have seen that modern prostatectomy has taught a better way of disposing of the troublesome class of cases that furnished most of the difficulties met by the early lithotritists. Having emphasized this additional exception in which a cutting operation should be preferred to litholapaxy, I shall close by repeating the assertion made in that earlier paper:

In my opinion, we have in litholapaxy the operation of choice for the removal of most stones. While this is the rule, there are exceptions to it, and the varying conditions surrounding stone in the bladder will now and then lead us to choose some other operation for their safest removal.

The surgeon who best appreciates these varying conditions, and selects in each case the operation which most surely avoids the dangers surrounding "that particular patient," will arrive at better results than any advocate of a special operation, however expert.

1 Marlboro Street.

SUPRAPUBIC CYSTOTOMY FOR VESICAL CALCULUS

INDICATIONS AND OPERATIVE PROCEDURE *

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There are but two operative methods now considered practical for the treatment of stone in the urinary bladder. One is the crushing of the stone and the removal of the fragments through the urethra; the other is the opening of the bladder suprapubically and the removal of the stone through the incision.

He would be obdurate indeed who did not acknowledge the wonderful invention of the lithotrite and the achievements accomplished by its inventor. At a time when any cutting operation carried with it such a high mortality and the convalescence was so prolonged in those who survived, the lithotrite, with the skilful touch of Bigelow, was truly a blessing; but the conditions that prevailed then with regard to the cutting operation no longer exist to-day. Little advancement, if any, has been made for the crushing operation, while each year brings a better record for the suprapubic operation.

To say that either operation should be used to the exclusion of the other for all cases of stone in the bladder would be ill-advised; but the cases generally recommended for the use of the lithotrite by the advocates of litholapaxy are, as a rule, selected cases and naturally would have a lower mortality-rate, no matter what kind of operation. Surgery is rapidly turning from the dark to the light, and blind operations or those depending entirely on the sensation of indirect touch must be replaced, wherever possible, by operations conducted by inspection of the field or by the direct aid of the fingers. We all know that it is possible by large experience to become fairly accurate by indirect palpation, but it can never be so nearly exact a method as that which depends on seeing or direct feeling.

The opportunities for any one person in this country to acquire a large experience with the lithotrite within any reasonable time are very limited; material in clinics is not sufficient to give the student the practical experience necessary to do a successful litholapaxy, and certainly no one would recommend its use by the untrained;

while the opportunities for teaching suprapubic opening of the bladder are quite common, there being many other conditions besides stone for teaching this technic. In India where so large a proportion of natives have vesical calculi, an extensive experience may be acquired in a comparatively short time; as most statistics for the lithotrite come from India, the comparison is hardly fair.

Most advocates of litholapaxy admit that the stone should be freely movable, that there should be sufficient bladder capacity, and that the urethra should be of sufficient size; also that a very large prostate, an encysted stone or a stone with a foreign body as a nucleus are all contra-indications to the successful use of the lithotrite. For these more or less difficult cases suprapubic cystotomy is recommended. If, then, the mortality-rate should be somewhat higher for the cutting operation would the comparison be fair?

Among the causes mentioned as being responsible for deaths in suprapubic operations is peritonitis. This should no longer occur, for with better aseptic methods and better technic the dangers of peritonitis are reduced to a minimum. Better local and general anesthetics have reduced the danger of shock from the operation; and better methods of dealing with the wound have shortened the period of convalescence and reduced the complications to a minimum!

The complications and mishaps of the lithotrite, when they do occur, are nearly always serious. I am treating now a most persistent stricture resulting from the use of the lithotrite by a colleague. In this case there had been an extensive laceration of the urethra.

INDICATIONS FOR SUPRAPUBIC CYSTOTOMY

Overenthusiastic exponents of litholapaxy may make the statement that they have never seen a stone too large or too hard to be grasped by the lithotrite, but their experience is scarcely borne out by the experience of other surgeons or by the many reported cases in medical literature. Even in the special stone number of the *Indian Medical Gazette* expert operators confess that this condition does exist. The case reported by Richards¹² is a good illustration. The stone weighed 2 pounds; lithotripsy failed; perineal incision failed because the stone had to be chiseled; and the stone was finally removed suprapubically, the wound healing readily. In my own practice there have been eight cases with large hard stones which I feel could not have been removed without great difficulty by any other than the suprapubic route. The patients made quick recoveries without complications.

The operative treatment of encysted or adherent calculi is always the high incision, as the many published cases prove. Inspection is absolutely necessary here. I have had three such cases; in one a stone about 2 cm. in diameter was enucleated from a pocket in the region of the trigonum, only the very tip showing. In another the stone was firmly adherent behind the prostate. In the third case cystoscopy showed a calculus embedded in the mucous membrane over the right half of the trigonum. This case is of further interest in that the patient returned in six months complaining of the old trouble; cystoscopy showed the diverticulum at the site of the former stone. Again suprapubic incision was made, several soft stony deposits removed and the diverticulum dilated, since which time the patient has been in good health.

Where multiple stones are present the superiority of the suprapubic method is hardly to be doubted, for

* Read in the Symposium on Treatment of Vesical Calculus in the Section on Genito-Urinary Diseases of the American Medical Association, at the Sixty-Third Annual Session, held at Atlantic City, June, 1912.

* This article is abbreviated in THE JOURNAL. The complete article appears in the Transactions of the Section and in the author's reprints.

12. Richards: *Lancet*, London, 1908, II, 230

exposure of the operative field is necessary for a thorough search. In my practice I have had ten cases of multiple calculi, in one of which I removed ninety-three stones, six the size of filberts and eighty-seven ranging down to the size of a grain of wheat; there was extensive trabeculation. This patient was 84 and made an uninterrupted recovery.

The suprapubic operation is generally accepted as the operation of choice in the young. The operations of Milton⁷ and Assendelft⁹ are good proof of the wisdom of this. Even Thompson did not advise litholapaxy in children. My youngest patient was a 19-month-old baby. There was a quick convalescence.

The presence of calculi in old men is another indication for the suprapubic incision. Thomas,¹³ in an article on calculus in old men, gives the histories of four cases in which the calculi were so situated behind the prostate that the lithotrite could not grasp them. The stones were removed suprapubically and the patients made good recoveries. My seven patients, all over 70, left nothing to be desired so far as operative recovery was concerned.

Except in the hands of the most experienced, prostatic hypertrophy offers obstruction to the lithotrite, there being few surgeons who will not prefer the suprapubic method. Six of my patients had marked prostatic hypertrophy, on three of whom I performed a prostatectomy at the same time.

The location of the calculus projecting from the vesical end of the ureter is another indication for the suprapubic method. I have had several very interesting cases of this kind; also two cases in which the stone was wedged in the neck of the bladder and considerable force was necessary to dislodge it. It could hardly have been removed in any other way.

The presence of a foreign body as a nucleus is another hindrance to crushing. Many such cases are on record. My cases of this kind are three in number, the nucleus being a hair-pin in one case, the wick of a taper about 3 inches long in another, and a piece of wax in the third. Calculi associated with tumor also hinder crushing and a strictured urethra almost necessitates the cutting operation.

A recent case in my practice was of more than general interest. The patient, a man aged 67, suffering from severe ascites and marked myocarditis, was in almost continuous pain, due to a bladder contracted firmly about a very rough stone. There was practically no bladder capacity. Five liters of cloudy serum were drawn from the abdominal cavity the day before the operation. Under nitrous oxid and local anesthesia, a large calculus was successfully removed suprapubically.

The reports of Lakeside Hospital, Cleveland, for the ten years from 1900 to 1910 show forty-six operations for vesical calculi; thirty-eight were done suprapubically, seven were litholapaxies and one was removal of the stone by dilatation of the urethra. Four deaths occurred in the suprapubic cases, all four being complicated cases. One man of 68 had acute double hydronephrosis; another of 74, with a very weak heart, had a prostatectomy at the same time; the third had marked prostatic hypertrophy and the bladder was divided into two compartments by a small band; the fourth patient, a man of 55, showed a gelatinous condition of the bladder mucosa, the bleeding being a constant oozing. The mortality of the suprapubic operations was 10.5 per cent. One death occurred in the litholapaxies, that of a boy of 12 who died from severe laceration of the

bladder. The mortality of the litholapaxies was 14.28 per cent.

One of the objections to suprapubic cystotomy is the prolonged convalescence. This was a valid objection when the bladder was drained, but it is no longer necessary to drain the bladder after removal of stone or tumors. If the bladder is properly closed, a week or ten days is all the time necessary for a complete cure. I have been closing the bladder in practically all suprapubic operations, with the exception of suprapubic prostatectomy, and have more than 90 per cent. of primary unions.

For the success of this operation certain points in the technic, which I have described in a previous paper, are necessary. In brief they are as follows: The cut edges of the bladder should not be grasped with crushing forceps. The edges must be carefully approximated while the wound is on the stretch so that the stitches will not be separated when the bladder is distended with urine. The ligature must be absorbable. My personal experience consists of fifty-three suprapubic operations for stone in forty-nine cases, with no deaths. There were four cases of recurrence. Good recoveries resulted in all cases. Two of the forty-nine patients were women. Three patients were below 15 years of age; sixteen between 15 and 50; twenty-nine between 50 and 84. The youngest patient was 19 months; the oldest, 84 years. The average age was 53.4 years. In thirty-three cases the bladder was immediately closed, leakage occurring in only three cases and in two of these only a small amount, and for a short time.

Until a practical observing lithotrite is invented, which will give the operator the opportunity of seeing the field of operation, suprapubic cystotomy for stone must remain the method of choice by the majority of operators.

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ABSTRACT OF DISCUSSION

ON PAPERS OF DRS. CABOT AND LOWER

DR. JOHN MYERS SWAN, Canton, China: In the Canton Hospital of South China, during the last twenty years I have had 1,058 lithotomy operations for urinary calculi, 950 of which were by the old lateral perineal section and about fifty by the suprapubic. In addition to that and during my earlier experience in the treatment of this disease, I had to deal with about 258 by litholapaxy. There are two or three factors that have caused us to adopt the operation we have generally done: first, the age of the patient. Out of 1,058, 330 were under 10 years of age, and we all know that it is not nearly so easy to use a lithotrite in patients under 10 years of age as it is in the adult. The factor that first influenced me with regard to the operation best to do was the mortality-rate. My predecessor, Dr. John G. Curry, was one of the most famous lithotritists in his time, and we have in the hospital one of the best outfits for lithotripsy. In the first few years of my experience the mortality-rate ranged higher in the operations for litholapaxy than in the ordinary lithotomy. The second and perhaps the most important factor was that there was recurrence after litholapaxy. Dr. John G. Curry was a skilled lithotritist, and yet I have found that anywhere from six months to a year and a half after litholapaxy our patients returned with recurrent stone. Recurrence very rarely occurs after lithotomy. Third, when we have from ten to twenty operations in one day, the question of time must be considered. From two to five minutes from the time the patient is anesthetized until he is ready to be removed from the table will generally allow of a lithotomy. Lithotripsy cannot be done in that time. The advantage to the patient, the liability to return after litholapaxy, and the quickness, ease, convenience and safety of the operation, have influenced us to adopt

13. Thomas: *Lancet* London, 1900, 1, 1652.

lithotomy, either suprapubic for the larger stones, or the ordinary lateral perineal for the smaller ones. Exclusive of serious organic disease, aside from kidney or bladder, our mortality-rate after lithotomy, either suprapubic or perineal, has been reduced to 3 per cent., and in one single year I did sixty-two perineal and suprapubic sections with no mortality.

DR. A. L. CHUTE, Boston: I do not know whether you are all aware that Dr. Cabot was the pupil and great friend of Dr. Bigelow, our surgical primate of Boston, who, we think, did so much in establishing this operation. In spite of the statistics from Canton, I do not see how anybody can hold to the cutting operations. It seems to me that the operation of litholapaxy is so much easier. In uncomplicated cases it does not seem to me that we ought to consider the suprapubic operation from the point of view of the patient. I disagree with Dr. Swan as regards the time. That is not an argument. It is the surgeon's time as compared with the patient's convalescence.

DR. HUGH H. YOUNG, Baltimore: I hesitate to say anything when there is a man present who has done 1,058 stone operations, an appalling experience to the rest of us. I agree with Dr. Cabot and Dr. Chute in the thought that it does seem a shame in this day of the cystoscope to do a cutting operation for stone in the bladder in uncomplicated cases, when it is so easy to crush this foreign body. Of course there are reports of a few cases of rectal fistula and a certain number of cases of incontinence in which the lateral perineal operation has been employed, so that the English surgeons in India have practically given up either the median or the lateral lithotomy. We have all seen severe suprapubic infections, and occasionally extravasation. One of my patients died from interrectus infection following the removal of a calculus. The fact that these complications are not possible after the litholapaxy operation ought to lead us to try wherever possible a crushing operation. Litholapaxy has fallen into disfavor on account of the length of time consumed, and on account of the difficulty in finding the last fragment which often remains and leads to the recurrence of stone.

Chismore was right in trying to perfect the operation by changing the instrument so that the stones could be sucked into the blades, caught there and crushed without hunting all over the bladder for them. Those of you, however, who have tried Chismore's instrument know of the difficulties. It was mechanically not a well-constructed instrument. One could not handle it so quickly and easily as the Bigelow. The evacuating tube was so small that it was impossible to get anything except the small fragments through it, although I think that the evacuating principle was a good one. Therefore, I constructed a lithotrite, fashioned after Bigelow's principle, with the handle hollow, a stopcock and an evacuator attached to the instrument, thus making it possible to have an assistant work the evacuator while the surgeon is crushing. Then, if desired, it is easy to introduce a straight cystoscope through the instrument, hunt for any fragment, pick it up and crush it. There are certain difficulties in the perfection of this instrument which have made me hesitate to put it on the market. The difficulty is in the balancing of the metals; to have the blade large enough and strong enough, whether the old Bigelow blade or a fenestrated posterior blade is used. Freyer and Keegan have shown that pushing of fragments through the fenestra does no harm. A fenestrated posterior blade makes a more effective crushing instrument than Bigelow's blade. So my instrument, which is made after the principle by Leiter, has the fenestrated blade. It seems to me that the great trouble with the lithotrite is the introduction of one instrument after another and the hemorrhage that results from the passing of the instruments through the posterior urethra. With an instrument introduced only once there is practically no bleeding, so that cystoscopy is really quite practicable.

DR. LOUIS E. SCHMIDT, Chicago: I should like to draw attention to the phrase, "enlarged prostate complicated with stone," which seems to be a general term. I am quite sure, however, that if we use the cystoscope, we can often readily see that we are dealing with a primary stone, and that the prostate

has absolutely nothing to do with the condition. In the past three years I have crushed stones in three patients over 65 years of age. All had been advised to have a prostatectomy and naturally removal of the stone. In all three instances litholapaxy has given perfect results. I think that it is well worth taking into consideration that it is the stone that is causing the trouble and not the prostate, and that we must not always think that the prostate has to be removed with the stone.

DR. EUGENE FULLER, New York: I have always felt that there was a very large and useful field for litholapaxy. There is no doubt that it is an operation which requires great dependence on the sense of touch, and if a surgeon has that accomplishment, he will find in many cases that it will be the simplest thing in the world to crush a stone and to remove it; by so doing he will subject his patient to less danger and pain than by cutting. There are cases in which stone is only secondary to some other condition, and of course, one does not want to try to crush. I think that is the case in a great many conditions of the prostate; not all of them, as Dr. Schmidt has just pointed out. For instance, if a phosphatic stone is secondary to foul urine in the postprostatic culdesac, there is little use in trying to crush that stone and leave the foul urine. It is better to remove both the prostate and the stone. If there is a hard stone and a clean bladder in a condition of prostatic retention, then it may be worth while to crush the stone. One curious point that is brought up sometimes is the tolerance to stone. One sees a certain class of cases in old men who have an extreme amount of tolerance; in such cases, for instance, there exists a mulberry calculus of the roughest kind with perfectly clear urine and no pain. The only way I can explain that condition is that these men have so much prostatic obstruction that the stone during urination lies in the culdesac and consequently is not brought into the grip of the neck of the bladder at the end of the act. I have never seen a young man who harbored a stone like that without a great deal of pain in the bladder.

DR. GEORGE S. WHITESIDE, Portland, Ore.: I have just seen the large collection of stones from the Canton Hospital here on exhibit. They are a most wonderful collection and some of them could not have been crushed. Some are as big as paving stones. Conditions are a little bit different in this country from those in Canton, and it seems to me that we see the smaller stones. Educated people, when they have anything the matter with them, go to see a physician instead of waiting until the stones are large. Here, litholapaxy is better than any cutting operation. It keeps the patient in the hospital but twenty-four hours, and the number of cases of recurrence that one sees after litholapaxy, with a proper cystoscopy afterwards, is almost nil. In neglected cases with large stones a cutting operation is often preferable.

DR. WILLIAM T. BELFIELD, Chicago: In nearly a hundred of my operations for stone, calculi were removed neither by crushing nor suprapubically, but by a simple median urethrotomy. I have no doubt that had I been brought up in the classic shades of Harvard I should have removed some of these by a crushing operation. But median urethrotomy gives advantages which litholapaxy cannot furnish; that is, drainage of the bladder, with less danger than a suprapubic operation. So I think we should not allow to go unchallenged Dr. Lower's statement that there are but two practical operations for stone in the bladder.

DR. A. T. CABOT, Boston: Our experience in litholapaxy in children in this country, of course, is nothing as compared with the experience that they have in China and India, but against the remarks just made by Dr. Swan we must remember the remarks of Keegan and Freyer. They operated among a similar clientele, had an enormous number of stones and found the crushing operation in children quite feasible. I have had very few. Someone said that it was a very difficult operation in children. That is all wrong. It is very easy. The bladder in children is small and globular and the stone cannot get away. One must be gentle, but the manipulation is easy. In the operations I have performed I have been delighted with the ease with which they were done. Recurrence has always been

an opprobrium of the crushing operation. There is danger in any operation of fragments being left. I have removed stones in a number of instances after suprapubic operations done for the removal of the prostate. When one leaves a suprapubic wound it leaves a granulating surface on the inside, on which calcareous matter collects and acts as a nucleus for stone. After litholapaxy I always wash my patient out about ten days later, with the idea that somewhere some little fragment may have caught among the folds and not have been removed. I remember one case in which I did a number of operations. The stone did recur. The patient had three or four hundred stones at the first operation, all the way from the size of a good-sized bean down to a grain of wheat. It was one of my early cases, and I did not wash the patient out afterward, and within less than a year he was back again for a second operation. I removed the stones again; they were multiple. A fortnight later I washed out 150 minute separate stones from his bladder. A week later I washed out fifty. I washed him out once a week until I washed him once or twice without getting any. I think that subsequent washing out is an important part of the operation.

Dr. Young spoke of Dr. Bigelow's lithotrite. I think that he is unaware of the fact that Dr. Bigelow devised a fenestrated lithotrite which he occasionally used. The fenestrated lithotrite cuts the large stones very easily. In operating on children I always use a fenestrated lithotrite. After he had broken the stones up Bigelow preferred the solid blade because he could put it down in the bottom of the bladder and crush the stone easily without any danger of thrusting fragments through against the floor of the bladder. In my early cases I constantly operated in cases in which the prostates were not removed. I have often seen the irritation disappear and the residual urine fall from several ounces to a few drams after removal of the stone. One field for stone removal is when they first come into the bladder. With my litholapaxy pump I have in my office removed quite a number of renal stones that had been passed from the kidney into the bladder and then had not passed out. Of course, behind an enlarged prostate that has any residual urine whatever, a small stone has a very small chance of being passed out, and in these cases the use of the pump will save the patient the subsequent formation of a vesical stone.

DR. W. E. LOWER, Cleveland: Dr. Swan has given statistics for cystotomy far better than anything I have to offer. The lithotritists are asking us to do the hard operations and they will do the easy ones. The only thing we ask is that we be permitted to do the easy ones as well. If the suprapubic cystotomy is properly done and the bladder closed, the patient has no greater discomfort than after the use of the lithotrite. It is doubtful if he has as much because of less trauma to the urethra, for there is always a certain amount of trauma to the urethra after the use of the lithotrite and urination is more or less painful.

SEMINAL VESICULOTOMY

ITS PURPOSE AND ACCOMPLISHMENTS *

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Since the operation of seminal vesiculotomy has been before the profession for a considerable period of time, no attempt will here be made to describe the procedure itself. All those desirous of such information are referred to my previous articles.¹ My first article was written during the experimental stage of the work; the second, after the procedure had established itself on a firm, practical basis. In the second article it will be seen that some of the original experimental technic was

abandoned and that improved features were substituted. At present, having more than doubled my surgical experience with the operation since the 1909 article was written, my cases then having numbered only 126, I naturally feel that my technic and surgery are more competent than they were three years ago. Still, in the way of a general description of the operative procedure itself, there is little to add.

To any one wishing to perfect himself in this particular, the following suggestions are offered: The anatomy should be studied and dissections should be made on the cadaver. In accomplishing such dissections the cadaver should be placed in the knee-breast posture, thus simulating conditions pertaining during actual operation. Dissection should be made without cutting into the muscular structure of the perineal body, the rectal sphincter muscle or the blood-vessels encircling the anus. If this is so done, the bursal space between the rectum and the prostate is entered without injury to a blood-vessel of any size. In fact, in the performance of the actual operation the tying of a single blood-vessel is only exceptionally necessary. After the bursal space is once entered, the finger-tip suffices, except occasionally when dense pathologic adhesions exist, in accomplishing a separation of the rectal wall from the prostate and seminal vesicles.

Aside from an acquaintance with the anatomy of the region traversed by the operation, familiarity with the regional anatomy of the part to be attacked is most essential. In common professional parlance, the term "prostate" is seemingly made to include not only the prostatic body proper, but also the seminal vesicles; and should an inflammatory or neoplastic tumefaction occupy a part or the whole of the postprostatic space, such lesion is generally classed also as prostatic, the idea that anything else could exist calling for a differentiation of the diagnosis not being apparently even thought of. As the result of a regional dissection, just what constitutes the prostate, the seminal vesicles and the outlying region of the postprostatic space will become apparent.

When one considers that the seminal vesicles are cavities for holding fluid, the walls of which, as with the bladder, are made up of muscular structure lined interiorly with mucous membrane, it is not difficult to picture the pathologic conditions so frequently encountered. Such conditions in the great majority of instances have to deal with intraseminal vesicular infections of various descriptions, most of which have entered the cavities by the ejaculatory ducts, though in a minority of instances the invasion has been effected by penetrations through the sac walls. The distention of the sac cavities due to muscular atony may represent a lesion in connection with which there is no intraseminal vesicular infection. Severe grades of infection are not simply intravesicular, but involve the muscular walls of the sacs or (and this is frequent) invade also the outside fibrous lymph-spaces, a periseminal vesiculitis of greater or less degree resulting.

As the seminal vesicle discharges its contents by the long narrow ejaculatory duct and only at infrequent intervals, it is readily seen that the organ is not well equipped by Nature to throw off spontaneously an infection, even when confined to the intravesical cavity, and much less so when the process has extended so as also to involve the sac walls and the perivesicular tissues. In very extensive infections in which pus collects in the postprostatic space outside the seminal vesicles, Nature, if left to herself, may discharge the pus into the bladder through the trigonum, into the rectum by perforating

* Read in the Symposium on Genital Pathology and Surgery in the Section on Genito-Urinary Diseases of the American Medical Association, at the Sixty-Third Annual Session, held at Atlantic City, June, 1912.

1. Fuller: *THE JOURNAL A. M. A.*, May 4, 1901, p. 1228; *Med. Rec.*, New York, Oct. 30, 1909.