporter. His personal history was very good. About the only trouble he had suffered from previously was a right-sided rupture, brought about when he was 40 by lifting a heavy weight. His condition upon admission to the Montreal General Hospital, under Dr. George Ross, in August, 1892, was one of great pallor and slow mental condition, with no pain experienced in any region. The knee-jerks were much diminished. The appetite was good, the digestive system apparently in fair condition; there was no abdominal pain. The arteries exhibited a slight amount of arterio-sclerosis; the heart was definitely enlarged, with the apex at the fifth interspace, just outside the nipple line. Upon auscultation, there was noted a soft blowing systolic murmur at the apex. An examination of the blood immediately on admission gave the number of red corpuscles at 570,000, a proportion of white to red corpuscles at 1 in 200 (about), the amount of hæmoglobin at 25 per cent., and this confirmed the diagnosis of pernicious anæmia. The patient was placed upon increasing doses of liquor arsenicalis, and in less than a fortnight the number of red corpuscles had increased to 1,353,333, and the patient was feeling stronger and was of better colour. On September 7th the red corpuscles were 2,006,000, proportion of white to red 1 in 301, and

¹⁴ *Surgical Disorders of the Urinary Organs*, 4th edition.

¹⁵ *Bull. de l'Acad. de Méd.*, Paris, June 2nd, 1896.

Lancet, November 14th 1896.

¹⁷ *BRITISH MEDICAL JOURNAL*, October 24th, 1896.

¹ This paper was read before the Montreal Medical Society in 1893, and an abstract was published at that time.