ANALYSIS OF 964 CASES
OF
OPERATION FOR CALCULUS IN THE
BLADDER
BY
LITHOTOMY AND LITHOTRITY,
WITH REMARKS.

BY
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Received December 10th, 1889—Read March 11th, 1890.

In the year 1878 I had the honour of presenting to the Society a record of 500 cases of operation for stone in the bladder of the adult male.¹ I now beg to offer a further record of 464, in all 964 cases, and constituting my entire experience from the first case in 1854 to the end of 1889; besides which are four cases of operation for the removal of foreign bodies unassociated with calculus, comprising a total of 968 cases.

Respecting all these I beg leave to repeat a statement made on the occasion referred to, viz. that I possess full

¹ See 'Transactions' Roy. Med. and Chir. Soc., vol. lxi, p. 159.

notes of every one recorded at the time of its occurrence, on a system adopted at the outset and never subsequently changed ; while founded on these is a printed catalogue (private) containing the chief particulars of every one, a copy of which accompanies this paper. The name of the medical man who sent me the case or who was present at the operation, for such there almost invariably was, is there given, as well as the after history, often embodying observations extending over several years. Every fact named can be verified by evidence under my hand. I have adopted this plan as satisfactory at all events to myself, desiring before all things to make a clear exposition of my entire experience, having often in past time regretted the want of details relating to that of some skilled and practised operators who have left no numerical statements, and only imperfect records or general impressions of the results they obtained. Whatever I offer here may be accepted as the outcome of my entire work in this department of surgery. Not a single case has been omitted. My object has been to present here an accurate although necessarily very brief study of the data obtained, chiefly in relation to treatment and its consequences ; and respecting this it may be permissible to state at the outset that I am not conscious of having entertained undue predilection for any particular method, and have therefore employed the knife and the lithotrite indifferently, according to my judgment, for the requirements of each individual patient.

These 964 calculous cases have occurred in the following proportions in regard of sex and age : in adult males 933, in females 15, in youths and boys 16.

The operations which I have employed are lithotomy by various methods, and lithotrity ; and, for a few among the female cases, dilatation and extraction.

1. LITHOTRITY.—Regarding lithotrity, the first case of which, that of a girl, bears date of 1854, I may say that I adopted at the outset the method of my friend Civiale, then in vogue. At this time the sittings for a stone of

moderate size were short and numerous, and generally without anæsthesia ; the *débris* being permitted to issue for the most part by the natural act of micturition, assisted occasionally by washing out the bladder with a syringe through a large silver catheter. For the first seven years I employed his instruments, which were much superior to those then used here, having learned to do so during two or three visits to him at Paris for the purpose, circumstances which led to a very friendly intercourse terminated only by his death. Previously to that event, however, I had designed the first lithotrite with a cylindrical handle, an idea which Messrs. Weiss and Son carried out for me ;¹ and Civiale himself during the last year or two of his life approved and employed my new instruments, made for him at his own request by that firm.

It was early in 1865 that Mr. Clover designed and carried out his idea of removing the *débris* produced by the lithotrite by means of an exhausting india-rubber bottle and silver evacuating catheter. I used it for the first time in April, 1865, for a patient (Case 51 in the catalogue) whom I saw with my friend Mr. C. A. Aikin, Hyde Park, and I continued to do so more or less for about twelve or thirteen years. As my experience increased I employed it more freely than at first, and thus diminished materially the number of sittings before considered necessary. Hence the value of an anæsthetic became obvious, and I always advised it when the "bottle," or, as it was subsequently termed, the "aspirator," was employed, since the action was more painful to the patient than that of the lithotrite. After 1872 I rarely operated without it, and therefore preferred the aid of chloroform, which was invariably administered by Clover. But previously to the last-named date I was in the habit, whenever severe cystitis appeared in a case undergoing lithotrity, of employing an anæsthetic at once, that I might empty the bladder at one sitting ; having learned by experience that the best way to treat the cystitis was to remove every

¹ See letter from Messrs. Weiss, 'Lancet,' August 20th, 1864, p. 229.

fragment of calculus, accomplishing this chiefly by means of Clover's aspirator. This principle of procedure I strongly advocated in my lectures here; I also made it the subject of clinical remarks after operating for stone at Hôpital Neckar, in Paris (1876-7), at my friend Dr. Guyon's request, before a large number of students there. I contended that the plan of emptying the bladder at a final sitting under these circumstances constituted a great improvement on the method by baths, demulcents, rest, and waiting for irritation to subside, always employed for cystitis during lithotrity at that time, especially in Paris. But it never occurred to me that this practice would be advisable in every case of calculus, as was, soon after this, to become apparent.

In 1878 Professor Bigelow, of Harvard, U.S., introduced his method by a single sitting, based on the assumption that less injury was sustained by the bladder from prolonged manipulation, provided the whole stone was removed at once, than by the irritation caused through prolonged contact with numerous fragments left therein for several days to await subsequent sittings. I was quite prepared to accept this principle, and, testing it without delay, soon recognised its importance and value. Since that time I have adopted it, with two or three exceptions only, for all those cases to which I considered lithotrity applicable, using, however, the same lithotrites as before, namely, those made on the model designed by myself, with the cylindrical handle, &c. I have made various modifications which experience has suggested from time to time in the apparatus for removing *débris*, arriving finally at the aspirator which I have used during the last few years. Hence, having employed the same instruments for crushing, and the same system for removing the material crushed since 1878 as before that date, I have felt myself unable to adopt a new name to denote the improved method which Professor Bigelow proposed. I have continued to perform "lithotrity," the term originated by the illustrious inventor of the crushing operation, adding, in

order to indicate the essential change made by Bigelow, "*at one sitting*," instead of by several.

In connection with the specimens preserved here it is necessary to point out that in endeavouring to collect the calculous matter removed by lithotritry of the early type, that is by numerous sittings, it was never possible to obtain and preserve the whole of the *débris*. A certain quantity was always lost, the task of collecting having been necessarily confided chiefly to the nurses, not always sufficiently attentive to this part of their duty. Among such, however, the specimens may be taken as representing about three fourths of the calculus in each case. It is advisable, when the *débris* of a stone removed by lithotritry is to be preserved, that it should be first dried, then weighed, and the result recorded. Since adopting the method by a single sitting, which renders the proceeding easy, this has been done in every instance. Accordingly almost every case catalogued here, from No. 503 (1878) to the end of the series, has been so reported.

Each one of these calculi has been placed in a glass cell, and is marked by a number corresponding with that in the catalogue, which indicates the case to which the calculus belongs, with its particulars, so that reference can be readily made from the specimens to the particulars, and *vice versâ*.

There is one feature in the collection of which I have to say a few words. Although it contains many large calculi, including a few of remarkable size, there is a considerable proportion of small ones, when compared with most of the old existing collections, obtained only by lithotomy, brought together as they were before the middle of the present century. When the knife was the only means available to remove the stone, few patients ventured to encounter the risk of operation until after some years of suffering, while the surgeon himself rarely recommended it until the stone had attained certain proportions. But as soon as the great superiority of lithotritry, particularly for cases where the calculus is small, had become

evident, the idea which dominated my practice and my teaching was the extreme importance of discovering the stone in the early stage, since the dangers incurred by the patient with a large stone, either from repeated sittings by lithotrity or from the knife, were thus to be avoided. I lost no opportunity of seeking for the calculus when recently developed, and learned slowly, with surprise, how much more frequently it was to be found in the bladders of elderly men than I had been taught to expect. So far from the stone being more common in children than in adults, according to the universal belief at the period referred to, justified as it was by the records of hospital practice, I was soon in a position to affirm that stone was more common among men of sixty years of age and upwards than at any other period of life. For let it be remembered that all existing records of practice, whether found in museums or reported by the operators themselves, from all sources previous to the middle of the present century, showed that half the total number of operations for calculus occurred in childhood and youth. The truth nevertheless is that a very large majority of calculous cases was then, as now, to be found in persons above fifty years of age ; but the fact was then unknown ; the calculi were simply overlooked, not being suspected to exist, and one obvious cause of the oversight is to be found in the fact that the early symptoms in elderly subjects are extremely slight—a rule with only few exceptions,—contrasting strongly with the marked and painful symptoms rarely absent in the young.

Thus, the slight irritation scarcely felt by elderly patients unless considerable exercise is taken was naturally attributed to commencing enlargement of the prostate, to undue acidity of the urine, to “irritation consequent on gout,” &c. Hence examination of the bladder for calculus had usually been deemed for such slight symptoms unnecessary. But further, at the period referred to, when such cases were examined by an instrument, as sometimes happened, it was obvious, on observing the method usually

followed, that the sounds employed, as well as the method of using them, were only adapted to find large calculi, and that a formation about the size of a bean or an almond could only be struck by the merest chance, and had indeed never been seriously sought for or thought of. Such can only be detected with certainty by light and delicate handling with the small curved or beaked sound, at that time unknown, and of which I availed myself some time after its introduction by Mercier, of Paris. Yet it is manifest that no greater boon could be conferred on the calculous patient than that of finding his stone while it is still small, and I venture to regard the keen pursuit of this object, and its realisation in several hundred cases of elderly men, as one of the most important results illustrated by this collection. Of small uric acid calculi alone, including a few oxalic acid, but not reckoning phosphatic calculi so frequent in age—that is, weighing from twenty grains to a drachm, and occurring among men of advancing age, say from fifty-five to seventy-five years—there are no less than 200 in this collection. The fact that a very large number of patients could thus be freed from calculus almost without risk was one of the highest importance. But there was another result not less valuable which subsequently appeared, namely, that such patients could almost invariably be prevented from forming fresh calculus by adopting dietetic precautions at an early period, before the morbid tendency had become too strongly marked ; and this has, I confess, been to me a source of extreme satisfaction. I possess a great number of subsequent records concerning patients on whom I have operated once for uric acid calculus, who, having followed instructions in respect of diet and regimen, have had no return ; while, on the other hand, the instances in which a fresh acid formation has taken place have occurred among those who have continued to indulge habits of diet favouring its reappearance, or those in whom such habits have existed for many years, or, lastly, in constitutions tainted by marked hereditary influence.

But at an earlier stage still, calculous matter may not infrequently be detected and removed, while existing only in the form of "gravel" or "concretion." We may often remove these small bodies by the aspirator only, particularly those of uric acid, weighing two or three grains or even larger; or we may occasionally dispose of them by a single crushing of a lithotrite. In connection with this subject I may remark that it has long been customary to employ certain terms to describe these bodies according to their size and importance—the visible crystalline deposits as "sand," and the ovoid or irregularly shaped bodies, like grains of wheat, peas, or small beans, as "gravel" and "concretions."

The object in employing these terms has hitherto been to convey general impressions respecting the small formations, and to reserve the word "stone" for bodies of greater size and importance. Nevertheless all these expressions, including even the last named, are sometimes very loosely employed. No doubt it is difficult, perhaps impossible, to define precisely the limit of their meaning in regard of size and weight. But in order to conform as far as possible to the practice of our predecessors I have invariably refused to recognise as "stone" the small bodies described above, maintaining for them a well-defined class of "gravel" and "concretions;" and especially because the removal of small calculous bodies, now that a formidable operation by the knife is no longer necessary, is a matter of extremely small difficulty and gravity. Hence I have uniformly declined to enter in the series of "stones" removed from adult patients any calculous bodies weighing less than about twenty grains. When a smaller one has been met with I have described it as "gravel" or "concretion."¹ I know that the dis-

¹ Thus, some years ago, I washed out from a patient's bladder some five hundred minute uric acid formations, about the size of a pin's head. The total weight was $2\frac{3}{4}$ drachms. Smaller quantities I have frequently removed, of which examples are presented here. But it never occurred to me to regard these as instances of "stone in the bladder," or to enter them as cases of operation.

tion is quite arbitrary, but I contend that any weight, whatever it may be, which is agreed to as marking the limit between "stone" and "gravel" must be equally an arbitrary one. Still it is desirable that a distinction should be drawn, and if possible agreed to, or we may have the washing out of tiny bits of gravel of one or two grains even in the adult individual represented and recorded as an operation for "stone in the bladder!"¹ Taking what I venture to believe may be regarded as a common-sense view of the question, I have adopted the twenty-grain limit for myself. Had I reckoned the removal of uric acid and oxalate of lime formations of the size just named, I should have very largely augmented my number of cases; and still more so had I thus regarded the phosphatic concretions which are so often crushed and removed from the bladder of prostatic patients who have long passed all their urine by catheter. Many persons live, subject to this condition, in tolerable comfort for ten or twelve years or more. Such a one after some months of freedom from pain gradually becomes the subject of calculous symptoms, often severe, due to the presence of a phosphatic concretion, weighing perhaps ten or fifteen grains, too large to wash out, but which a single introduction of the lithotrite suffices to remove. This proceeding may be performed sometimes once or twice a year, and thus, for a single individual, the surgeon may have to repeat the process many times. Had I included all these examples in my series the total number would have reached at least two or three hundred cases more than it now does.

2. LITHOTOMY.—Regarding the series of operations by lithotomy, I commenced with the ordinary lateral operation for the largest calculi, employing the median for those which five-and-twenty years ago were regarded as just outside the scope of lithotripsy. Subsequently I tried the medio-bilateral of Civiale and the bilateral of Dupuytren for the first named, not acquiring any marked

¹ This actually has taken place. See 'Brit. Med. Journ.,' 1887, vol. ii, p. 1376.

preference for any one of these methods. It so happened that during the first fifteen or twenty years of my experience no calculus of very unusual size presented itself. I met with several weighing from one and a half to three ounces, and usually removed them by the lateral operation. The supra-pubic operation I performed for the first time in 1864, not for a calculus, but for a foreign body in the bladder of a young woman in University College Hospital. It was a hair-pin lying across the bladder, tightly impacted in this position and defying any fair attempt to remove it by the urethra. The next occasion was in 1877, for a gentleman whose legs were immovable and extended as the result of spinal disease. The position for lateral lithotomy being impossible, I performed the supra-pubic in this, as in the preceding case, on a staff, the method adopted at that time for removing a large uric acid calculus (Case 456 in the catalogue).

But in the year 1883 I became acquainted with the modification of this operation made by Petersen, of Kiel, and from my experience of its results in the hands of Guyon, of Paris, and others, I advocated its merits in my lectures at the Royal College of Surgeons in 1884. Immediately afterwards a case of large calculus presented itself, and I performed the new supra-pubic operation, for the first time in this country, in July of that year. The calculus was one of pure cystine, and weighed $2\frac{3}{4}$ oz., the largest of that product I have ever seen. The patient is now living and well (see Case 690). Several other examples soon came under my notice, one of pure uric acid reaching the weight of 14 oz.; and this method, which I have employed seventeen times for stone patients, yielded me results which surpassed any before obtained from the lateral operation, considering the size of the calculi removed. In connection with this subject it may be permissible to add here that I have also performed the same operation eleven times for the purpose of removing tumours of the bladder, none of which cases of course appear here, with only one death following the proceeding, viz. from

septicæmia. With such an experience I should never again adopt, in ordinary circumstances, any other form of lithotomy for a large stone in the bladder.

The whole of the calculi extracted by all the methods above named are, with only two or three exceptions, systematically arranged in a cabinet, and have been presented to the Royal College of Surgeons for preservation in the museum there, accompanied by the catalogue referred to.

The following tables summarise the leading facts relating to the sex, age, nature of calculus, operations employed, their results, &c., in regard of the patients who have come under my care both in hospital and in private practice from the first case down to the end of 1889. The last table, giving a general view of the whole, is suspended in the room.

TABLE I.—*Cases operated on in University College Hospital, London, between 1854 and 1874.*

Adult males.	Youths and boys.	Girls.	Total number of patients.	
79	13	1	...	93
			Cases of operation.	Deaths.
The 79 male adults were treated—				
24 by perinæal lithotomy, median, medio-bilateral, bilateral, but chiefly by the lateral operation .			24	10
55 by lithotritry, by several sittings. A few of these were operated on again at a later period, finishing in all			63	6
The 13 youths and boys were treated—				
10 by lithotomy			10	1
3 by lithotritry			3	0
The 1 girl ¹ was treated—				
1 by lithotritry			1	0
Total			101	17
Extraction of foreign bodies:				
1 girl lithotomy, supra-pubic.				

¹ This was a patient in the infirmary of Marylebone, the only case of stone occurring there while under my care as visiting surgeon, and hence, ranking as a hospital patient, is placed with the University College Hospital cases.

TABLE II.—*Cases operated on in private practice only between 1857 and December 31st, 1889.*

Adult males. 739	Youths and boys. ...	3	...	Females. 14	...	Total number of patients. 756	
					Cases of operation.		Deaths.
The 739 male adults were treated—							
91 by perinæal lithotomy, median, and medio-bilateral, but chiefly by lateral	.	.	.	.	91	...	33
1 supra-pubic (old) operation	.	.	.	.	1	...	1
17 supra-pubic (modern) operation	.	.	.	.	17	...	4
630 by lithotrity, nearly half being at a single sitting.							
Several cases were operated on a second time, a few a third time, and in six cases four times							
	.	.	.	.	737	...	40
The 3 youths and boys were treated—							
2 by perinæal lithotomy	.	.	.	.	2	...	0
1 by supra-pubic lithotomy	.	.	.	.	1	...	0
The 14 women were treated—							
9 by incision, 1 chiefly by dilatation	.	.	.	.	9	...	1
5 by lithotrity and extraction	.	.	.	.	5	...	0
Total	.	.	.	.	863	...	79

On examining the above table and the total shown in No. III, which follows, it will be seen that the proportion of children to adults is very small. Among these only 16 males fell to my lot, 13 being in hospital practice; 3 were cases in private—a fresh proof of the rarity of calculus in the children of parents among the middle and upper ranks of life. Sir William Fergusson stated that he had but once received a fee for operating on a child. Deschamps in the latter part of last century stated that he had never seen an example among families in easy circumstances.

The number of females operated on was 15 (14 adults and 1 girl), and of these little need be said here. Hence I shall now deal with male adult cases only, and shall beg you to bear this in mind throughout all subsequent remarks. Deducting these two series of 16 and 15 respectively from 964, the number of male adults remaining is 933, 800 by lithotrity and 133 by lithotomy.

TABLE III.—*Total of all cases of stone in the bladder operated on in hospital and in private practice between 1857 and December 31st, 1889.*

Total number of cases of operation 964

Total number of patients 849

Male adults—818. Youths and boys—16. Females—15.

	Hospital.			Private.			Total.		
	Number of patients.	Number of operations.	Deaths.	Number of patients.	Number of operations.	Deaths.	Number of patients.	Cases of operation.	Number of deaths.
Male patients (adults):									
Lithotrity	55	63	6	630	737	40	685	800	46
Lithotomy (perinæal)	24	24	10	91	91	33	115	115	43
Lithotomy (supra-pubic):									
Old method	—	—	—	1	1	1	1	1	1
New method	—	—	—	17	17	4	17	17	4
	79	87	16	739	846	78	818	933	94
Youths and boys:									
Lithotrity	3	3	—	—	—	—	3	3	—
Lithotomy (perinæal)	10	10	1	2	2	—	12	12	1
Lithotomy (supra-pubic)	—	—	—	1	1	—	1	1	—
Female patients:									
Lithotrity (adult)	—	—	—	2	2	—	2	2	—
" (girl)	1	1	—	—	—	—	1	1	—
Lithotomy and dilatation (adult)	—	—	—	12	12	1	12	12	1
							849	964	96
Foreign bodies in the bladder:									
Removed by lithotrite (males)	—	—	—	3	3	—	3	3	—
Removed by supra-pubic operation, old method (female)	1	1	1	—	—	—	1	1	1

Respecting these operations it will be seen that they were performed on 818 individuals, due to the fact that several of the patients operated upon by lithotrity formed fresh calculi subsequently, and required fresh operations for their removal. As before observed, such proceedings have been strictly limited to the removal of considerable formations, evidently newly produced, and not to the recurring concretions already referred to.

Next it should be stated that there were six patients among the entire number who were operated on by me at different periods of their lives and for different stones, both by perinæal lithotomy and by lithotrity, but in each case at a more or less considerable interval of time. These cases are numbered in the catalogue as follows: 170, 233, 341, 396, 474, 714.

Among the 800 cases of lithotrity in the male adult the sum-total of hospital and private practice—

There were 6 patients who had the operation performed four times for different calculi, with considerable intervals of time (several years) between each.

There were 10 patients operated on three times, and 77 patients operated on twice.

Hence there were 592 patients operated upon by lithotrity once only, at all events by myself; a very few of these have to my knowledge been operated on a second time by some other surgeon, but almost the entire number have remained free from stone-formation subsequently.

3. NATURE OF THE CALCULI REMOVED.—The calculi removed from male adults in hospital practice were 87 in number, 24 by perinæal lithotomy and 63 by lithotrity=87.

The calculi removed from male adult patients in private practice are 846 in number, as follows: 91 by perinæal lithotomy, 18 by supra-pubic lithotomy, and 737 by lithotrity=846.

		Hospital.		Private.	Total.
Uric acid {	Multiple calculi	. 8	= 53 ...	103 = 482 ...	535
	Single calculi .	. 45		379	
Uric acid and phosphate .		. . 8	...	82 ...	90
Oxalate		. . 3	...	29 ...	32

	Hospital.	Private.	Total.
Oxalate and urate	4 ...	29 ...	33
Oxalate and phosphate	— ...	15 ...	15
Phosphates	18 ...	207 ...	225
Cystine	1 ...	2 ...	3
	<hr/> 87 ...	<hr/> 846 ...	<hr/> 933

The calculi in 15 female cases (one a girl) were—

Uric acid	11
Uric and phosphate	2
Phosphates	2

The calculi in 16 cases of male children were—

Uric acid	10
Urate and phosphate	3
Oxalate	1
Oxalate and urate	1
Phosphate	1
	<hr/> 31

Total number of cases	<hr/> 964
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4. THE AGE OF MALE PATIENTS with calculus will be next examined. I have already referred to the very large proportion of elderly men who are affected with calculus, in calling attention to the circumstance that this important fact has been in former time greatly overlooked. The following table forcibly illustrates this view.

Of the entire record of 964 cases, the number of MALE patients (adults and children) operated on was 949. Their ages are shown in the following table, which presents them in five classes for reasons which will appear.

CLASS 1 contains all from the earliest age to puberty, say from the first to the fifteenth year.

CLASS 2, the period from 15 to 25 years, at which stone is most rare.

CLASS 3, from 25 to 50, during which it gradually becomes more frequent.

CLASS 4, from 50 to 70, when stone, especially uric acid, abounds.

CLASS 5 contains all cases above 70 years, when stone is also frequent, but the proportion of vesical phosphatic formations is greater than in the preceding class.

	Below 16 years.	16 to 24 years.	25 to 50 years.	51 to 70 years.	Above 70 years.	Total.
In the hospital	13	5	22	56	4	100
In private	3	8	89	565	184	849
Total	16	13	111	621	188	949

The mean age of the entire adult male cases occurring in hospital and private practice is within a fraction of $62\frac{1}{2}$ years. The greatest age at which I have operated is 91 years, by lithotripsy, for a stone of considerable size (Case 797), occurring in January, 1888; the patient, who passes all his urine by catheter, was greatly relieved, and was living (1889) free from his calculous symptoms, and in fair health for his age.

5. NUMBER AND NATURE OF THE FATAL CASES.—I have made it a rule to accept as a "fatal case" any instance in which death took place within six weeks of the operation from any cause; four instances excepted, in three of which it suddenly and instantaneously occurred from failure of the heart's action, the result of long-standing organic disease; the patient in each case being completely convalescent and in apparently good health. In the fourth the death occurred in similar circumstances from acute bronchitis acquired within that period. I am satisfied that this rule is too stringent, but I have preferred to err if at all in accepting a full proportion of deaths.

In considering the question of death it is of course absolutely necessary to deal with children and adults in separate classes. The different degree of risk incurred from lithotomy in childhood and in manhood is so great as to render practically useless any numerical inferences regarding the mortality of cases in which this distinction of age is not kept clearly in view. The number of children is so small in this collection that my remarks will be brief. There were 16 male children and one female. Four were treated by lithotripsy, and 13, being mostly large stones, by lithotomy, one of them being very large by the supra-pubic method. I commenced on the principle of employing lithotripsy for children whenever

the calculus could be crushed at one sitting, and the very first case of stone which fell to my lot occurred in a girl, and was thus crushed, in 1854.¹ Three other cases followed, the first being in the year 1860, at University College Hospital, all successful. This treatment I enforced at some length in my first work on Calculus, published in 1863, alluding to the practice adopted in the Children's Hospital in Paris, where large calculi were crushed at numerous sittings, with very unsatisfactory results.² Among the 13 lithotomies in children there was one death, a case of deformed pelvis from rickets, exhibited at the Royal Medical and Chirurgical Society in 1863, in which with great difficulty I removed the calculus through a preternaturally contracted outlet.³ Had I been aware of the fact beforehand, I should certainly have performed a suprapubic operation.

Hence I have first to deal briefly with the mortality following 933 cases of operation in the MALE ADULT ONLY, 800 treated by lithotrity, and 133 by lithotomy.

At the middle of the present century, soon after which my series commenced (the first case just referred to dating 1854, although there were practically none, that is only three, before 1860), the relation between lithotomy and lithotrity was that of rival systems for the relief of the calculous patient, the respective claims of which for preference were under consideration by the profession. Sir B. Brodie had declared in favour of lithotrity for cases in which the calculus was small, and the passages favorable and healthy (Royal Medical and Chirurgical Society, 1855). The practice, however, then and for ten years after was to employ lithotomy as a rule, and lithotrity only in exceptional instances. It was much later than this before even half the cases were generally submitted in this country to the crushing operation. When Sir W. Fergusson in 1865 gave a summary of his entire experi-

¹ Vide 'Lancet,' 1854, October 21st.

² 'Practical Lithotrity and Lithotomy,' Churchill, 1863, pp. 207—211.

³ 'Trans.,' vol. xlvii, p. 11.

ence, the total number of his cases was 219, namely, 110 of lithotomy, and 109 of lithotritry—an equal division between the two methods, although the latter had occurred in an increasing ratio during the later years of his practice. My observation of Civiale's practice in Paris, who performed lithotritry in fully seven eighths of the calculous cases which at the rate of about fifty a year passed through his hands, convinced me that this proportion offered far better results than those attained by the English practice, provided Civiale's instruments and procedure, both at that time much superior to our own, were adopted. This conclusion was also shared by Mr. William Coulson, of St. Mary's Hospital, who acted on it towards the end of his career.

But the present relations between lithotomy and lithotritry have gradually been changed. There is no longer any rivalry between the two systems; one operation is complementary to the other. Lithotritry has in fact superseded lithotomy for all ordinary cases of stone, whatever may be the age of the patient; and a cutting operation of some kind is now only necessary or desirable in certain exceptional conditions, extreme size and hardness of the stone being those which chiefly render it necessary.

I commenced practice under the influence of impressions received from Civiale, reserving only my own opinion that lithotomy might occasionally have been adopted with advantage for some of the calculi crushed in Hôpital Neckar at that time. Accordingly, among my first 200 patients, lithotritry was employed in the proportion of about 4 or 5 cases to 1 of lithotomy. In my next 300 it rose to about 8 to 1. And for the last ten years, during which cases of large calculi have been sent to me in an unusual number, the ratio of lithotritry has slightly diminished, the latter five years having furnished 17 cases of high operation in the adult, which, as already said, I have substituted for the lateral with considerable advantage. In relation to this proportion of large calculi it is necessary to note in passing, that one of the results to an

operator of large experience in calculous disease is the attraction to him of advanced and difficult cases. Hence the proportion of patients demanding lithotomy on such grounds increases during the third period of his career, as compared with his experience in the middle and early periods.

But with the large proportion of cases just referred to treated by lithotrity, 800 in number—and let it be remembered that adult cases alone are now referred to,—it necessarily followed that a group of very unpromising patients was formed by lithotomy, differing widely from the average cases formerly operated on by English surgeons, and constituting the bulk of lithotomy records in this country before lithotrity was practised; much also from the lithotomy cases performed by surgeons who submitted only a half or at most two thirds of their patients to lithotrity.

Then it should be further stated here that I have rarely refused to any applicant the last chance of life which an operation might afford him, having done so in fact but five times throughout my career. These were patients who were obviously unfitted by disease and exhaustion to undergo any surgical proceeding whatever.

The group of exceptionally hazardous cases thus set apart in my series for operation by the knife amounted in number to 133, of which 115 were dealt with by perinæal lithotomy, one by the old supra-pubic, and 17 cases by the modern supra-pubic operation.

The series of lithotrity cases comprises 800 operations. Of these, 475 were performed by the old method of one or more sittings according to the size of the calculus, and 325 by the modern method of one sitting only. The mortality, reckoned on the principle laid down above, was as follows:

In 475 of lithotrity by multiple sittings were 33 deaths, or 7 per cent.

In 325 of lithotrity by a single sitting were 12 deaths, or a little over $3\frac{1}{2}$ per cent.

In 115 of perinæal lithotomy were 43 deaths, or rather over 1 in 3 cases.

The mortality of the 17 cases of supra-pubic operation by the new method was 4 cases ; 3 of these occurred in patients whose condition was exceptionally bad : one had been for six years the subject of vesico-intestinal fistula, and his death was certainly not due to the operation, although it was hastened thereby ; while the other two would certainly have been rejected by me for perinæal lithotomy, but I gave them the chance of the less formidable supra-pubic operation. But it may be mentioned here that 11 cases of the same operation for vesical tumour already referred to were followed by death in one case only, making 28 cases of the modern supra-pubic operation, as employed for all purposes, in the adult with 5 deaths.

I beg permission here to recall the fact that in reporting the first 500 cases presented to the Society in 1878 I carefully investigated the causes of death, which occurred in 61 cases, and recorded them under several heads in a tabular form. The technical distinctions there employed have been somewhat changed in dealing with the mortality in the 434 cases which have passed through my hands since that date, in accordance with the progress of pathological knowledge. The following table will show the later results in three columns : deaths after lithotripsy, after perinæal lithotomy, and after supra-pubic lithotomy.

Causes of death occurring in 434 male adult cases operated on since preceding report of 500 cases in 1878.

	Lithotripsy.	Lithotomy.	Supra-pubic lithotomy.
i. Septicæmia, with deposits in various parts of the body	2	...	3
ii. Acute nephritis, with purulent deposit in the kidneys	3	...	0
iii. Chronic disease of the kidney, with dilatation of the pelvis and ureters	5	...	1
iv. Peritonitis	0	...	1
v. Acute cystitis	0	...	1
vi. Exhaustion in feeble and aged patients, no other cause of death being obvious	3	...	4
vii. Hæmorrhage	0	...	1

	Lithotritry.	Lithotomy.	Supra-pubic lithotomy.
viii. Delirium tremens	0 ...	1 ...	0
ix. Erysipelas	0 ...	1 ...	0
x. In confirmed diabetic patients	1 ...	1 ...	0
	<hr/> 14 ...	<hr/> 14 ...	<hr/> 4

It will be manifest that the death-rate is considerably less in the 433 cases operated on since 1878 than in the 500 cases which occurred before that date, and this in spite of the influx of more formidable cases. This satisfactory result is in great part, although not entirely, due to the increased safety of lithotritry by one sitting, as compared with that by several sittings, and to the marked superiority of lithotomy by the supra-pubic route for large calculi to that by the perinæum.

Lithotritry in the male adult.

SERIES I.—Cases reported to the Royal Medical and Chirurgical Society in 1878 :¹ 422 cases with 32 deaths, mortality $7\frac{1}{2}$ per cent.

SERIES II.—Cases since that date now reported : 378 cases (325 by one sitting) with 14 deaths, mortality rather over $3\frac{1}{2}$ per cent.

I may note also that among this small number of deaths following lithotritry, Series II, I include one which I was sent for into the country to finish for an aged and worn-out patient (No. 619), whose stone had been already crushed three times by my friend who summoned me, the case being one of unusual difficulty. I emptied the bladder at this sitting, removing a large quantity of calculous matter, and the patient gradually sank from exhaustion. I accepted this case as a fatal one for my own list, certainly not with satisfaction, excepting that which arises from the consciousness of adhering strictly to a principle laid down, however hardly it may sometimes apply.

It is worthy of observation also that no accident in

¹ Vide 'Trans.,' vol. lxi.

operating has been met with in the present series ; such as perforation of the bladder by the staff in lithotomy—the breaking of a lithotrite—and the impossibility of withdrawing an over-impacted lithotrite, of each of which an example was described in the first series. The first named was of course fatal ; the second and third were successfully dealt with.

6. UNUSUAL CASES.—I shall now very briefly advert to some examples in the collection of calculus formed under conditions rarely occurring, and therefore of unusual interest.

Thus in Case No. 66, an adult, the nucleus of the calculus, which was removed by lithotrixy, is constituted by a portion of dead bone, most probably exfoliated from the pelvis. Some years before the operation the patient had been the subject of chronic hip-joint disease, then cured, and considerable exfoliations had taken place from the surface of the hip, several cicatrices being visible.

But I also found a large exfoliation in the bladder, the result of hip disease, in a youth, Case 878, whom I cut by the lateral method, consisting of a great part of the head of the femur thickly covered with phosphates, believing it to be simply a large phosphatic calculus, until subsequent examination showed that it was the bone in question. This must have gradually made its way through the pelvic bone and entered the bladder, remaining there long enough to have acquired a large deposit before symptoms rendered an operation necessary. This case, like the preceding, made a good recovery ; both were treated in University College Hospital.

Several examples of encysted calculus have been met with, cases in which the condition was demonstrable at the time of the operation by digital exploration. Two occurred in female patients, and were felt by the medical men present : in one case, No. 883, the stone itself shows by its form the portion which was encysted. This I turned out of its bed by means of my finger without difficulty ; the other, No. 887, was almost entirely en-

capsuled, and gave some trouble to remove. Dr. Smith, of Dumfries, who brought the patient to town, was present ; both of the patients recovered. Another example in a male subject (No. 193) lay just within the neck of the bladder, and was only felt by me after I had, by lateral lithotomy, removed one from the cavity ; when on searching I thought I felt another, but found on introducing my finger into the rectum that it was absolutely fixed, almost the entire formation lying outside the cavity.

In Case 653 two pyriform calculi, each the size of a large nut, occupying a cavity close to the neck of the bladder, were turned out by the finger and a director, Dr. Macnab of Bury St. Edmunds being present.

One very remarkable case is that of a patient *æt.* 64, No. 714. He was the subject of lithotritry in 1885, having for some years previously passed all urine by catheter. Seven months after, being again a sufferer, and no stone felt by sounding, I explored the bladder by incision from the perinæum, and detected in the neck a number of small calculi in a sac. I opened this by the knife and removed six, each about the size of a large pea, facettèd by close contact. I drained the bladder, and the wound healed slowly. Next year his symptoms again became more severe, and the catheter was required every hour. The prostate was very large ; phosphatic matter could be felt, but no defined stone. I performed supra-pubic lithotomy, cleared out a quantity of phosphatic matter firmly adhering to the inner coat of the bladder attached by fibrinous deposit, and then established a constant opening, so as to dispense with the use of the catheter in future. Fitted with a well-curved tube and silver plate, he lived for three years in comfort, travelling abroad and taking considerable exercise ; never used the catheter again. He died in August, 1889, efficiently served by his tube to the last.

Of course the well-known cases of facettèd calculi lying closely packed in front of the bladder, occasionally met with, and composed chiefly of phosphate of lime, are not here referred to, as these are more common than calculi really

encysted within the vesical cavity, which are extremely rare.

I shall refer to the largest calculus in the series, No. 717, as more remarkable for its structure even than for its size. It is composed of uric acid with a small proportion of alkaline base, but without any phosphatic deposit whatever, either internally or externally, notwithstanding that it weighs no less than fourteen ounces. I have never seen in any collection a calculus nearly approaching in size to this *unmixed with phosphates*.¹

Let me observe that when a calculus has been cut in its largest plane it is easy to trace somewhat roughly the patient's history, reading it, so to speak, from and "between the lines" exposed by the section. Thus a pure uric or oxalic acid nucleus is mostly seen, and if the patient's circumstances permitted him to avoid much exercise, because found by experience to be painful, he escapes cystitis and alkaline urine, and the acid deposit continues. But an attack with muco-purulent urine sooner or later leads to phosphatic deposit, a ring of which appears in the calculus to mark the fact; and another fact, viz. that he was then kept quiet for a time, is indicated by subsidence of the phosphate followed by a fresh ring of uric acid deposit. Similar changes of deposit again appear, and furnish the outline of a history which I have often found interesting, but which cannot be further illustrated here.

I subsequently learned from this patient that as soon as symptoms became painful he assumed the horizontal position, and maintained it night and day for a period of somewhat more than ten years, and thus escaped an attack of cystitis and phosphatic urine. Moreover, the stone is seen to have occupied during, at all events, the latter portion of that period an unchanged position in the bladder, for each side of its base is deeply indented by the flow of

Cheselden's largest calculus weighed seventeen ounces. It is largely composed of uric acid, three separate calculi originally, united to form one through being cemented together by a considerable proportion of phosphatic matter. It is now in the Royal College of Surgeons, No. A.c. 7.

urine issuing from the corresponding ureter, several layers of the crust being thus worn through ; illustrating, by the way, the truth of an observation made some time ago, that fresh, pure, healthy urine exercises some solvent power on certain calculous formations. The patient's age was sixty-two when I performed the high operation for him in 1865. He made a good recovery and married about a year after, and wrote me last summer that he was enjoying good health and an active life. He was sent to me by Mr. Atkinson, Bennington, Boston, Lincolnshire.

Among somewhat rare calculous cases should be named three cases of cystine. Of these one was crushed (Case 127) for a gentleman of eighty years of age, who lived to be ninety. Another (Case 690) is the largest I have ever seen ; it weighs two ounces and three quarters, and was removed by the high operation in 1884. The patient is living and well. The third (Case 274) was cut by the lateral method in the hospital and made a good recovery.

The two following cases illustrate an incident which seldom occurs. In No. 253 I performed lithotomy for a large uric acid calculus in which spontaneous fracture had recently occurred, producing formidable cystitis. Case 333 was an instance in which fracture of calculus took place on sounding, and a similar case is alluded to in the notes thereon in the catalogue.

Case 7 was that of a man *æt.* 22, whom I cut in the hospital in 1861 ; a phosphatic stone which had a piece of sealing-wax about an inch long as its nucleus, which he stated that he had used as a bougie about six months before. He left the hospital, and I saw no more of him until two years ago he called upon me to report himself well, twenty-eight years after the event.

Lastly, I shall only name four cases operated upon for the removal of a foreign body strictly so regarded, no calculous matter being present, since the object had been introduced into the bladder within a few days before coming under observation. Three of these were successfully dealt with by the lithotrite. The fourth, occurring in a

girl in University College Hospital in 1865, I was compelled to deal with by the old supra-pubic operation, the course and results of which appeared to be quite satisfactory, but death suddenly occurred through the bursting of a peritoneal abscess, when she had resumed active habits after supposed complete recovery.

Two were hair-pins, purposely introduced, and two were broken catheters.

Here I must close this somewhat lengthy record. I would gladly have entered on the perhaps more interesting subject of practical lessons in relation to treatment deducible therefrom; but this it was manifestly impossible to do as part of the present paper, and if ever accomplished must form a communication by itself.

(For report of the discussion on this paper, see 'Proceedings of the Royal Medical and Chirurgical Society,' Third Series, vol. ii, p. 79.)