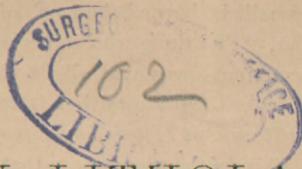


WEIR (R.F.)

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ON LITHOLAPAXY.

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THE operation of crushing a vesical calculus *in situ* and aspirating all the fragments in one sitting, as published by Bigelow in the pages of this Journal less than two years since,* has probably more than realized the expectations of its inventor, for since its promulgation to the profession this method of removing stone has been resorted to some seventy-seven† times, and the testimony thus accumulated has sustained the claims made for it. Bigelow, however, is somewhat in error in stating that the comparative harmlessness of long sittings was unsuspected until the publication of his paper, for not only had Amussat resorted to the immediate removal of stone from the bladder by the use of instruments so large as to compel the division of the meatus urinarius,‡ but also Leroy d'Etiolles accomplished the same thing in the very way that Thompson now does, *i. e.*, by the use of multiple lithotrites; and, more pertinent still, so did Heurteloup, who in 1846 published an account§ of sixty-nine cases in which vesical calculi were removed in a single sitting, with but three deaths—two of which were due to coincident disease of the kidney, and one from cerebral apoplexy. The last-named surgeon said of his operation, with justifiable complacency, “that whatever might be the fatigue (ether then not being known) which some of his patients had experienced, he had never found that it was regretted;” and also speaking later, almost prophetically, “that the reduction in powder of vesical calculi being capable of being done in a short time, lithotripsy will find in ether and chloroform,|| and especially in chloroform,

* January, 1878.

† Bigelow.....	21	Harrison.....	1
Van Buren and Keyes.....	19	J. C. Warren.....	1
Thompson.....	13	Coulson.....	1
Curtis.....	3		—
Cadge.....	5		65
Teevan.....	1	Included in this article.....	12
			77

‡ Amussat in one case introduced an instrument, size 31 lièvre, *Gaz. des Hôp.*, 1856.

§ Lithotripsie sans fragments au moyen des deux procédés de l'extraction immédiate ou de la pulvérisation immédiate des pierres vésicales, etc., 1848. This pamphlet has, I notice, also been quoted by Gouley in the *Medical Record*, Oct. 16, 1879.

|| *Gaz. Med. de Paris*, 1848, p. 473.

an aid so that but few cases will be beyond the reach of this operation :” and further, still quoting him, “that those who had been completely freed at once (from stone) have sometimes presented slight rigors or irritation, and even had the bladder attacked with catarrhal inflammation, but this lasted but a short time, for *it was not kept up by fragments, since the latter had been entirely removed.*” This is the same reason that Bigelow gives in 1878.

It must be admitted, however, that Heurteloup, who did not use any evacuating tube, preferring to withdraw the detritus in the jaws of the lithotrite, subsequently* stated that “his aim was to construct and use the most powerful instrument in order to crush the stone, and not simply to complete lithotripsy in one sitting.” And his followers soon found that by the frequent withdrawal of instruments charged with detritus, complications ensued that caused the method of immediate extraction of a calculus by lithotripsy to fall into disuse; and, though endeavors have from time to time been made to use evacuators, some of which are very similar to Bigelow’s, as for instance Mercier’s,† and one of which, Clover’s, is generally known to the profession, yet happily Bigelow went further than Heurteloup, and, by the use of large-sized lithotrites and large-sized evacuators, legitimately deduced from the valuable republication by Otis of the natural calibre of the urethra, afforded surgeons of the present day not only the means, on the one hand, of attacking stones that have heretofore been considered unsuitable for lithotripsy (viz., those beyond 1 inch in diameter), but also, on the other hand, of rapidly aspirating the fragments of a stone not of necessity in a pulverized condition. This latter, *i. e.*, the efficient means of evacuation of the fragments, is incontestably and essentially the novel point in Bigelow’s operation.

Of the following cases, twelve in number, three occurred under my own care, and the others under that of the surgeons whose names are appended thereunto.

CASE I.—L. C., aged 73; operation Dec. 20, 1878. Instrument used Bigelow’s lithotrite, size 33 Fr.; greatest seizure 1 inch; lithotrite in bladder 19 minutes; straight evacuating tube, No. 31, for 12 minutes. Total time occupied in the operation 42 minutes. Detritus weighed 365 grs., and the composition of the calculus was uric acid. The day following the operation the temperature was 100°, and the frequency of urination had diminished one-half its previous rate. On the 8th day the patient was up and about, when he was seized with a chill and symptoms of renal colic affecting the left loin. The chill recurred a number of times during the week following, with great prostration, and the patient sank with symptoms pointing to abscess of kidney, Jan. 18, 1879, four weeks after the operation. The autopsy revealed the bladder perfectly sound and free from calculus. The left ureter, at about three inches from the pelvis of the kidney, was choked up by several small uric acid calculi. The kidney itself was broken down with several abscesses, one of which communicated with the perinephritic tissue.

CASE II.—Dr. D. E., aged 65; hypertrophied prostate; operation March

* Gaz. des Hôp., 1856, p. 396.

† Traitement des Sédiments, etc., 1872, p. 373 Perfectionnements à la lithotritie, p. 13.

8, 1879; Bigelow's lithotrite, size 33 Fr., used; straight evacuating tube 30 Fr.; greatest seizure $\frac{1}{2}$ inch. Time occupied 40 minutes, most of which was taken up with the aspiration, not only to get rid of the last fragment, but also to determine by the absence of any clicking noise that nothing was left in the bladder. Detritus weighed 3iiss, and was composed of the fusible phosphates. Very slight reaction. Recovery ensued, though obstinate cystitis remained, which resulted in

CASE III.—In the same patient; operation repeated June 21, 1879, with Bigelow's lithotrite; time occupied 35 minutes. As before, much time was spent in using the aspirator as a means of assuring one's self that nothing remained behind. Reaction was sharp, and the patient showed unpleasant symptoms of threatened kidney complication, such as heaviness, copious turbid urine, and fever. These subsided at end of fourth day, and the case then progressed favorably.

CASE IV.—Dr. George A. Peters; operation, May 25, 1878. J. P., aged 64; Keyes's lithotrite used; greatest seizure $\frac{1}{2}$ inch; lithotrite in bladder 50 minutes first time, introduced in all 3 times, occupying 76 minutes. Aspirator tube in bladder 19 minutes. Total time of operation 1 hour 45 minutes. Weight of stone 253 grs. Composition uric acid. Sharp vesical irritation followed for three days with but slight constitutional disturbance. Complete recovery.

CASE V.—Dr. C. M. Allen; operation, Nov. 7, 1878. Jno. P., aged 51; Keyes's lithotrite used; time of operation 66 minutes. Lithotrite introduced 4 times, and remained in bladder 39 minutes. Straight evacuating tube, size 30 Fr., employed for 22 minutes. The stone weighed 398 grs., and its composition was of the mixed phosphates. The nucleus, which was a small piece of wax, was withdrawn imbedded in the eye of the evacuating tube. The patient made a rapid recovery, and was out of the house in seven days.

CASE VI.—Dr. H. B. Sands; operation, Oct. 28, 1878; male, aged 69. A fenestrated lithotrite was used. The operation lasted seventy minutes. The aspirator was used twice; a curved evacuating tube, No. 28, was employed, a straight one having failed to enter. The greatest grasp was $1\frac{1}{4}$ inches. The weight of thercollected fragments, some of which were lost, was 90 grains. The stone consisted of uric acid. No reaction from the operation occurred, and the patient made a speedy recovery.

CASE VII.—Dr. H. B. Sands reports one case of rapid reformation of stone in an elderly gentleman, who had some time previously been lithotomized, and on May 20th, July 31st, Oct. 10th, and Nov. 1st, 1878, was relieved of calculi of phosphatic formation, by litholapaxy, the sittings being about half an hour each in duration, except the first, which lasted an hour. The quantity of stone removed was 360 grains in all. Collin's lithotrite was used. Since the last operation, the patient has acquired the use of the catheter, which had previously failed to be borne, and the reformation of calculus has thereby been prevented.

CASE VIII.—Dr. McBurney; operation, Aug. 15, 1878. Alfred P., aged 32. Keyes's lithotrite. Duration of operation, two hours and twenty-three minutes, in which time the lithotrite was employed six times, and the aspirator six times, with curved evacuating tube, No. 26 Fr. in size. The largest seizure was seven-eighths of an inch. The stone was phosphatic, and weighed 3iij. Temperature next day was 101.6° , which declined to normal in four days. Patient had a very satisfactory recovery.

CASE IX.—Dr. J. C. Hutchison; operation, May 22, 1879; patient aged 76. Bigelow's and Keyes's lithotrites used. The latter worked badly, pinching off pieces of mucous membrane three times. Bigelow's aspirating tubes. The operation lasted two hours. The stone was phosphatic, and the largest grasp was $1\frac{1}{2}$ inches. No reaction followed, and the result was satisfactory.

CASE X.—Dr. G. H. Fox; operation, Nov. 9, 1878. On a consumptive man, by means of Keyes's lithotrite and Bigelow's aspirator. Stone was $1\frac{1}{4}$ inches in diameter. The operation, after continuing seventy-five minutes, and 154

grains of fragments having been extracted through a No. 29 tube, in three applications of the aspirator, was stopped, as the patient's breathing became unsatisfactory under the ether used. He passed a quiet night; no chill; and as no urine had passed by the morning, a soft catheter was introduced, and $\frac{3}{4}$ of bloody urine withdrawn. The patient passed clotted blood with the urine during the day, and he suffered considerably from nausea and flatulence. Temp, $103\frac{1}{4}^{\circ}$ in the evening. Nov. 11, temp. $102\frac{1}{4}^{\circ}$; urinated without pain every half-hour: stomach still irritable. Nov. 12 and 13, was doing well; temp. 101° . Nov. 14, temp. $100\frac{3}{4}^{\circ}$, pulse 98. During day became drowsy, and passed less urine than usual, and with more effort. In the afternoon had a severe pain in left renal region, followed by jactitation and slight coma. These symptoms of uræmia became more marked, and the patient died Nov. 15, 7.30 A. M.

The *autopsy* showed distinct pelvic peritonitis advancing upwards and into the abdomen. The bladder, which was hypertrophied, contained several ounces of muddy and very bad smelling urine, and showed evidence of intense cystitis. The mucous membrane of the bas fond, over a space as large as a ten-cent piece, was dark-colored, and shreddy, and showed a loss of substance (extending through the mucous and muscular coats, but not further. Whether this was due to an ulceration or a laceration could not be determined; it was, however, thought to be the former, as the exposed fibres were coated with a decided layer of phosphates. In the median line, and just posterior to the orifices of the ureters, was found a fragment of a calculus about half the size of a bougie à boule, No. 30. It was imbedded in a mass of apparently necrotic mucous membrane. The kidneys were very soft and flabby, probably from decomposition, as the post-mortem changes generally had rapidly progressed. Microscopically, however, there were recognized shrunken glomeruli, with thickened Bowman's capsules.

CASE XI.—Dr. G. H. Wynkoop; operation, Aug. 20, 1879; Jno. M. G., aged 55. Bigelow's lithotrite (33 Fr.) used. Duration of operation eighty minutes. Lithotrite used three times, and aspirator three times. Largest seizure was half an inch, and the amount extracted about $\frac{3}{16}$ (estimated, as some was accidentally lost). The composition of the calculus was phosphatic. Reaction after the operation was good; the urine passed freely. The day after the operation the patient presented evidences of peritonitis, and died in collapse, with slight convulsive action, at 9 o'clock that evening, some twenty-nine hours after the operation. Autopsy revealed the bladder free from calculous matter, save that in one of two small hernial pouches formed on the left side was found a small stone the size of a pea. On the posterior wall, and to the left side, was seen a linear laceration about three-quarters of an inch in length, and involving the mucous membrane only. A little nearer the median line was an abrasion the size of a two-cent piece. On the floor were seen several minute lacerations, and spots of ecchymoses. The walls of the bladder, subperitoneal tissue, and the peritoneum, over the sites of the lacerations of the mucous membrane, showed evidences of inflammation; and in the peritoneal cavity were $\frac{3}{4}$ sero-sanguineous fluid. The kidneys were both larger than natural, deeply congested, and so friable as to tear readily in the fingers.

CASE XII.—Dr. G. H. Wynkoop; operation, Oct. 17, 1879; William W., æt. 34. Bigelow's lithotrite, Weiss's manufacture, used, size 33 Fr. The stone was a large one, the greatest grasp being $1\frac{1}{4}$ inches, and the time occupied in the operation was three and one-quarter hours. It was then deemed advisable to postpone further attempts to rid the patient of the remaining calculous material, both on account of his bearing the ether badly, shown by lividity and irregular breathing, and also by the difficulty met with in entering the bladder, by reason of a false passage formed by the end of the tube catching in an abrasion, which had resulted, in its turn, from the instrument becoming impacted. This impaction, however, on examination after withdrawal from the bladder, was ascertained to be due to a fault of construction in the screw, which was of a too soft steel, for on turning back the catch or lock the jaws readily separated or went "home,"

as was desired. The weight of the fragments extracted was 486 grains. Both Thompson's and Bigelow's aspirators were used, also straight and curved evacuators, sizes 26 to 30. The patient was in good condition the next day, and had at no time any unpleasant bladder symptoms. Polyuria to the amount of eighty ounces per diem was noticed for nearly three weeks after the operation. A fragment lodged in the urethra three inches from the meatus Oct. 31, and was, after trial of usual methods, removed by external incision. After that date an abscess appeared in the region of the scrotum, which, when opened, gave exit first to pus, and subsequently to urine. On Nov. 11, on account of a fresh impaction in urethra, well back, and of the continuance of the false passage, and of the abscess in perineo, the remainder of the calculus (65 grains, in one large (22 grains) and several small fragments) was removed by median lithotomy. The incision opened into the track of an abscess running up into the ischio-rectal tissues. The patient has since done well.

In nearly all the cases, not my own, I acted either as an assistant to the surgeon in charge, or was a witness to the operation. The following summary of experience is the result, offered, however, with some hesitation, as a larger observation may change the views set forth.

The remarks to be made apply first to the instruments, and second to the operation itself.

The Instruments.—The lithotrite of Bigelow I must speak of in all praise, both for its ease of working, on account of its ball-handle and mode of bringing the screw-power to bear, as well as for its general freedom from risk of pinching the mucous membrane, and from its facility of introduction. I have, however, learned that Dr. Bigelow believes that it can be and needs to be improved, in this latter respect. In its introduction care is to be observed that, after entering the hole in the triangular ligament, the outer end of the instrument should not be too rapidly depressed between the patient's thighs. A steady but gentle pressure downwards of the lithotrite, while at an angle of 45° with the horizon, relieves the roof of the prostatic urethra from the rubbing of the toe of the shoe, or jaws of the instrument. A tendency to impaction was noticed in two instances, but when the lithotrite was withdrawn it was ascertained to be due to the slot in the shoe or female blade not being in correspondence with the termination of the groove between the two shanks of the instrument. This defect has been remedied by enlarging the posterior part of the opening in the shoe. The size of those made by Weiss, after a pattern of Bigelow's, is to my mind too large, save for exceptional cases. They measure 33 of the French scale, a size which in one case could not be passed through a normal urethra, and in another, by reason of the very slightest amount of impaction between the jaws, required considerable force to draw it through the spongy urethra. Of course, the lithotrite can be made of various sizes, as Bigelow plainly directs, and it is true that large instruments are better for crushing the largest stones. Certainly I should desire to use, in a calculus more than one inch in diameter, the largest instrument of Bigelow's pattern I could safely pass through the urethra; but I consider it always advisable that the lithotrite should be at least two or three sizes smaller than the urethra, say, for

average working, one measuring 30 or 31 Fr. There is, also, a difficulty in inverting Bigelow's instrument behind an enlarged prostate, to seize a fragment there; but when a fragment is so small as not to be caught by the horizontal sweep of the jaws, it will either escape through the aspirator-tube, or be dislodged by it from its position.

Evacuating Tubes, varying in size from 26 to 31 of the French scale, were used in the cases narrated, and it was found to be a common experience that the straight tube could be more easily introduced than the curved ones, and when in the bladder less frequently became occluded by the sucking in of the mucous membrane.

In the use of Bigelow's aspirator, at times, much annoyance, and occasionally deception, was produced by the churning up of the air that leaked into the rubber bag and through the fittings. In this respect the aspirator of Thompson* proved itself superior, because the stopcock at its upper end allowed the evacuation of the air at will, and also permitted the ready introduction of a fresh supply of water to replace that which escaped in various ways, from time to time, during the operation. These improvements have, it is understood, been applied by Dr. Bigelow to the newest pattern of his aspirator, and with a stopcock on the catheter, and one adjacent to it on the aspirator, the wetting of the bed so commonly noticed is now done away with. In the use of Thompson's aspirator, it was learned that it was desirable to interpose a piece of rubber tubing between the evacuating tube and its metallic connection with the rubber bag, in order to obviate the unavoidable mobility imparted to the bladder end of the tube whenever the bulb was compressed. Nor was the observation of Keyes, that Thompson's aspirator had an advantage in taking up less room between the thighs of the patient, confirmed, as in the customary position of lithotripsy, ample space is provided for either aspirator.

The *operation* itself has been modified somewhat since it was first announced to the public, and principally in shortening the time of the employment of the lithotrite. After a satisfactory crushing of ten to fifteen minutes, it is now deemed wiser to use the aspirator, and thus remove the fragments, that would otherwise lodge between the jaws of the instrument, to be unnecessarily pulverized, and to interfere with the comminution of large pieces. And as soon as fragments cease to appear in the glass receiver, the crushing is then resumed, and so on. But in two ways departure from the directions of Bigelow have been made: first, in not following strictly his rule of injecting warm water into the previously emptied bladder "until the water is expelled through the loosely held urethra, by the side of the tube." Clinically, it was ascertained that at times this test either failed to work, or the water only escaped per urethram after some fourteen or sixteen ounces

* Since the above was penned, Thompson has modified his aspirator (*London Medical Record*, Nov. 15, 1879), mainly in having the glass receiver spherical. Bigelow has also made a similar change, and uses this receiver as a ball-and-socket joint, and thus much simplifies the stand of the apparatus.

had been slowly injected. A serious distension is hence possible to a bladder accustomed for months previously to contain at the most only two or three ounces of urine. Five or six ounces of water are now thrown in, and the lithotrite resorted to, and, if any impediment is noticed from contact with vesical rugæ, an additional amount of fluid is then injected. The second deviation from the directions given is, in reality, based upon the old preference which is given to the French method of seizing or searching for a calculus over that of the English or Brodie's method. Bigelow states that "it can hardly be doubted that in practice, dexterous operators secure more stones and fragments as they gravitate into the female blade while it depresses the floor of the bladder, perhaps a little to one side or the other, where the stone is felt." While this may be true of some surgeons, yet a rigid adherence to this suggestion, on the part of an operator anxious to exactly carry out the details given, led, in Case XI., to the many minute lacerations of the floor of the bladder from the shoe of the lithotrite crowding downwards the sharp-edged fragments; producing thus the very accident which is justly stated by Bigelow* as likely to occur in the employment of Keyes's† instrument.

Litholapaxy seems, in contrast to lithotomy, such an easy operation, simply to introduce a large instrument, crush the stone, and suck the pieces out, that there is a risk of every one trying it, but in reality this operation needs more skill than is required in lithotripsy, and it follows as a sequence that the adherence to the rules that have hitherto successfully conducted lithotripsy to its high place in surgery, should be maintained as far as possible in litholapaxy; for, although the bladder tolerates much handling, so long as all offending substances are finally removed, yet it must be constantly borne in mind that the dangers of mechanical violence to this viscus in litholapaxy, with an instrument no matter how perfect, is some ten or fifteen times greater than in an ordinary lithotripsy; in other words, it is the difference between the damage possible in a five minutes' sitting and one of an hour's duration. Hence it is safer not to ignore or cast aside all the precautions suggested by a large experience in the past, and to perform this more recent operation with the sole idea that all injuries of the bladder will be innocuous so long as the stone is removed. It must also be continually remembered how slight a lesion of the bladder or urethra may seriously influence a kidney whose condition cannot previously be determined. Litholapaxy strikes a spectator who witnesses it for the first time

* In opposition to Keyes's lithotrite he says, in the *Medical Record*, June 8, 1878: "1. Sharp fragments while firmly engaged in the opening or driven through it are likely to injure the floor of the bladder. During a long operation, such as I propose, it is hardly possible to prevent the frequent contact of the floor of the bladder with the extremity of the instrument, in which case the latter does not present a rounded and polished surface, but irritates it with protruding splinters of calculus continually coming in contact with the same limited region of the floor."

† Keyes's lithotrite purports to be a modification of Reliquet's, but it is really after the pattern of one of Weiss's early instruments. Weiss was the first to penetrate completely (according to Mercier) the female blade, and did it in such a manner that the male blade could even pass beyond the other so that they should not become packed. Information relative to Mercier's lithotrite is moreover desirable, as its claims for non-impaction and avoidance of pinching the mucous membrane are indorsed by Reliquet, p. 502.

as a rude operation; most of this is only the association of ideas connected with the use of large instruments and the blood from an incised meatus; but there is some ground for this idea when the blood-tinged water, even clots, are seen in the aspirator, when repeated *thuds*, indicative of the occlusion of the tube opening, are met with, and when evacuating tubes halt in their onward progress to the bladder from just created false passages or from want of due anatomical consideration. It is, therefore, not too much to say of this operation, that it demands all the care and gentleness that years have taught should be exercised in all operations on the urinary organs, and that the injunction should be loudly raised, that none but those who have had experience in lithotrity, or those who have familiarized themselves on the cadaver beforehand with all the required instrumental manipulations, should undertake the operation of litholapaxy. This note of warning has already been raised. Bigelow says that it should not be done by a novice; and Cadge, of the Norfolk and Norwich Hospital, writes: * "I think the new plan (of operating) should not be attempted by any one who has not already acquired by plentiful experience on the living, and by repeated experiments on the dead body, all the little knacks and tricks which go to make up successful lithotrity." Gouley† has more recently put forth a similar caution.

Notwithstanding all the existing possibilities of kidney complications in a stone case, it is exceedingly satisfactory to see that in the seventy-seven collected cases, there were recorded but four deaths, only one of which could be said to be due to a nephritic cause, the others being produced by injuries done to the bladder from the operation itself, and which are such as experience will lead to the avoidance of. The mortality of these cases is only 5.2 per cent., or 1 death in 19 cases, a lower rate than that given to lithotrity, which is 1 death in 13 cases (Thompson). This result, considering the novelty of the operation and the fact that a number of lithotomy cases, or those which would have been so, is included in the list, is extraordinary; but properly to pass judgment on any new operation requires larger figures than these.‡ Several years will probably elapse before the profession can rightly estimate the merits of litholapaxy. Furthermore, it is improper at any time to compare litholapaxy with lithotrity, for it is an operation which not only embraces the latter, but invades to a large extent the domains of lithotomy. How far this invasion may progress time must tell, but the limits of a crushing operation have apparently been justifiably advanced from the diameter of 1 inch, allotted to the older operation of lithotrity, to 2½ inches, as has been done successfully by Bigelow.

NEW YORK, Nov. 18, 1879.

* Lancet, April 5, 1879.

† Medical Record, Oct. 18, 1879.

‡ Dr. Keyes has just informed me of a death occurring in his practice after litholapaxy, wherein the result was due to an abscess in each kidney. The case was a bad one, the preceding cystitis very severe, and pyelitis and contracted kidney were recognized prior to the operation. Six drachms of calculous matter were removed. At the autopsy the bladder was found perfectly smooth, uninflamed, and empty of stone.