

Litholapaxy in male children and male adults / by D.F. Keegan.

Contributors

Keegan, Denis Francis.
Royal College of Surgeons of England

Publication/Creation

London : J. & A. Churchill, 1887.

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LITHOLAPAXY

IN

MALE CHILDREN AND MALE ADULTS.

DURING the past two years I have published four papers,* giving details of a considerable number of litholapaxies performed on male children and male adults at the Indore Charitable Hospital, Central India. At a time when the treatment of stone in men, women, and children is attracting so much attention in Europe, by reason of the revival of the "high" operation, perhaps it may not be amiss if one who has enjoyed considerable opportunities of treating stone in India were to place before his professional brethren in England his experiences of litholapaxy in male children and male adults. I advocate litholapaxy in preference to lateral lithotomy in the treatment of the great majority of stones we meet with in male children, principally for two reasons—viz., rapidity of cure and absence of a cutting operation. Litholapaxy as applied to the treatment of stone in male children, being a new departure in surgery, must undoubtedly be submitted to the accumulated experience of practical surgeons in all parts of the world before a positive conclusion can be arrived at as to its

* *Indian Medical Gazette*, May 1884, June and September 1885, and June 1886.

practicability and value. I therefore beg to submit to the judgment of surgeons in Great Britain the record of a considerable number of litholapaxies performed on male children in India. Having discussed this operation in its application to the treatment of stone in boys, I shall subsequently deal with some points of interest connected with its performance in the adult male. Believing, as I do, that Bigelow's operation will, in the near future, supersede to a very large extent lateral lithotomy in the treatment of stone in male children, I am all the more anxious on that account that my predecessor at Indore, now retired, Deputy Surgeon-General T. Beaumont, should obtain the credit of having originated the idea of the feasibility of practising litholapaxy in boys. I, however, was the first to put his ideas on this subject into practice. He had performed six lithotrities successfully on male children at Indore prior to my succeeding him, and had ordered to be sent from London lithotrites and evacuating catheters suited to the performance of litholapaxy in boys a few months before he left Indore for Hyderabad in the Deccan. He was not the first to perform litholapaxy in boys, simply because he had not an opportunity of doing so at Hyderabad; but had he remained on at Indore he would undoubtedly have put his ideas into practice at the first favourable opportunity. Soon after my joining my present appointment at Indore the lithotrites and evacuating catheters suited to the performance of litholapaxy in boys arrived from London, but I must confess that for some time I hesitated to use them. Like many surgeons practising in India, lateral lithotomy in male children had hitherto proved a very successful operation in my hands, and therefore I was naturally somewhat loth to change it for any other method of removing a stone from a boy's bladder. However, in December, 1881, I performed

litholapaxy successfully on a boy aged five years. In the succeeding year I operated on two boys by this method. During the years 1883 and 1884 ten and twelve boys respectively were subjected to litholapaxy at the Indore Hospital. During the year 1885 we performed twenty-seven litholapaxies on boys; and between January and the end of March, 1886, when I left India on furlough, six boys were operated on by Bigelow's method at this hospital. We have therefore performed fifty-eight litholapaxies on boys at Indore since I began this operation on male children at the close of 1881, and we have lost one case. Cases 12 and 13 in the table appended were performed by my assistant Mr. Gunput Singh. Surgeon-Major Caldecott, during my absence from Indore, performed nine operations of this series, beginning at No. 41 and ending at Case 49. Case 11, the only unsuccessful one, was operated on in the first instance by my assistant, and on two subsequent occasions by me. All the other cases in this table were performed by me alone.

That litholapaxy is capable of dealing successfully with stones of considerable size occurring in male children is, I think, proved by the facts detailed in the accompanying table; and from what I have already stated it will be seen that I practised litholapaxy in male children very tentatively at first, and as time went on, and I had gained more experience, I gradually increased the scope of this operation.

Now, what are the conclusions at which I have arrived after nearly four and a half years' experience of litholapaxy in the treatment of stone in male children? I may at once answer this question by stating that, with my present experience of this operation in boys, I would almost as soon think of performing lateral lithotomy on an old man the subject of a small, uncomplicated stone as I should think of

TABLE

Showing particulars of Fifty-eight Lithotomies performed on Boys at the Indore Hospital from December, 1881, to March, 1886.

Cases.	Age.	Caste.	Date of operation.	Time occupied by operation, in minutes.	Time occupied by crushing, in minutes.	Time occupied by evacuation, in minutes.	Time occupied by manipulation, in minutes.	No. of lithotrite used.	No. of catheter used.	Number of times lithotrite was introduced.	Number of sittings.	Composition of stone.	Duration of disease, in months.	Weight of stone, in grains.	Number of days in hospital.	Result.
1	5	H.	15-12-81	No record	No record	No record	No record	10	9	No record	1	No record	5	No record	25	Succ.
2	8	H.	21-4-82	Do.	Do.	Do.	Do.	10	9	Do.	1	No record	15	Do.	14	Do.
3	7	M.	11-10-82	Do.	Do.	Do.	Do.	10	9	Do.	1	No record	No record	30	9	Do.
4	8	H.	7-2-83	45	Do.	Do.	Do.	10	9	Do.	1	Phosphatic	Do.	15	2	Do.
5	2½	H.	16-3-83	No record	Do.	Do.	Do.	7	9	1	1	No record	Do.	10	3	Do.
6	5	M.	28-6-83	35	Do.	Do.	Do.	10	9	No record	1	Uric acid	Do.	17	12	Do.
7	4	H.	26-9-83	30	Do.	Do.	Do.	10	9	Do.	1	Uric acid	Do.	55	3	Do.
8	7	H.	27-9-83	No record	Do.	Do.	Do.	10	9	Do.	1	Uric acid	Do.	5	3	Do.
9	8	H.	9-10-83	20	Do.	Do.	Do.	10	9	Do.	1	Uric acid	Do.	16	10	Do.
10	5	H.	9-10-83	70	Do.	Do.	Do.	10	9	Do.	1	Uric acid	Do.	84	9	Do.
11	4	H.	15-12-83	No record	Do.	Do.	Do.	7 & 10	9	Do.	3	Uric acid	10	35	16	Died.
12	10	H.	17-12-83	Do.	Do.	Do.	Do.	10	9	Do.	1	Phosphates growing round till stalk	No record	200	9	Succ.
13	5	H.	29-12-83	60	Do.	Do.	Do.	10	9	Do.	1	Phosphates	6	168	11	Do.
14	3	H.	26-1-84	38	Do.	Do.	Do.	10	9	Do.	1	Uric acid	12	104	7	Do.
15	5	H.	16-2-84	30	Do.	Do.	Do.	10	9	Do.	1	Urate of ammonia and uric acid	6	51	12	Do.
16	12	H.	3-3-84	55	Do.	Do.	Do.	10	9	Do.	1	Earthy and triple phosphates	24	240	11	Do.
17	2	H.	10-3-84	4	Do.	Do.	Do.	7	9	Do.	1	Uric acid	4 days	7	2	Do.
18	1½	H.	27-3-84	32	Do.	Do.	Do.	7	7	Do.	1	Uric acid	4	18	4	Do.
19	7	M.	12-5-84	60	Do.	Do.	Do.	10	9 & 12	5	1	Phosphates	24	160	15	Do.
20	3½	H.	26-5-84	67	Do.	Do.	Do.	7 & 10	9	5	1	Phosphatic	12	75	8	Do.
21	2¼	H.	29-5-84	70	Do.	Do.	Do.	7	7	5	1	Uric acid	24	24	3	Do.
22	6	M.	3-7-84	60	30	27	3	10	9 & 11	6	1	Uric acid and oxalate of lime covering	48	210	8	Do.
23	4	H.	22-8-84	56	No record	No record	No record	8	7 & 9	4	1	Uric acid	10	38	13	Do.
24	11	M.	20-11-84	112	41	41	26	8	12	7	1	Oxalate of lime	12	308	14	Do.
25	2	M.	10-12-84	20	10	4	6	7	7	3	1	Lithic acid	12 days	5	10	Do.
26	8	H.	30-1-85	104	30	30	10	8	9	9	1	Phosphatic	60	285	5	Do.
27	10	H.	30-1-85	85	54	20	11	8	9	7	1	Phosphates and uric acid	24	170	6	Do.

28	9	H.	19-3-85	78	33	20	25	8	7 & 9	6	1	Uric acid	12	90	5	Do.
29	10	H.	27-3-85	10	5	3	2	8	9	1	1	Oxalate of lime	24	43	2	Do.
30	5	H.	5-4-85	68	26	21	11	8	9	6	1	Phosphate of lime	6	140	4	Do.
31	7	H.	11-4-85	31	11	9	11	8	9	3	1	Mulberry with slight covering of phosphates	48	57	4	Do.
32	11	H.	13-4-85	67	29	14	24	8 & 10	12	6	1	Pure mulberry	48	236	9	Do.
33	10	H.	28-4-85	90	41	30	19	8	9	6	1	Oxalate of lime	24	200	5	Do.
34	7	H.	30-4-85	43	16	14	13	8	9	4	1	Oxalate of lime	36	140	3	Do.
35	10	H.	2-5-85	80	31	25	24	7 & 8	7 & 9	8	1	Phosphatic and uric	4	91	11	Do.
36	4	H.	7-5-85	41	14	13	14	7 & 8	7	4	1	Mulberry with phosphatic covering	9	27	3	Do.
37	10	H.	27-5-85	94	47	35	12	8	9	6	1	Urates and phosphates	72	360	8	Do.
38	2½	H.	9-6-85	17	7	3	7	7	7	4	1	Uric acid	3	11	4	Do.
39	2½	M.	9-7-85	31	14	10	7	8	7	5	1	Uric acid	2½	32	3	Do.
40	8	H.	1-8-85	57	18	16	23	8	7 & 9	5	1	Oxalate of lime	No record	28	4	Do.
41	2	H.	16-8-85	21	7	6	8	7	7	2	1	Uric acid	3	8	5	Do.
42	5	H.	9-9-85	62	22	17	23	7	7	9	1	Uric acid and phosphates	6	41	4	Do.
43	3	H.	15-9-85	18	8	4	6	8	7	3	1	Phosphates with nucleus of oxalate of lime	5	12	3	Do.
44	9½	H.	19-9-85	182	94	37	51	11 & 15	13 & 14	26	1	Uric acid, nucleus oxalate of lime with phosphatic covering	24	700	10	Do.
45	8	H.	29-9-85	36	17	10	9	10	11	6	1	Uric acid and phosphates	12	176	8	Do.
46	12	H.	30-9-85	62	32	14	16	11 & 14	12 & 13	9	1	Oxalate of lime	12	344	4	Do.
47	8	H.	1-11-85	30	15	10	5	7 & 8	7 & 9	5	1	Phosphates	24	72	9	Do.
48	5	H.	4-11-85	24	10	6	8	7 & 8	7 & 9	4	1	Uric acid	12	32	10	Do.
49	13	H.	8-11-85	48	27	11	10	11	12	7	1	Uric acid and oxalate of lime	48	272	12	Do.
50	2½	M.	11-11-85	30	10	8	12	7	7	4	1	Uric acid with slight phosphatic covering	3	16	4	Do.
51	6	H.	17-11-85	12	5	2	5	8	8	2	1	Mulberry and uric acid with slight phosphates	6	23	3	Do.
52	4½	H.	16-12-85	45	24	10	11	8	8 & 10	4	1	Uric acid	10	118	5	Do.
53	3½	H.	6-2-86	37	10	5	22	8	8 & 9	4	1	Uric acid	12	70	8	Do.
54	14	H.	12-2-86	60	31	22	7	8 & 11	9 & 10	6	1	Fawn-coloured uric acid	24	248	11	Do.
55	3½	H.	23-2-86	10	5	2	3	8	7	2	1	Oxalate of lime	18	19	4	Do.
56	14	H.	27-2-86	10	3	1	6	8	9	1	1	Phosphates	4	19	2	Do.
57	6	H.	28-2-86	56	16	20	20	8	8 & 9	5	1	Uric acid and oxalate of lime nucleus	6	105	9	Do.
58	6½	H.	25-3-86	39	11	12	16	7	7	6	1	Uric acid and phosphates	8 days	14	5	Do.

performing lateral lithotomy on a boy whose urethra would readily admit the passage of suitable lithotrites and evacuating catheters, and whose stone was neither abnormally hard nor large. The only cases of stone in male children which I nowadays reserve for lateral lithotomy are those in which litholapaxy is contra-indicated by reason of the existence of a very narrow urethra or the presence of an unusually hard or large stone. I am well aware that in advocating litholapaxy in the treatment of stone in male children I am running counter to the cherished opinions and judgment of many eminent lithotomists, and I know that some high authorities consider my views on this subject heterodox and dangerous in practice. But facts and figures are on my side, and I can therefore, perhaps, afford to disregard the adverse opinions of those who have never practised this operation in boys. I am anxious to draw a very marked line of demarcation between lithotrity and litholapaxy as applied to the treatment of stone in male children. I hold that lithotrity is an uncertain, tedious, and often dangerous method of disposing of stones in boys, because the surgeon in performing it can never be perfectly sure that he has reduced the stone in the bladder into fragments sufficiently small to pass of themselves readily through the urethra along with the urine, and thus a second operation, with all its train of suffering and dangerous complications, is often a necessity. Indeed, I consider that the success and safety of litholapaxy as applied to children depend in a very great measure in not leaving, if possible, the smallest fragment of stone behind in the bladder. Lithotrity at many sittings, the lithotrity which preceded Bigelow's operation, is happily dead and buried, and is even less suited to the treatment of stone in male children than it is to the treatment of stone in adult males.

The chief objections which have been raised against the performance of lithotrity and litholapaxy in boys, are, as we all know, the undeveloped condition of the genito-urinary organs, the smallness of the bladder, the extreme sensitiveness and liability to laceration of the mucous membrane of the bladder and urethra, and the narrowness or small calibre of the urethra. Let us examine these objections. If by the undeveloped condition of the genito-urinary organs in boys is meant an undeveloped condition of the prostate, this is for the surgeon a decided advantage, as recently pointed out at the Medical Society of London by Mr. W. J. Walsham, when detailing the history of a very instructive case of litholapaxy performed on a boy aged ten. The smallness of the bladder in boys is, in my opinion, not a valid objection to the performance of litholapaxy. The bladder of a boy of even only three or four years of age is, as a rule, quite roomy enough to permit of the efficient working of a small lithotrite; and if a medium-sized aspirator be used in the removal of fragments of stone, or a full-sized aspirator be gently worked, no injury can be done to this organ by over-distension. The bladders of boys suffering from stone are as a rule healthy, and will stand more distension proportionately to their size or capacity than the bladders of old men. The next objection we come to is the extreme sensitiveness of the mucous membrane of the bladder and urethra. With regard to this objection, I would merely remark that, as litholapaxy is always performed on patients under the influence of an anæsthetic, this objection may be safely disregarded; and I would add, in passing, that it has yet to be proved that the urethra of a boy, say of six years of age, is more sensitive than the urethra of a youth approaching puberty. Indeed, I am inclined to think that the urethra

of the latter is the more sensitive of the two. We now come to the liability to laceration of the mucous membrane of the bladder and urethra in boys. Theoretically this may appear a very plausible objection; but in practice it may also be safely disregarded, if the surgeon employs suitable instruments, and is careful and skilful in their use. I have performed nearly fifty litholapaxies in boys, and, as far as I can judge, I have never damaged the mucous membrane of the urethra and bladder; and even if I have done so, no untoward consequences have supervened. We come at length to the last objection to the performance of litholapaxy in boys—viz., the narrowness or small calibre of the urethra. Now, if it were a fact that the size or calibre of the urethra in male children is generally very small, this would, of course, be an insuperable objection to the performance of litholapaxy in these young patients. *But it is not a fact* that the calibre of the urethra in boys of six or eight years of age is, as a rule, very small. On the contrary, the calibre of the urethra of boys of only three or four years of age is sometimes very large, as I shall show later on by citing examples of this fact from the pages of my case-book. True it is that the meatus of the urethra in male children is sometimes very small; but let the orifice be incised, and it will then be generally found that a lithotrite of considerable size will pass readily into the bladder. It may seem somewhat strange that a false estimate of the normal size of the urethra in male children should have existed until very recently; but it is really no more strange than that surgeons should have believed up to the date of the discovery of Otis that the calibre of the adult male urethra was much smaller than it really is. I think that the chief reason why an erroneous estimate of the normal size of the urethra in boys has hitherto prevailed is, that in

performing the old operation of lithotrity in male children the meatus of the urethra was seldom divided, and thus the true calibre of the normal urethra in boys was ignored or not noticed. I certainly was unaware of the normal calibre of the urethra in boys until I had practised litholapaxy amongst this class of patients, and, like other lithotomists, I had failed to recall to mind several occasions on which I had been able to pass staffs of large size into the bladders of young boys preparatory to performing lateral lithotomy. Now, what does the annexed table prove regarding the size or calibre of the urethra in boys? Speaking generally, for there can be no hard-and-fast rule laid down on this point, it shows that the urethra of a boy from three to six years of age will admit a No. 7 or a No. 8 lithotrite (English scale), and that the urethra of a boy of eight or ten years of age will admit a No. 10, a No. 11, and even sometimes a No. 14 lithotrite (English scale). With a No. 8 lithotrite and a No. 8 evacuating catheter it is, I find, quite feasible to crush and dispose of a mulberry calculus weighing between two and three hundred grains in an hour's time. Experience has taught me that there is as great a difference in the size or calibre of the urethra in male children of the same age as we find to be the case amongst adult males. Age cannot always be depended on as the measure of the capacity of the urethra in boys, as I know from experience; indeed, some children of only four years of age have more capacious urethræ than other children of ten. Cases 35 and 36 in the annexed table are examples of this fact. The No. 8 lithotrite did not pass with the same facility into the bladder of Case 35, whose age was 10, as it did into the bladder of Case 36, whose age was only four. In some children of four or five years of age it is unsafe to pass a No. 7 lithotrite, although an instrument of this size

will sometimes pass readily into the bladder of a boy of only two years of age. Perhaps I shall best illustrate the size or calibre of the urethra in male children by briefly relating the history of some of the cases in the annexed table.

CASE 17.—S——, a male child two years old, was brought by his mother to the Indore Hospital on March 10th, 1884, suffering from symptoms of stone. On being placed under chloroform, I passed a small steel sound and struck a stone in the prostatic portion of the urethra. Withdrawing the sound, I passed a long urethral forceps and seized the stone. I found, however, that the forceps with the stone between its blades could not be withdrawn through the membranous portion of the urethra. I therefore pushed the forceps with the stone between its blades into the bladder and then let go my hold on the stone. Withdrawing the urethral forceps, I then introduced a No. 7 lithotrite into the bladder, seized the stone and crushed it readily three or four times. To my surprise, a No. 9 evacuating catheter passed readily into the bladder. I then attached a Berkeley Hill's débris extractor to the evacuating catheter and removed the débris, which weighed seven grains and consisted of uric acid. The operation lasted four minutes, and the child left the hospital perfectly well on March 12th.

CASE 18.—F——, a male child one year and nine months old, was carried in his mother's arms to the Indore Hospital on March 24th, 1884, suffering from stone symptoms which had existed for four months. Being placed under chloroform, the stone was struck in the bladder, and I then tried to introduce a No. 9 evacuating catheter, intending to perform litholapaxy. The evacuating catheter, would, however, not pass, so the operation was postponed to the

27th. In the interim a clever and very intelligent native workman, who makes many surgical instruments for me from European patterns, made me a No. 7 evacuating catheter. On March 27th, the child being again placed under chloroform, the No. 7 evacuating catheter passed readily. I crushed the stone with a No. 7 lithotrite, which I introduced into the bladder on three occasions, and removed the débris by means of a Berkeley Hill's extractor attached to the No. 7 evacuating catheter. The operation lasted thirty-two minutes, and the stone, which weighed eighteen grains, was composed of lithic acid. There was not a particle of débris left behind in the bladder. On the 28th the child complained of much pain in passing urine, and the penis was somewhat swollen.—29th: Pain in voiding urine much less. Swelling of penis much diminished.—30th: Pain in micturition very slight; swelling of penis nearly subsided. The mother took the child home.

CASE 38.—K——, a boy aged two years and a half, was admitted into hospital on June 9th, 1885, suffering from stone symptoms, which had existed for three months. A No. 7 lithotrite and a No. 7 evacuating catheter passed readily into the bladder. It was not considered necessary to incise the meatus. The lithotrite was introduced into the bladder on four different occasions. On its last withdrawal from the bladder, the meatus of the urethra was torn slightly, as some of the débris had got clogged between the blades of the lithotrite, thus increasing the size of the lithotrite from a No. 7 to perhaps a No. 7.5. Weight of stone removed 11 grs., and consisting of uric acid. Time occupied in operation seventeen minutes.—10th: Urine clear; boy cries much when passing urine.—12th: Patient doing well; urine clear; much less pain in passing urine.

13th: Patient feels much better. The boy's father, living not far from Indore, took the child home. On July 26th the father brought the boy to the hospital to show him to me. The boy had grown plump, and had continued to pass urine without pain and with perfect freedom.

CASE 39.—M. A. K——, a boy aged two years and nine months, was admitted into hospital on July 8th, 1885, with stone symptoms, which had existed for three months. Urine clear and acid in reaction. There is great straining in passing urine, which comes away drop by drop. Evening temperature 100.6° . Next day a No. 8 lithotrite passed readily into the bladder. Lithotrite introduced five times. A No. 7 evacuating catheter employed to remove the débris. Stone weighed 32 grs., brick-dust colour, consisting principally of uric acid. Operation lasted thirty-one minutes.—10th: Urine quite clear; slight pain in micturating.—12th: No pain in passing urine, and the father took the boy home. On the 19th the father brought him to the hospital for inspection. The boy complained of no symptoms of stone, and passed urine quite freely and without pain.

CASE 53.—G——, a boy aged three years and three months, was admitted into hospital on February 6th, 1886. When sounded, a stone was detected. Chloroform having been administered, I tried to pass a No. 9 and then a No. 8 evacuating catheter, but found the meatus of the urethra too small to permit their passing. I then introduced without any difficulty a No. 7 evacuating catheter into the bladder, into which I injected some tepid water. A partially fenestrated No. 8 lithotrite was then passed with ease. When in the bladder, and before attempting to seize the stone, I opened the blades of the lithotrite very slightly by working the screw action. I did so to allow for clogging, and then withdrew the lithotrite, thus slightly

opened, with the greatest ease through the membranous portion of the urethra. When coming through the meatus of the urethra the lithotrite ruptured it (the meatus) and caused a little bleeding. I then screwed home the lithotrite and passed it again into the bladder, and immediately struck the calculus, but found great difficulty in seizing it. The stone seemed to me to be quite spherical, for it slipped from out the blades of the lithotrite on several occasions. I seldom recollect having experienced so much difficulty in seizing a stone as I did on this occasion. However, after some thirteen minutes' duration, I at last succeeded, and then crushed it readily. After the crushing, a No. 8 and then a No. 9 evacuating catheter passed with ease into this boy's bladder. Indeed, I feel quite certain that I could have passed a No. 10, or perhaps even a No. 12, evacuating catheter, if I had found it necessary or advisable to do so, *once the meatus of the urethra had been ruptured*. Owing to the great difficulty experienced in seizing the stone the operation lasted thirty-seven minutes, although the stone weighed only 70 grs.—Feb. 7th: No pain on pressure being made over the bladder or course of the urethra; pain in passing urine less than it was prior to the operation.—8th: Urine clear and pale; no pain over bladder or urethra; no fever; pain in passing urine less.—12th: Child placed under chloroform and bladder explored with Sir H. Thompson's sound. No particle of stone could be detected. No click heard on working the aspirator.—13th: Patient quite well; allowed to go home, distant about forty miles from Indore.

Remarks.—The history of this case well exemplifies the fact that, although the meatus of the urethra is sometimes very small in young boys, the size or calibre of the urethra itself may nevertheless be very large. Had I incised the meatus of the urethra before introducing the No. 8 partially

fenestrated lithotrite, I might have dispensed with the precaution of opening its blades in the bladder, because I should have at the outset learnt that the lithotrite was, so to speak, an easy fit for the urethra. I opened the blades of the lithotrite when in the bladder because, from the sensation conveyed to my hand on first passing the lithotrite, I thought that if the instrument were to become clogged by débris I might possibly experience some trouble and difficulty in withdrawing it through the membranous portion of the urethra. A lithotrite, when being passed through the urethra, if it happens to be gripped merely by the meatus, still conveys to the hand of the operator the impression that the lithotrite is a tight fit for the whole length of the urethra, when, as a matter of fact, the urethra itself would accommodate a lithotrite a size or two larger if the constriction existing at the meatus were removed in the first instance by means of an incision. And here I would like to make some observations on the kind of lithotrite which experience has taught me is best adapted to the performance of litholapaxy in male children. *Unquestionably the best, and indeed the only perfectly safe, form of lithotrite to use in performing litholapaxy in young boys is the completely fenestrated pattern of lithotrite.* A partially fenestrated lithotrite is liable to get clogged with débris, and may sometimes retain within its blades a thin sharp projecting fragment of stone, which may lacerate the urethra on the withdrawal of the lithotrite from the bladder. Clogging of the blades of a lithotrite with débris is a very dangerous complication in performing litholapaxy in male children, because it has the effect of increasing the size or number of the lithotrite, say, from a No. 7 to a No. 8 (English scale). And as in performing litholapaxy in male children we are dealing with urethræ in which there is, so to speak, not much spare

room left to work in, the effect of increasing the size or number of the lithotrite may be such that in its withdrawal from the bladder the urethra may get unduly stretched or ruptured. Now, it is impossible that clogging can occur, or that thin, sharp fragments of stone can project, between the blades of a completely fenestrated lithotrite. Objecting to the employment of a partially fenestrated lithotrite in performing litholapaxy in male children for the reasons already stated, I can only characterise the use of a flat-bladed unfenestrated instrument in operating on this class of patients as *unwarrantable and absolutely dangerous*. Since the operation in the case just detailed I have received from Messrs. Weiss and Son, of London, a completely fenestrated lithotrite, which is No. 6 in the stem and No. 8 in the angle (English scale), and with this instrument I performed litholapaxy on three young male children shortly before leaving India. Since my arrival in England the same firm have constructed for me a still smaller instrument, which is No. 6 in the stem and No. 6 in the angle (English scale). This instrument will pass readily through the urethræ of the great majority of boys of between two and three years of age, and is perfectly capable of disposing of stones weighing up to two drachms. I exhibited these two patterns of lithotrite at the recent meeting of the British Medical Association held at Brighton, and they are miniatures of the lithotrite shown as Fig. 2 on page 10 of Freyer's work on Litholapaxy, recently published.

Having now related perhaps sufficient examples of cases in which I performed litholapaxy for the removal of small stones in very young boys, I shall proceed to detail a few cases in which I removed by this operation stones of considerable size from older boys.

CASE 37.—V——, a boy, aged ten, was admitted into

the Indore Hospital on May 26th, 1885, suffering from stone symptoms, which had existed for six years. His spleen was greatly enlarged. Urine neutral and clear. Next day, being placed under chloroform, a No. 8 lithotrite was passed into his bladder, when a large stone was easily seized and crushed. A No. 9 evacuating catheter was then introduced with ease. The lithotrite was passed six different times, and the operation lasted as long as ninety-four minutes. The stone was composed of uric acid and phosphates, weighed 360 grains, and was completely removed at one sitting.—May 28th: Pain along course of urethra and over bladder region; pain also on micturition. At the root of the penis there is a slight swelling.—May 29th: Swelling less, also pain on micturition; urine quite clear.—31st: Swelling at root of penis diminishing; some pain along the course of the urethra when pressure is made; eats well.—June 4th: All swelling disappeared; micturates freely and without pain; complains of pain over region of spleen. Discharged as cured of stone, and readmitted for the treatment of splenic enlargement. Left hospital for his home on June 9th.

CASE 44.—R——, a boy aged nine years and a half, was admitted into hospital on Aug. 18th, 1885, with stone in the bladder. Urine alkaline and turbid; specific gravity 1014; a trace of albumen. Next day, being placed under chloroform, the meatus of the urethra was incised, when evacuating catheters Nos. 9, 11, 13, and 14 were passed with ease. Lithotrites Nos. 8, 10, 11, 14, and 15 were then passed, but the stone proved too large for all these, with the exception of the last. The stone was eventually seized and crushed. The operation lasted as long as three hours and two minutes, and the urine in the aspirator was clear to the end.—20th: There is great pain over the urethra and

over the bladder region when deep pressure is made; considerable pain in passing urine; colour of urine reddish-brown.—21st: General condition unchanged; urine light brown.—22nd: Pain over bladder region and urethra much less; has fever.—23rd: Fever less.—24th: Penis is swollen.—26th: Much better; pain over bladder and in passing urine much less; swelling of penis much diminished.—28th: Feels quite well now; walks about the hospital verandah.—Sept. 1st: Gone home quite well.

Remarks.—The stone in this case weighed 700 grains, and consisted chiefly of uric acid, with a nucleus of oxalate of lime and a thin covering of phosphates. Surgeon-Major Caldecott removed this stone during my absence from Indore on leave. It is the largest that we have as yet removed from a boy's bladder at the Indore Charitable Hospital. Had this boy been cut, he would, in all probability, have remained in hospital for five or six weeks before being discharged; and had his urethra proved less capacious than it was, litholapaxy would have been impracticable. Had his lines been cast in London in the present day, he would most probably have been subjected to Petersen's modification of supra-pubic lithotomy.

CASE 46.—S——, a boy aged twelve, was admitted into hospital on Sept. 30th, 1885, with symptoms of stone, which had existed for one year. Specific gravity of urine 1026; alkaline in reaction; no albumen; deposits phosphates on standing. Being placed under chloroform, Nos. 11 and 14 lithotrites were passed with ease. An oxalate of lime calculus weighing 344 grains was removed in sixty-two minutes. Respiration of patient stopped suddenly during operation, but he revived under artificial respiration; colour of urine quite clear in aspirator throughout the operation.—Oct. 1st: No pain over urethra or bladder. Urine quite

clear and of amber colour; has no pain in passing urine.—2nd: Feels perfectly well; colour of urine normal; wishes to go home.—3rd: Quite well; allowed to go home.

Remarks.—Compare the history of this case after the operation of litholapaxy with what it would have been had the stone been extracted by lateral lithotomy. The boy was practically well the day after the operation.

In the table giving the details of fifty-eight litholapaxies performed at the Indore Hospital there is one fatal case, the history of which I have given at some length at pages 135 and 136 in the May number of the *Indian Medical Gazette* for 1884. Suffice it to say on the present occasion that had the previous history of this case been carefully noted on the boy's admission into hospital, lateral lithotomy, and not litholapaxy, would have been performed. The nucleus of the stone in this case was a long piece of "tilli" * stalk, which had penetrated the bladder through the rectum and had broken off inside the former. It was a case eminently suited to lateral or supra-pubic lithotomy. I have included this case in the table of litholapaxies, although it really does not fairly come under this category, for my assistant in the first instance attempted to treat this case by lithotrity, and on two subsequent occasions I endeavoured to remove the foreign body and its encrustation by the lithotrite and an evacuating catheter. The case altogether was a very unfortunate one, and exemplifies the great importance of carefully going into the previous history of every case before an operation is undertaken. I think, however, that any of my readers who will refer to the history of this case in the pages of the above-quoted

* *Didynamia angiospermid sesamum*. Schreb-gen, N. 1048. Is annual and in good soil grows generally to about three or four feet high. Oil from the seed is used extensively in all Indian bazaars.

medical journal will agree with me when I state that the fatal termination in this one solitary case should not be considered as militating against the performance of litholapaxy in male children.

There is yet another case in the table which, being of special interest, I shall detail at some length. Although in this case the operation of litholapaxy in itself was completely successful, I was subsequently afforded an opportunity of examining the bladder and urethra post-mortem, the immediate cause of death being due to anaemia and epistaxis.

CASE 54.—L——, a Hindu lad aged fourteen years, was admitted into hospital on Feb. 11th, 1886, with symptoms of stone which had existed for two years. He was greatly emaciated: sunken jaws and prominent teeth; spleen much enlarged; most anæmic. He had travelled a long distance to reach Indore; his sufferings were very great, and he begged to be operated on at once. Urine contained about one-third albumen. Next day, being placed under chloroform, a fawn-coloured uric acid calculus, weighing 248 grains, was evacuated from the bladder in sixty minutes. A No. 11 lithotrite was passed with the greatest ease into the bladder, and the operation presented no special features of interest or difficulty.—Feb. 13th: Morning temperature $104\cdot5^{\circ}$. No pain on pressure over bladder; some pain along the course of the urethra; pain in passing urine great; colour of urine reddish-brown. Evening temperature $104\cdot4^{\circ}$. Linseed-tea, milk, and diaphoretic mixture every third hour.—14th: Morning temperature $101\cdot6^{\circ}$; pulse 120. Had five thin motions during the night; colour of urine clear brown; some pain in passing urine. Port wine and lead and opium pills ordered. Evening temperature $99\cdot8^{\circ}$.—15th: Slept well; feels very languid;

no desire for food. Morning temperature 98.4° ; evening, 102° ; pulse 120.—16th: Has great pain over the splenic region and in the left loin, for which morphia was injected hypodermically.—17th: Morning temperature 100.8° ; pulse 120; no pain in abdomen; passes urine in a good stream.—18th: Had two thin motions during the night; slight epistaxis; quinine and sulphuric acid prescribed.—19th: No fever; pulse 108; feels slight pain in passing urine.—20th: Had four motions during the night; morning temperature 97° ; pulse 96; tongue clean; feels better; biniodide of mercury ointment rubbed over spleen.—23rd: Has no urinary symptoms whatever; discharged as cured of stone in the bladder, and readmitted for hypertrophy of spleen and debility. From this date up to March 2nd, the lad used to walk about the hospital grounds.—March 3rd: Has some pain in left loin.—4th: Has great pain in left loin over kidney. From this date up to March 13th he had much pain in both loins; latterly the pain was greater in the right loin, and presence of stone in the right kidney was suspected. Very weak and anæmic.—14th: Had bleeding from the nose during the night; tampon applied.—15th: Epistaxis stopped by tampon; pain in the right loin less.—16th: The tampon being removed, epistaxis recurred; tampon reapplied; blood which came from nose thin, pale, and watery; very weak.—17th: Patient died early this morning. The post-mortem appearances six hours after death were as follows: The bladder and urethra were found free from organic disease, though very anæmic; lining membrane of bladder and urethra perfectly smooth; urine drawn off after death perfectly clear. No particle of calculus found in bladder; spleen much enlarged, presenting the usual features of malarious hypertrophy. Left kidney flabby and pale; a small abscess found in its cortical

substance ; some grains of uric acid found in the pelvis. Right kidney : On making a section, a large uric acid calculus was found filling up the pelvis and infundibula ; indeed, the stone formed a perfect cast of the pelvis and infundibula, and several processes of the stone were embedded in the papillæ of the kidney. Weight of kidney calculus, 80 grains. Heart pale and somewhat flabby.

Remarks.—I think I am justified in returning this case amongst the number of successful litholapaxies performed at the Indore Hospital. I feel quite certain that if I had performed lateral lithotomy for the removal of the stone from this boy's bladder he would never have left his bed, and would most probably have died of exhaustion and diarrhoea a few weeks after the operation. The most ardent advocates of lateral or supra-pubic lithotomy would not, I think, assert that the final result in this case would have been different from what it was, had the stone been extracted by one or other of these methods. Although the presence of a stone in the right kidney was suspected during life, the boy's general condition contra-indicated all further operative interference. Extirpation of the right kidney could have done no good, as the left kidney was also much diseased. The history of this very interesting case strengthens the opinion I had already formed respecting the superiority of litholapaxy over lateral lithotomy in the treatment of stone in boys in suitable cases.

If space permitted, I might relate the history of several other interesting cases from the series of litholapaxies detailed in the table (*ante*, pp. 6-7). I have now, however, I consider, produced sufficient evidence to prove that the calibre of the urethra in male children is as a rule much larger than surgeons have hitherto believed to be the case. Amongst the many objections raised against the advisability

of performing litholapaxy in boys, there is really only one which is worth much consideration in actual practice, and that is the hitherto assumed smallness or narrowness of the urethra. The fact is that the whole question of the feasibility of performing litholapaxy with success in male children hinges on the size or calibre of the urethra in these young patients. Mr. W. J. Walsham was the first, as far as I know, to perform litholapaxy pure and simple, in England, on boys. In bringing forward for discussion at the meeting of the Clinical Society of London, held on April 9th last, the history of a case in which he had successfully performed litholapaxy on a boy aged ten, he stated that experiments instituted by him confirmed the truth of my experience of the size of the urethra in male children. This experience has been gained in the performance of forty-seven litholapaxies with my own hands in this class of patients, and I do not know how I could have gained it in a more practical way. In the table of litholapaxies (*ante*, pp. 6-7) there are several cases detailed in which I was able to pass a No. 7 lithotrite into the bladder of boys of only two years old, and there is one case of a boy aged one year and nine months into whose bladder a No. 7 lithotrite was passed. I have met with a case in which I have been able to pass a No. 7 catheter into the bladder of a boy of only eleven months old. This case was as follows. In August, 1855, a mother brought her male child, aged eleven months, to the Indore Hospital, labouring under symptoms of stone. The child was the subject of phimosis, which I considered the cause of these symptoms. Being placed under chloroform preparatory to performing the operation for the cure of phimosis, I considered it advisable to clear up any doubts existing in my mind as regards the cause of the stone symptoms, and passed a

No. 7 catheter with ease into the child's bladder. I then attached an aspirator, but could detect no click. The phimosis was cured, and the symptoms of stone soon passed away. But had I found a small stone in this case, I should certainly have crushed it with a No. 6 lithotrite and evacuated the débris through the No. 7 evacuating catheter. I should say that in many cases a No. 6 catheter will readily pass into the bladder of a child of one year old, and with a lithotrite and evacuating catheter of this size it is quite feasible to dispose of a fair-sized stone in half-an-hour. On the other hand, I have often met with cases of boys of two years of age suffering from stone into whose bladders it was impossible to pass a No. 6 catheter, and in such cases I have of course performed lateral lithotomy. In dealing with cases of stone in young boys, I do not as a rule decide the kind of operation I shall perform until the little patient is placed under chloroform. If I find that the urethra will admit a lithotrite sufficiently powerful to crush the stone to be attacked, I almost invariably perform litholapaxy; and if not I perform lateral lithotomy. I have, however, on one occasion begun the operation of litholapaxy, and after proceeding some way in this operation considered it wiser and safer to extract the stone by lateral lithotomy. But this was in the days when I was not well supplied with small fully fenestrated lithotrites. The case is an interesting one, and, briefly stated, is as follows. K——, a boy aged eight years and a half was admitted into the Indore Hospital on April 28th, 1884, suffering from symptoms of stone for three years and a half. The same day I passed with comparative ease a No. 7 lithotrite into the bladder, and at once seized a stone. After a few crushings I withdrew the lithotrite (which was not fenestrated) from the bladder, and in doing so I experienced considerable difficulty in getting

it to pass through the membranous portion of the urethra, as the blades had become clogged with the débris of a soft, clayey stone. This clogging had the effect of increasing the size of the lithotrite from a No. 7 to a No. 8. Fearing that this clogging might recur on a second withdrawal of the lithotrite from the bladder, I determined to cut the boy, and, passing in a No. 5 staff, performed lateral lithotomy, making a very small cut in the prostate, and extracted the broken fragments of stone from the bladder by means of an ordinary dressing forceps. The stone weighed 127 grains, and was composed of mixed phosphates and urates. The boy made an excellent recovery, and left the hospital well on May 11th. Here was a boy, aged eight years and a half, with a far less capacious urethra than I have often found to exist in a child of three or four years old.

At starting, I stated that I advocate litholapaxy in male children principally for two reasons—rapidity of cure and absence of a cutting operation. An analysis of the table appended shows that the average number of days spent in the Indore Hospital by boys after litholapaxy was a little over seven. The surgical records of this hospital in past years show that the average number of days passed by boys in hospital after lateral lithotomy was 17·61, and from what I have been able to learn of the statistics of other hospitals in India, it would appear that boys generally remain nearly twenty days in hospital after lateral lithotomy. Now, an average stay in hospital of but seven days after litholapaxy does not fully represent the advantages gained by the patient in having his stone removed by this method. The table does not show the fact that many of these young patients were practically well the day succeeding the operation, and that they were very often only detained in hospital for the purpose of observation. Indeed, some of them were

walking about the wards of the hospital the day succeeding the operation. Any lithotomist who has cut many boys for stone will readily recognise the advantages inherent in a method of surgical procedure wherein the suffering, annoyance, and personal inconvenience which follows the operation of lateral lithotomy can be safely avoided. Rapidity of cure in itself would not of course be a sufficient reason for performing litholapaxy in boys, unless rapidity of cure were accompanied by successful results. And such results I have obtained. Some surgeons would include Case 53, where death was caused by epistaxis and general anæmia some three weeks after all troublesome urinary symptoms had disappeared, amongst the number of unsuccessful litholapaxies. I do not myself think that this case should appear in this category. But, granting that it should so appear, I have still only lost two cases out of fifty-eight, or something under $3\frac{1}{2}$ per cent., which is a rate of mortality considerably less than that usually following the operation of lateral lithotomy in boys in England. I have not selected my cases, but took them as they came. Some of the boys operated on were in a very weakly state of health, and not a few suffered from chronic malaria with enlargement of the spleen. The operation of litholapaxy in boys cannot of course be free from all risks to life, no matter how skilfully performed; and should extensive organic disease of the kidneys coexist with stone in the bladder, there must of necessity be always a certain percentage of mortality after such an operation. But I maintain that if suitable instruments are skilfully and judiciously employed in performing litholapaxy, this operation will be found to be a much more rapid and a somewhat more successful method of dealing with stones in male children than lateral lithotomy.

I advocate litholapaxy in preference to lateral lithotomy

in dealing with stone in boys for another and very important reason—viz., the absence of a cutting operation.

The operation of litholapaxy, in the performance of which no important structures are cut or wounded, has much to recommend it, more especially in a country like India. A native of India will not, as a rule, undergo any grave surgical operation for the cure of disease until he has tried all other methods of treatment; and he will be even still more loth to submit his child to the terrors of the surgical knife unless he be fully persuaded that an operation is an unavoidable and absolute necessity. He will procrastinate and put off what he considers the evil day to the last hour. And hence it is that surgeons in India are continually meeting with cases of very large stones in young boys. But when the native of India comes to learn, as he is already slowly beginning to do, that in certain hospitals a stone can be disposed of without a cutting operation, he will then seek surgical aid for his child as soon as stone symptoms manifest themselves. I am strengthened in this belief by the fact that at the Indore Hospital the number of admissions into hospital on account of stone amongst boys has steadily increased since litholapaxy has become an established and a recognised operation at this institution. I am sanguine enough to hope that when the prejudices and opposition which have hitherto existed amongst surgeons in India against the operation of litholapaxy in boys shall have disappeared, and when this method of treating stone in boys shall be more generally adopted than it is at present, that we shall then more rarely meet with cases of large stones in young male children. And should this operation become an established and widely recognised method of treating stone in boys, its adoption in this class of patients will mean an avoidance of an amount

of pain and misery which can be only fully realised by those who are intimately acquainted with the daily lives of the Indian peasantry, cut off as they often are from frequent communication with large towns or cities where hospitals and dispensaries flourish. A glance at the table shows that many of the boys operated on at the Indore Hospital had suffered for four or five years from stone before they sought surgical relief; and I feel certain that many unfortunate Indian boys, living in villages far removed from skilled surgical aid, drag out a miserable existence for some years, and eventually perish with the stones in their bladders. The method of treating stone in boys by supra-pubic cystotomy is not very likely to find much favour amongst the natives of India, and I think that surgeons in India will be slow to adopt it amongst this class of patients. I do not think that surgeons practising in India very generally share Langenbeck's opinion, that the operation of lateral lithotomy in boys is frequently followed by emasculation. The natives of India have certainly not generally noted this after-consequence of lateral lithotomy; and should they ever come to do so, they will at once abandon the time-honoured operation of lateral lithotomy for litholapaxy, or for even supra-pubic cystotomy, although the latter is a cutting operation. They will do so chiefly on religious grounds, for in no other country in the world is the hope of male offspring so intimately interwoven with religious aspirations and practices as it is amongst the natives of our great dependency. I am not in a position to deny or confirm the truth of Langenbeck's statement, for this question I confess has not as yet engaged my attention. It is extremely difficult in a country like India to follow up the life-histories of boys cut for stone at public hospitals, for in India, as in Europe,

we meet with stone in boys nearly always amongst the poorer classes of society, and the "short and simple annals of the poor" are not easily traced. Still, the difficulties of collecting the necessary information to settle this very interesting and important question, so far as it refers to Central India, are not insuperable, and on my return to India I shall endeavour to trace the life-histories of all boys cut for stone in past years at the Indore Hospital. The impossibility of wounding the ejaculatory ducts in performing supra-pubic cystotomy would seem, however, to be the principal advantage it possesses over lateral lithotomy in dealing with cases of stone in male children. It may, perhaps, be an easier method of removing a stone from the bladder of a very young male child than lateral lithotomy would seem to be for those who do not enjoy many opportunities of cutting for the stone in boys. I say it may be an easier method advisedly, for I have my doubts on this point. I am inclined to think that the "high" operation in a fat male child of two years of age might possibly be not so easy of performance as the advocates of supra-pubic cystotomy would have us believe. But it will not prove a more expeditious, and it can hardly prove a more successful, method of dealing with stones in boys than lateral lithotomy is well known to be when performed by an experienced and skilled hand. Freyer's brilliant and unequalled success in cutting 143 boys for stone without a death has conclusively shown what splendid results can be achieved by lateral lithotomy when this operation is skilfully performed. On the other hand, the total number of supra-pubic cystotomies performed on boys in England up to the present date is so very small that it is as yet impossible to draw any safe conclusions as to what its rate of mortality is likely to be, and therefore I think I

am warranted in expressing my conviction that surgeons practising in India will be slow to abandon lateral lithotomy for supra-pubic cystotomy when dealing with cases of stone in male children. Before leaving the subject of litholapaxy in boys, I should like to make a few remarks of a practical nature.

The operation of litholapaxy in boys differs from the same operation in the adult male only in the size of the instruments employed. Great gentleness and a light hand are essential to success. The evacuating catheters should be as short as possible, and they should be fitted with stylets; for although some authorities state that a fragment of stone impacted in the eye of the catheter is easily removable by briskly working the aspirator, I have on many occasions found that this manœuvre fails to dislodge a tightly wedged fragment. The employment of a stilet then becomes a necessity. The evacuating catheter should never be withdrawn from the bladder with the aspirator attached to the catheter, because in doing so the operator has no means of knowing whether a small fragment of stone is lodged in the eye of the catheter or not; and should a piece of stone project from the eye of the evacuating catheter, the urethra might be lacerated in the withdrawal of the catheter from the bladder. It is, therefore, a wise plan to always pass the stilet into the catheter before withdrawing the latter from the bladder. All lateral and up-and-down movement of the lithotrite should be avoided as much as possible, so as not to strain the neck of the bladder. It is scarcely necessary to say that no undue force should be employed in passing either a lithotrite or evacuating catheter into the bladder. The meatus of the urethra should be incised only when it is considered necessary to do so. The operation very often lasts a con-

siderable time when a stone of considerable size has to be dealt with; for, since the evacuating catheters employed are comparatively small, the stone must be crushed very fine to come through the eye of the catheter. But the surgeon should be in no hurry to finish the operation, and no particle of débris should, if possible, be left behind in the bladder. The aspirator should be freely employed. I think that the performance of this operation in young male children requires a greater amount of skill and dexterity than the same operation in the adult male. But the difficulties are, after all, not very great, and the surgeon who has performed a few litholapaxies in the adult male with success may then safely proceed to operate by this method in young male children. Whoever wishes to give litholapaxy in boys a fair trial must supply himself *with a set of completely fenestrated lithotrites*, beginning at No. 6 and running up to No. 10 (English scale). To recapitulate. Use completely fenestrated lithotrites suited to the calibre of the urethra; if possible, crush the stone in the bladder into fine powder, and you will not then require to use large evacuating catheters; never use a lithotrite or an evacuating catheter which will not pass readily in and out of the bladder; be extremely gentle and careful in practising all manipulations in the bladder and urethra; do not be in a hurry to finish the operation; use the aspirator freely, and never, if possible, leave a single grain of débris behind in the bladder. If all these conditions be fulfilled, you may count on a large measure of success. Some cases you will meet with where no lithotrite, however small, can be employed with safety, and these are the cases which should be dealt with by lateral lithotomy.

Having now considered the operation of litholapaxy in its application to the treatment of stone in male children, I

should like to touch on some points of present interest connected with its performance in the adult male. It would appear that whilst surgeons in India are endeavouring to widen the sphere of litholapaxy, their brethren in Europe, and even in America, seem inclined to restrict Bigelow's operation to very narrow limits. This divergence in opinion and practice between the East and the West has doubtless been brought about by the increasing favour now being accorded to the operation of supra-pubic cystotomy in its revived form. I have had no practical experience of the "high" operation; but, in common with most surgeons, I recognise the fact that in its latest development it is eminently adapted to the treatment of very large stones, which cannot be disposed of by litholapaxy or by perineal lithotomy. And in dealing with cases of tumours of the bladder and encysted stones, no matter what their size may be, it is doubtless the correct method of surgical procedure. It cannot, however, be said that there exists a universal consensus of opinion amongst practical surgeons at the present day as to where we should draw the boundary-line between litholapaxy and supra-pubic cystotomy. I certainly am not disposed to draw this line at a stone which is hard and much above an ounce, and I feel certain that my brethren in India, with their unrivalled opportunities of treating stone, have no intention of adopting a course of practice which I can only characterise as retrograde.

The size, density, and weight of a stone must be carefully considered when drawing this boundary-line. But the size, density, and weight of a stone are not the only important factors of the problem to be solved. The size and the general condition of the bladder and prostate, together with the size or calibre of the urethra, are equally important points for consideration before we can arrive at any safe

conclusion as to the method of treatment best adapted to each individual case. Indeed, no operator can tell with anything approaching accuracy the weight of a stone in the bladder when grasped between the blades of a lithotrite. The weight can only be determined after its evacuation from the bladder, and its density can only be learned with certainty during the progress of the operation. And, therefore, rules laid down to guide inexperienced surgeons in drawing the boundary-line between litholapaxy and supra-pubic cystotomy, based solely on the weight and hardness of a stone, must prove valueless and misleading in actual practice. For it often happens that a stone of moderate size lying in an irritable, contracted, and diseased bladder will give the operator much more trouble than a stone weighing upwards of three ounces will do, in a roomy and healthy viscus. Again, there are some cases, happily rare, wherein the bladder continues to contract during the whole course of the operation, grasping with spasmodic effort the lithotrite, impeding its working and ejecting the water thrown in by the aspirator. These are certainly the most difficult cases we meet with in practice, and should the novice in performing litholapaxy be so unfortunate as to come across a case of this kind, it will give him an exaggerated idea of the difficulties to be met with in performing litholapaxy in the ordinary run of cases. It requires all the patience, care, and skill which an experienced hand can command to combat such conditions as these. Indeed, it is a question for consideration whether even an experienced litholapaxist would not better consult the safety and welfare of his patient by having recourse to perineal or supra-pubic lithotomy when brought face to face with a case of this kind, more especially if the stone happens to be at all large. I am, however, of

opinion that any uncomplicated stone on which the surgeon can lock a trusty and efficient lithotrite can in most cases be crushed and evacuated from the bladder at one sitting. By an uncomplicated stone I mean one not complicated by an enlarged and diseased prostate, and which lies free in a healthy and roomy bladder. I can, of course, imagine a case in which the surgeon, having locked his lithotrite on a very hard mulberry calculus, weighing between two and a half and four ounces, would fail to break it; and I can also imagine a case in which the surgeon, having broken across a large stone, would still be unable to evacuate it at one sitting owing to the inability or unfitness of the patient to remain sufficiently long under an anaesthetic to permit of the operation being completed at one sitting. But putting aside exceptional cases such as these, I think that, using efficient modern instruments, the surgeon ought to be able to dispose of any uncomplicated stone on which his lithotrite will lock, at one sitting. I would go even further, and say that some stones on which a lithotrite will not in the first instance lock can be reduced in size to the working capabilities of the lithotrite by judicious chipping of the outer covering of the stone, and that then the operation can be completed at one sitting. In dealing with cases of large, soft, phosphatic stones this chipping process is quite feasible. I shall now endeavour to substantiate these views by relating the histories of some cases from my own practice at the Indore Hospital.

M. S——, forty-nine years of age, suffering from stone symptoms, was admitted into the Indore Hospital on Dec. 16th, 1884. He suffered from emphysema of the lungs; his heart was weak, and he was very corpulent. His muscular system was very flabby. Urine acid; specific gravity 1014; no albumen. On Dec. 17th he was placed under

chloroform, which he took very badly. Equal parts of chloroform and ether were then tried. The largest lithotrite which could be used with safety was a No. 12 fenestrated. The stone was readily seized, but the inspiratory and expiratory efforts were so deep and laboured that the water injected into the bladder was soon expelled, and so the bladder kept continually contracting on the lithotrite, rendering the operation most difficult and tedious. A No. 14 evacuating catheter (English scale) was the largest I was able to employ. The lithotrite was introduced sixteen times, and the operation lasted two hours and thirty-five minutes, although the stone, mixed lithic acid and phosphates, only weighed 272 grains. This will give some idea of the difficulties attending the operation of litholapaxy in this case. Again and again I was obliged to cease working the lithotrite and aspirator in the course of the operation, owing to the frequent spasmodic contractions of the bladder. I have frequently removed stones weighing between two and three ounces with far less difficulty than I experienced in this case.—Dec. 19: Pulse 120; evening temperature 104° ; suffering from an attack of asthma; right testicle swollen; some pain on pressure over bladder.—22nd: Feels burning at time of micturition; condition of testicle unchanged; sounded bladder with Sir H. Thompson's sound, but no fragment of stone could be detected.—26th: Does not sleep well; pain in epigastric region; getting weaker; has difficulty in breathing; had two fits of asthma.—27th: Dyspnœa increasing; pulse rapid and weak; becoming drowsy. Died during the night. No post-mortem examination was obtainable.

I ascribe the fatal issue in the foregoing case to the lengthened administration of chloroform and ether in a patient suffering from emphysema of lungs and weak heart.

If I were again to meet with a similar case, I should most certainly perform either perineal lithotomy or supra-pubic cystotomy in preference to litholapaxy, for I consider that litholapaxy is contra-indicated in cases where a contracting bladder keeps on continually grasping the lithotrite and expelling the water injected by the aspirator. We have performed ninety-three litholapaxies in boys, men, and females at the Indore Hospital between May, 1884, and the end of March, 1886, and this case is the only one amongst this large number of litholapaxies which has proved fatal. Indeed, I am disposed to think that, had I used no anæsthetic, and had performed lithotrity instead of litholapaxy in dealing with this stone, the result might have been different from what it was. The history of this case goes to prove how valueless in actual practice are the rules which have been laid down to guide us in drawing the boundary line between litholapaxy and supra-pubic cystotomy, rules which are based solely on the weight and density of a stone.

At the close of the year 1883 a young man, aged twenty, was admitted into the Indore Hospital with stone in the bladder. The stone, which consisted of uric acid and weighed 1140 grs., was disposed of by litholapaxy, and he left the hospital perfectly well twenty days after the operation. Indeed, he might have returned to his home very much sooner, but it was considered wise to keep him for some days under observation in hospital. The notes of this case I have left behind me in India, and am not in a position at present to state how long the operation lasted, or the size of the lithotrite or evacuating catheters employed.

S. M——, aged sixty-seven, an inhabitant of Indore, was admitted into hospital on May 18th, 1884, suffering from symptoms of stone, which had existed for fifteen

years. His face bore the traces of great suffering. The pain on passing urine was so great that sometimes he used to strike his forehead against the ground or against the wall of his room in paroxysms of despair. The urine was alkaline in reaction, and its specific gravity 1015. The same day I passed a No. 15 fenestrated lithotrite into the bladder and readily seized a very large stone. The bladder was healthy and roomy, and the urethra very capacious. The stone, however, I found too large to permit of its being cracked across with the lithotrite, and I had not a larger one in my possession. To have cut an old man with a large stone would almost certainly have killed him, and I therefore determined to chip away at the stone until I could so reduce it as to get the lithotrite to lock on it. I was obliged to spend a very long time in chipping away at the outer shell of the stone, and when nearly half an hour had elapsed I had the satisfaction of finding that I was able to lock the lithotrite. Once the stone was cracked across, the operation presented no remarkable features except its great tediousness. At the end of two hours I had only extracted half the stone, and I almost began to despair of success. But my old patient's pulse improved, his breathing was perfectly regular, and he required but little chloroform to keep him in a condition of perfect anæsthesia, and so I was determined to extract the entire stone at one sitting if possible. I was obliged to introduce the lithotrite fourteen different times, and applied the aspirator an equal number of times. The evacuating catheter which I employed was a No. 29 (French scale). At the end of the fourth hour I had nearly extracted the entire stone, and the last quarter of an hour of the operation was spent in sounding and in disposing of the last few fragments. The stone consisted of urate of lime, and when damp weighed 1600 grs. I have

weighed it recently, and after two hot weathers in India its weight is 1470 grs.—May 18th: Evening temperature 102.4° ; pulse 96.—19th: Feels slight pain over bladder region: urine somewhat red; not much pain in micturition; has almost recovered from the effects of chloroform.—21st: Patient feels quite well; walks about his room; is anxious to go home.—23rd: A small lithotrite having been introduced into the bladder, a small fragment of stone was detected lying close to its neck, and was removed between the blades of the lithotrite.—24th: Urine perfectly clear; no pain in micturition. Allowed to return home.

The above case is a good example of the results which can be achieved by Bigelow's operation. Compare the history of this case after the operation of litholapaxy with what it would have been had I extracted the stone by suprapubic cystotomy, and the superiority of Bigelow's method over other systems of treatment becomes very striking. This man was in the enjoyment of excellent health when I left India in March last, and was perfectly free from all bladder trouble. I may here mention that his testicles have never descended into the scrotum, or even into the inguinal canal. He affirms that he has had two children, and suffered once from syphilis and once from gonorrhœa, proving that a man may be the subject of retained abdominal testicles and still possess undiminished virile power.

M. S——, aged thirty years, admitted into the Indore Hospital on February 1st, 1885, with symptoms of stone in the bladder. A No. 15 fenestrated lithotrite having been passed into the bladder, a large stone was easily seized and crushed. The lithotrite was introduced into the bladder eight times, and the débris evacuated through a No. 29 catheter (French scale). The operation lasted one hour and thirty-seven minutes, and the debris of the stone, which

consisted of mixed uric acid and urate of ammonia, weighed 770 grs. The patient left the hospital quite well on the twelfth day succeeding the operation.

L——, aged thirty years, admitted into the Indore Hospital on May 20th, 1885, with stone symptoms, which had existed for twelve or fifteen years. A No. 15 fenestrated lithotrite being passed into the bladder, a stone was readily seized. The stone I found was a very hard one, and tested the strength of the lithotrite employed, one of Weiss and Son's make. The male blade seemed to me to sink into the stone. The lithotrite was introduced eleven different times, and the evacuating catheters employed were No. 16 English and No. 25 French scale. The operation lasted two hours and four minutes, and the stone extracted weighed 550 grs. It consisted of oxalate of lime, was quite black in colour, and was the hardest stone I have yet crushed. The man made an excellent recovery, and left the hospital quite well ten days after the operation. The lithotrite on this occasion did its work splendidly. The amount of pressure I was obliged to exert in screwing up the lithotrite was represented by the whole strength of my wrist and forearm. In attacking stones of this description, I screw up the lithotrite as tightly as I think I can do with safety, and then wait for some seconds before endeavouring to give the handle of the screw an extra half turn, and I generally find that in the interim the stone gives way with a snap under the continuous pressure exerted by the blades of the lithotrite. The screw power of the lithotrite should be worked judiciously and carefully when one meets with very hard stones. The inexperienced litholapaxist who, so to speak, "rushes" a hard mulberry calculus is not acting fairly either towards his patient or the surgical instrument maker. The blades of the best made lithotrite

are liable to break if the whole power of the screw is rapidly brought into play against a very hard and tough stone.

M——, a man, aged forty, was admitted into the Indore Hospital on July 3rd, 1885, suffering from stone symptoms, which had existed for some years. On introducing a No. 15 fenestrated lithotrite into the bladder, a large stone was readily seized and crushed. The stone was a very hard one. The lithotrite was introduced on six different occasions, and the débris extracted by a No. 16 evacuating catheter. The operation lasted eighty-eight minutes, and the stone, which consisted principally of oxalate of lime with some mixture of lithic acid, weighed 1100 grains.—July 4th: Urine clear; has some pain in passing urine.—5th: Pain much less; feels quite well. Sir Henry Thompson's sound being passed into the bladder, no particle of stone could be detected.—6th: Went home quite well.

M. S——, aged twenty-five years, admitted into the Indore Hospital on July 11th, 1885, with symptoms of stone, which had existed for some years. Next day, being placed under chloroform, a stone, consisting of lithic acid and oxalate of lime, and weighing 787 grains, was evacuated from the bladder in seventy-five minutes. The lithotrites employed were Nos. 11 and 15, and the evacuating catheter used was a No. 16 (English scale). The patient made an excellent recovery, and left the hospital quite well on the seventh day succeeding the operation.

S. B——, aged thirty years, was admitted into the Indore Hospital on March 12th, 1886, suffering from stone in the bladder. This man's stone had been diagnosed by a native practitioner in the city of Jaora, who sent him to me for treatment. He had suffered for seven years from stone symptoms, and several hakims had treated him for

gonorrhœa. He was most anxious to be relieved from his sufferings as speedily as possible, and next day, being placed under chloroform, I passed into his bladder a No. 15 fenestrated lithotrite, and at once seized a very large stone. I at once perceived that the stone was far too large for such a lithotrite. I then introduced with great facility a No. 32 fenestrated lithotrite (French scale), which Messrs. Weiss and Son had sent me out in September, 1885. My patient had a wonderfully capacious urethra, for it was not found necessary to slit up the meatus before introducing this powerful lithotrite. The bladder I found also very roomy, and not disposed to spasmodic contraction. I seized the stone, but could not lock the lithotrite. I therefore began to chip away at the stone, and gradually wore away some of its shell. After working in this fashion for about five minutes, I withdrew the lithotrite from the bladder, introduced a No. 31 evacuating catheter (French scale), and then applied the aspirator. I then brought away a quantity of white fine débris, proving at any rate that the covering of the stone was phosphatic. I therefore made up my mind to crush the stone at one sitting if possible, for I had many of the conditions necessary to success on my side. I had a powerful and trusty lithotrite and a large evacuating catheter to hand; a very capacious urethra and a roomy bladder to work in; my patient was young; the stone to be attacked was not, I believed, abnormally hard; and last, though not least, I had gained a considerable experience in performing litholapaxy. I therefore reintroduced the large lithotrite, and started afresh. After further chipping away at the stone I eventually wore it down, and soon I was able to lock the lithotrite on it, and crushed it at the rim. Once having crushed it, I felt confident of ultimate success, and not to enter into weary details, I may at once state that,

after three hours and a half of hard work, I had extracted a stone, principally phosphatic, weighing over six ounces avoirdupois. The last half hour of the operation was passed in disposing of the nucleus, which I found composed of oxalate of lime, and in searching for pieces of *débris* lying in the trigone of the bladder. My patient took the chloroform well, and I had no anxiety on this score during the operation. Next day I found the stone, when dried, to weigh exactly 2804 grains. The nucleus, which I easily picked out from the mass of *débris*, weighed 100 grains. During the operation I introduced the lithotrite thirteen different times into the bladder, and the evacuating catheter an equal number of times. I exhibited the *débris* of this stone at the meeting of the British Medical Association held at Brighton in August last. It is, as far as I know, the largest stone which has ever been removed from the bladder by Bigelow's method. To perform an operation of this kind with success is a great strain on the resources of the surgeon who attempts it. He must be ever gentle in his movements, and at the same time persevering and courageous in attack. He must have implicit confidence in the lithotrite which he employs, and he must of all things be patient and in no hurry to finish the operation. Portions of this stone I found extremely hard. On one or two occasions I screwed up the lithotrite with almost the whole strength of my wrist and kept up the pressure. I patiently awaited the result, and soon I had the satisfaction of hearing the snap of the stone as it gave way under the continued pressure of the blades of the lithotrite. I would not, however, recommend an inexperienced litholapaxist to attack such a stone. Had this stone been composed of hard lithic acid or oxalate of lime, the correct operation for its removal would, I think, have been supra-pubic cystotomy, but being what

it was the course which I pursued was doubtless the correct one. The subsequent history of this case was the following:—
March 13th (evening): Had completely recovered from the effects of chloroform at 3.45 P.M. One drop of nitroglycerine was then given. Passed urine at 4.30 and again at 6.20 P.M.; slight pain over bladder and urethra; feels better than before the operation. Evening temperature 102.6° ; pulse 96.—14th: Morning temperature 100.2° ; pulse 90; slept well; some pain on pressure over bladder and urethra; pain on micturition less than yesterday; colour of urine brown; large deposit of phosphates in urine on cooling; feels much better. Evening temperature 102.2° .—15th: Morning temperature 99.2° ; slept well; feels much better. Evening temperature 99.0° .—16th: Pain over bladder and urethra less; passed some small bits of stone along with the urine during the night; sat out in the verandah of the hospital for about half an hour to-day.—17th: Passed some more small portions of stone. Morning temperature 98.4° ; evening temperature 99° .—18th: Passed some very fine phosphatic sand; sits out in the verandah daily.—20th: Patient's general health improving; pain in urethra and over bladder on pressure much less.—21st: Passes urine freely and without much pain; has some slight purulent discharge from urethra; has some pain over descending colon.—22nd: Some pain in the left testicle. Placed under chloroform, and bladder washed out with saturated solution of boracic acid. No particle of stone could be detected by Sir H. Thompson's sound. No click on using aspirator.—23rd: Had four motions during the night; pain in left testicle much less. Morning temperature 98.4° ; pulse 96; sits out in verandah.—25th: Has some pain in region of left kidney; morphia injected.—26th: Pain disappeared from region of left kidney; looks quite cheerful;

urine still continues to deposit phosphates on cooling.—27th: Slight pain in passing urine; walks about the hospital grounds. Evening temperature 98.4° .—28th; No urinary symptoms of any importance, except very slight pain in passing urine; urine, however, continues to deposit phosphates; general health much improved. Left the hospital for his home to-day.

That litholapaxy is capable of successfully dealing with stones of considerable size occurring in females, the following case will go to prove.

B——, an old woman aged eighty, was admitted into the Indore Hospital on March 17th, 1886, with stone symptoms which had existed for two years. She had lost control over the bladder for more than one year, and had suffered much from irritability of the same. A stone being found, she was next day placed under chloroform and a uric-acid calculus weighing 395 grains removed from the bladder in sixty-seven minutes. The evacuating catheter used was No. 16 (English scale), and the lithotrite employed was No. 14 (English scale). The operation presented no features of difficulty, and the evacuating catheter and lithotrite passed with the greatest ease. When working the aspirator an assistant's finger pressed the meatus of the urethra against the catheter, and thus very little water leaked out between the wall of the urethra and the catheter.—March 19th: Colour of urine pale; it still dribbles away.—20th: Pulse 84; colour of urine brown; no pain over bladder; feels much better.—21st: Has some pain after micturition; passes urine involuntarily only when she moves about in bed; no pain over bladder.—22nd: Is able to retain her urine for two hours at a time; feels very weak.—23rd: Is now able to retain her urine for three hours at a time; she passed some this morning at 6 A.M., at

8 A.M., and again at 11 A.M.—24th: Feels much better; is fast regaining complete power over the bladder.—25th: Allowed to go home to-day, feeling quite well.

Remarks.—Had the stone in this case been twice the weight it proved to be, I do not think there would have been any difficulty in removing it at one sitting.

Were it necessary or profitable to do so, I might relate the history of several more cases wherein I have disposed of stones weighing between 700 and 800 grains by litholapaxy. The cases, however, which I have now recorded, together with many others already reported by Freyer, wherein he has successfully removed very large calculi from the bladder by litholapaxy prove how wide indeed is the legitimate sphere of Bigelow's operation. Sir Henry Thompson is of opinion that a surgeon who is not practically familiar with lithotripsy, on meeting with a hard calculus which he cannot readily seize with a lithotrite, will be more likely to achieve a lasting success for his patient by adopting supra-pubic cystotomy in preference to litholapaxy. This may be a wise and sound rule for those who at rare intervals meet with a case of stone, looking at the question from the standpoints of the patient's safety and the surgeon's reputation. But there is another standpoint from which this subject must be viewed, and it is this: Given a patient labouring under the presence of a hard and large stone lying in a healthy and roomy bladder, and an experienced and skilled litholapaxist at hand to treat him, what for the patient is the safest and most satisfactory method of getting rid of such a stone? The record of cases which I have now laid before my readers may supply the answer to this important question. For my part, I think that recourse to Bigelow's operation will best fulfil the requirements of such a patient. Believing, as I do, that litholapaxy is the best

method of dealing with the vast majority of stones we meet with in men, women, and children, I must confess that I view with considerable apprehension and misgiving the attempts which are now being made in England by the advocates of supra-pubic cystotomy to apply this revived surgical procedure to the treatment of many cases of stone which would be more appropriately and expeditiously disposed of by Bigelow's operation. And now I leave to the judgment of practical surgeons in Great Britain this record of fifty-eight litholapaxies performed on male children.

