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A REVIEW OF THE OPERATIONS FOR
STONE IN THE MALE BLADDER.

BY

WILLIAM F. HASLAM, M.B., F.R.C.S.

A HISTORY OF THE
STATE OF NEW YORK

BY
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A REVIEW OF THE OPERATIONS FOR STONE IN THE MALE BLADDER.

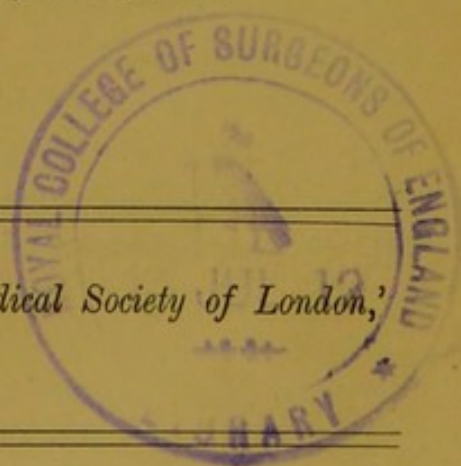
BEING THE
LETTSOMIAN LECTURES
DELIVERED BEFORE
THE MEDICAL SOCIETY OF LONDON
ON
FEBRUARY 6TH AND 20TH, AND MARCH 6TH, 1911,

BY
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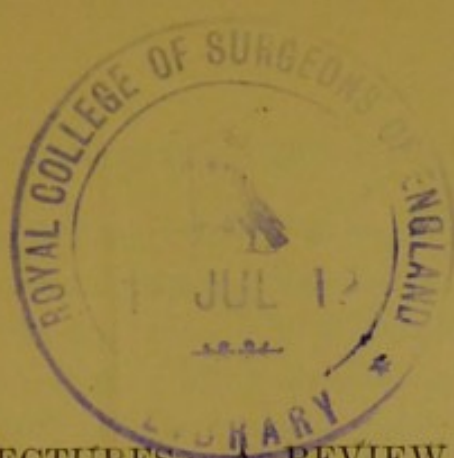
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LETTSOMIAN LECTURES: A REVIEW OF THE OPERATIONS FOR STONE IN THE MALE BLADDER.

By WILLIAM F. HASLAM, F.R.C.S.

LECTURE I.

MR. PRESIDENT AND GENTLEMEN,—My first duty is to tender my thanks to the Council of this Society for the honour they have conferred upon me by asking me to give these lectures. I can assure them that this is no mere figure of speech, for when I look at the names of those who have preceded me, and the importance of the subjects they have dealt with, I feel that in accepting the Council's most kind invitation I have incurred a very considerable responsibility.

These lectures were founded to keep before us the memory of one who in his day must have been not only a good physician, but a very remarkable personality. John Coakley Lettsom was born on November 22nd, 1744, at Vandyke, in the West Indies. His mother had seven times had twins, all of whom were males. He and his brother Edward were the last children born to her, and the only two who survived. He was sent to England to be educated, and after serving the usual apprenticeship came to St. Thomas's Hospital, where he seems to have been a student of unusual ability and industry, and to have distinguished himself by taking a keen and intelligent interest in his cases, of which he made careful records. Such diligence seems to have been "a custom more honoured in the breach than the observance" with students in those days. He widened his experience by studying in the Universities of Edinburgh and Paris, and in other Continental schools, and he took the degree of Doctor of Medicine in the University of Leyden. He practised with great success in London, and was one of the original Fellows of this Society; its records show that for many years he was also one of its most active workers. On looking at the list of subjects on which he wrote, we are struck with their extent and variety. His mind must have

been one of extraordinary activity, and his interests were wide. Mention of a few of the subjects on which he wrote will show this. He published 'The Naturalists' and Travellers' Companion,' containing instructions for collecting and preserving objects of natural history and for promoting enquiries after human knowledge in general. In 1801 he published three volumes of 'Hints and Essays,' and amongst others in these volumes we find "Hints respecting a Samaritan Society," "Crimes and Punishments," "Wills and Testaments," "The Support and Education of the Deaf and Dumb Children of the Poor," "Religious Persecution," "To Masters and Mistresses respecting Female Servants," "The Prevention and Cure of Infectious Fevers, and the Establishment of Homes of Recovery," "Hints addressed to Card Parties," and "Hints designed to promote Medical Relief to the Poor at their own Habitations." He also edited the works of his friend Dr. Fothergill, and on January 19th, 1778, he delivered the oration before this Society, taking as his subject the "History of the Origin of Medicine," which he afterwards published. Dr. Lettsom was benevolent to an extraordinary degree, and spent much time and money in assisting those in distress. He died on November 1st, 1815. He must have been a man of wide information and liberal views, a great man as well as a sound physician, and we may be the better in these days when the tendency to specialise is ever increasing, for remembering what he was and what he was able to accomplish.

I am confident you will recognise that the choice of a subject for these lectures is by no means easy. Lectures and addresses are so frequently given that the difficulty of finding new ground is an ever increasing one. Bearing in mind that in his oration before this Society Dr. Lettsom dealt with the history of the origin of medicine, I thought I should be fully justified in leaving the beaten track and in drawing your attention for a time to the methods that have been adopted for the treatment of stone in the male bladder. The evolution of the various operative measures we adopt must always be a matter full of interest and of no small importance, and yet it is one that has not received that attention and consideration from us that it merits. Surgical progress has been so rapid during the past quarter of a century, and the strain to keep in any sort of way abreast of it has therefore been so great, that we are often quite unmindful of what good work was

done years ago, or of what we owe to surgeons of the past whose courage, skill, manipulative dexterity, and clinical instinct were in no way inferior to ours; who, by virtue of these qualities, were leaders then just as they would have been leaders now had they been born in our time. While there is much of interest in the history of the methods we adopt for the treatment of such conditions as diseased joints, aneurism, hæmorrhage, or ovarian tumours, none of these present a chapter so full of interest and romance as does that which is disclosed when we trace the evolution of the treatment of stone in the bladder.

It is known that operations for the removal of vesical calculi have been performed for over two thousand years, and we are indebted to Celsus for a clear description of the method then adopted, which with but little variation kept the field for over fifteen hundred years, and was at times practised as lately as two hundred years ago. This operation seems originally to have been regarded as beyond the scope of the practitioner of that time, for we find that those who took the Hippocratic oath bound themselves not to perform this operation, the disciple taking the oath said: "I will not cut persons labouring under the stone, but will leave this to be done by men who are practitioners of this work." No wonder then that the operation fell into the hands of quacks and irregular practitioners, but in justice to them we must remember that the first step of putting the operation on a sound foundation was taken by a man who was in no sort of way qualified as a practitioner of medicine. When we remember that this operation has not only been brought before societies of learned men, but before princes, Parliaments, and men in high position, there is sufficient of interest to warrant our giving it some attention. We may safely conclude that a person suffering from a vesical calculus in those distant days had to put up with the pain and distress until his condition was desperate. There was no early diagnosis of stone then; indeed, the stone was detected not by the sound, but by introducing the fingers into the rectum and feeling it through the anterior wall. The next step was to recognise that it could be pressed forward against the perineum; then, when this was done, it was but one step farther to suggest that the intermediate parts should be cut with a knife and the stone extracted. Such were the steps by which the first simple operation was arrived at. It is possible also that the sloughing

of the perineum, due to the presence of a stone impacted in the deep urethra, thus allowing it to come away, may have suggested the division of the soft parts as a means for its extraction. This operation, from its having been described by Celsus, has been called the *Lithotomia Celsiana*, or, from the use made of the fingers in pressing down and holding the stone, it has been called cutting on the gripe, and when, in later ages, more complicated operations were invented and many instruments used, this was named the apparatus minor, or lesser apparatus, from its being performed with no other instrument than a knife and a hook. Such an operation as this, requiring no knowledge of anatomy for its performance, could be undertaken by quacks, whose only desire was to extract the stone, and who were indifferent as to any complications which might arise afterwards. Apart from these, however, it was performed by regular practitioners, and for many centuries was in considerable favour. Celsus describes the operation as one which, "when all others fail, must be performed on those afflicted with the stone; an operation which, since it is full of danger, must never be rashly performed, nor at all times and seasons, nor in all ages, nor in all degrees of the malady; but only in the spring in boys from 9 to 14 years of age, and when the disease is so desperate that it can neither be cured nor even alleviated by medicine, but when the person must die in a little while." Such then were the conditions justifying the operation. It is difficult to understand why the operation should not have been performed on boys under 9 years of age, as it could have been carried out as well before that age as after. In the adult there were difficulties, arising from the size and depth of the perineum, which may have rendered it more dangerous than in boys. The operation was performed as follows:—The fore and middle fingers of the left hand were inserted, one after the other, into the anus, while the right hand was placed on the lower abdomen. The stone was then sought for by the fingers of the left hand in the rectum, assisted by those of the right hand, which pressed from above into the pelvis, and kept the stone in front of the left fingers so that these might press it from behind forwards against the neck of the bladder and perineum. The difficulties at this stage were fully recognised, for we are told that, "when the stone is within the gripe, it must be more cautiously and carefully handled in proportion as it is small and smooth, for a small and

smooth stone is apt to slip back, and to occasion much handling and tormenting of the bladder. For these reasons the fingers of the right hand are pressed in behind the stone, while, with the fingers of the left hand, it is brought downwards to the neck of the bladder. If the stone be oblong, let it be presented, lying along with one end turned towards the wound, if flat with one edge towards the wound, if square resting upon two of its angles, if bigger towards one end, let the smaller end be presented to the wound. Whereas, when the stone is round there can, from the figure of the stone, be no difference in which position it is presented, but from its roughness there may, if in a rough stone there be one smooth part, let that part come foremost." Such reasoning as this shows that the early operators not only knew of the difficulties that were likely to arise, but were capable of obviating them as far as circumstances would allow. The next step was to make the incision directly on to the stone. This was "of a lunated form, not far from the anus, and with the horns of this lunated incision looking towards the hips. Then, in the deeper and narrower part of the wound is to be made a second incision, also transverse, into the neck of the bladder itself till the flowing out of the urine shows the incision to exceed, in some degree, the size of the stone. The neck of the bladder being thus opened the stone itself comes into view, which, if small, is to be got out with the fingers alone, the fingers of the left hand pushing it forward from within, while the fingers of the right help to pick it out; but if it be larger, a hook, made on purpose, must be slipped in behind it." This hook, we are told, "should be flattened and bent into a semicircular form, smooth on its back part, where it presses against the parts, and rough where it touches the stone, and it should be rather long, for a shorter hook has little power." Such careful detail could hardly be improved upon, and when we read the directions for its use we see that the operators had at least given attention to their work, for we are told that, "when the hook is fixed behind the stone, it must be moved from side to side, to work the stone forwards; for the stone, if it be fairly caught by the hook, moves along with it; whereas, if you merely press upon the stone without moving it thus from side to side, it will slip, it will escape again into the bladder and the point of the hook will strike against the edges of the wound. Having secured a fair hold of the stone, you are to perform at one moment three separate motions, viz., from one side to the

other and directly forwards, but all quietly, taking care first to draw the stone a little downwards. Finally, the handle of the hook must be raised, that the lower end may press deeper behind the stone, which may be then more easily protruded. The stone, if it be not easily caught from above, may be extracted by slipping in the hook from one side." Celsus was fully alive to the danger of dragging a large stone through a small incision, and he therefore recommends that "when the stone is too large to be extracted without laceration of the neck of the bladder, it is to be broken." This was accomplished by fixing it with the hook and then striking it with a suitable iron instrument. Such then was the nature and scope of the operation as described by Celsus, and for many centuries it was the only one that was resorted to. There were obviously many dangers connected with it, and it would not be unfair to assume a high mortality. The operators, however, had the sympathy and support of the public, though they were not regarded favourably by the profession. One, especially, rendered himself obnoxious to the regular practitioners by the success he attained in the practice of this procedure. This was Le Raoues, who operated in the 17th century in the principal cities in France, long after surgeons had established the operation known as the Marian. When one reads of his skill in operating, and considers that surgeons were then performing the Marian, with all its horrible cruelties, it is easy to understand that the advantage was with him as regards results. His operation was an advance on the apparatus minor as described by Celsus; for, instead of using it only for boys from 9 to 14 years of age, he cut men of all ages, and did not hesitate to pass three fingers into the rectum when necessary. His incision, instead of being transverse and lunated, was longitudinal and curved to the left of the middle line. Further, by drawing the skin of the perineum to the right and pushing the stone towards the left he obtained an oblique or valvular incision on to the stone, so that the bladder should be closed afterwards. This, however, could hardly have been an advantage, as the risk of extravasation of urine must have thereby been considerably increased. He is, however, reported to have operated on a nobleman who was able on the ninth day, to walk round the city with his operator. Raoues, after having operated with great success in the provinces of France, appeared in Paris, and managed to gain access to the

society of learned men, where, in the presence of His Highness the Prince of Condé, he stated that he had discovered a new way of cutting for stone, more expeditious, safe, and easy than that by the Marian then in use. This brought down on him the wrath of the physicians, and more especially of Collot, the King's Lithotomist, who did not hesitate to say that he operated on men who had not the stone, and that the one produced was one which he held in his sleeve and dropped into the palm of his hand at the proper moment and presented to the spectators, soiled with the blood of the wound. In spite of such hostile criticism there can be no doubt whatever that his was a plain, simple, and successful operation, which he well knew how to perform, and there was no need for him to resort to deception. He was therefore bound to make enemies, many of whom invented tales against him.

The incision in the apparatus minor, up to the time of Celsus at any rate, was transverse and lunated; the incision of Raoues was also lunated, but it was nearly an inch to the left of the middle line, a sort of semicircle around the tuber ischii. It is not known when this was changed for a longitudinal incision, but about this time the incision was made in a direction similar to that of the Marian, that is, in a lateral direction. In the case of the apparatus minor, the incision was made on to the stone, while in the Marian it was made on to the staff. The original transverse incision was open to many objections, for the parts cut varied according to the degree in which they were protruded by the fingers, and it was quite possible to completely sever the urethra from the bladder, an accident which might also happen with the lateral lunated incision. The extraction of the stone was comparatively simple, provided a suitable incision was made, and there was the further advantage that no gorgets were used. The bladder was entered by a clean cut of sufficient size, but unfortunately it was possible by this very method to inflict irreparable harm, and at all times there must have been a great uncertainty as to what parts were being cut. The dangers and difficulties of this operation were therefore very considerable. Great pain was caused by bringing a rough stone to the surface in a chronically inflamed bladder. The irregularity of the stone frequently caused the incision upon it to be so uneven as to render its extraction difficult. The possibility of damaging the rectum with the fingers was very real. In a stout patient the size of the bladder and its distance from the surface rendered it difficult

to protrude the stone, and it was very difficult to retain it in that position in the case of a very smooth stone. There was also the fact that the surgeon's fingers became tired when pressing down the stone on to the perineum. It was not, however, until early in the sixteenth century that any serious attempt was made to introduce any other operation in place of this, and it is somewhat uncertain as to the exact reasons that caused the new procedure to be adopted. It has been suggested that the first idea of this may have arisen from observing how easily stones were frequently voided by women, either naturally or with some assistance; the shortness and great dilatability of the urethra in women giving a comparatively easy passage to the stone. It may therefore have been argued that if an opening were made into the male urethra near the bladder, so as to have the intermediate parts as short as in women, it might be dilated and the stone extracted with ease. Such an operation was also in accord with the view generally held at that time, that a wound of a membranous organ, such as the bladder, was mortal. Thus it may have been that, seeing the dangers and difficulties of the apparatus minor, men were honestly searching for an improved method; or was it from less worthy motives that the new operation was introduced? Such at any rate was the reason, if we are to believe Heister, who says that physicians abandoned it because "their fees were melting away, their gains and honours were intercepted by quacks. They invented, therefore, new and curious operations, not to cut men more easily, but to display their learning. They first proved by an aphorism of Hippocrates that wounds in membranous parts are mortal. Thence they deduced this rule that, whatever external incisions might be required, the neck of the bladder itself should never be divided with the knife, but should only be dilated with instruments of various forms." They willingly forgot the maxim of Celsus, "that there is greater danger in dilating the neck of the bladder than in opening it by incision." They therefore dilated the parts rather than cut them, and the simplicity of the apparatus minor, and the ease with which it was performed, may have been, if we are to accept this view, their chief objection to it. "Those," says Heister, "who choose to speak contemptuously of this method, represent it as an operation fit only for quacks and mountebanks, as an operation too low and contemptible even to be practised by regular surgeons and physicians; modern surgeons have invented more cunning and curious methods, such as the vulgar

do not know, such as must captivate all ranks of men, the rich and great as well as the vulgar, by the profusion and elegance of the apparatus."

The operation that superseded the apparatus minor was called, not without good reason, the apparatus major, or, from its having been described by Marianus Sanctus Barolitanus, the Marian operation. The instruments used were well calculated to impress the great with admiration and reverence, provided they were not likely to require its assistance; but the feelings of the unfortunate patient must have been those of mingled dread and fear, while the spectators of this agonising proceeding must have left the scene with a silent prayer to be delivered from the troubles incident to a vesical calculus. The inventor of this horrible operation was one Joannes de Romanis, a surgeon of Cremona in Italy, but for some reason he did not publish any account of it. This omission, however, was made good by his pupil, the eloquent Marianus, in 1524, who was quite equal to the task of presenting it to the public in language that would convince them of its virtues. Even the fact that it was to be performed by the use of an ordinary barber's razor did not disturb him, for he proceeds: "The barber's razor, friendly reader, is a most important weapon, wherewith, when the business is to shave, cut close, and utterly subdue a stubborn and rebellious beard, the barber mows down the hairs, thousands falling before him at each remorseless stroke." All the instruments in their turn are spoken of in the same strain, but as dilatation was the chief purpose of the operation, the description of these instruments of torture excels even that of the razor. "Look," he says, "look but to the aperiens, how it gapes with desire when the conductors have made way for its approaching, and, seizing the stone, it rages like the ferocious soldier ready to enter the breach in the walls of the besieged city. Next come the voracious and vociferous forceps themselves, which often, when their morsel is too large for them to devour, cry out for the aid of their two supporters, or latera, which are then laid side by side with the forceps." The operation thus fantastically described was performed by introducing a grooved staff into the bladder, then opening the perineum by an incision in a longitudinal direction to one side of the middle line, which, however, did not pass backwards through the transverse perineal muscle into the ischio-rectal fossa, thus considerably limiting the space through which the stone had to be removed.

The groove in the staff was then felt for and the membranous urethra opened by fixing the point of the knife in the staff. A probe was then passed along the knife into the groove, and along this into the bladder. The staff was now withdrawn. The operator then took two conductors, like strong iron probes, one, called the female conductor, having a groove in it, the other, the male conductor, having a probe point corresponding to the groove. The female conductor was passed along the probe into the bladder, which was then removed, and the male conductor was passed along the groove in the female conductor until it also was in the bladder. Then, indeed, the operator was in a position to carry out his principle of dilating the deep parts, for, taking a conductor in each hand, he separated them to such an extent as to dilate, or rather tear open, the prostate. The wound was now prepared for the introduction of the dilator, an instrument resembling forceps, whose points diverged and opened when the handles were pressed together. The dilator was passed into the bladder between the conductors, and the wound was stretched until it would admit the forceps. Finally the dilator was removed and the forceps were introduced between the conductors, the stone was seized, and the conductors removed. If now the stone could be extracted there was no further need for help, but if, as Marianus said, the stone was too large for them to devour, they cry out for the aid of their two supporters or latera. These were passed by the side of the forceps and locked upon the stone so that the whole resembled a four-bladed forceps. The latera were so constructed that on clasping the handles the points closed and the hinges rose, so that the instrument served at once the double purpose of dilators and assistant forceps. This barbarous procedure did not entirely supersede the more simple, and probably at least equally successful, apparatus minor, for, writing in 1808, on "Lithotomy," Allan says of the apparatus minor: "It was longer practised than all the other methods for lithotomy put together, and was performed at Bordeaux, Paris, and other places in France on patients of all ages, by Raoules, even so late as 140 years ago. It was one of the operations of Frère Jaques, for he had two; in performing it he made a longitudinal instead of a lunated and transverse incision. It was practised with great success by Heister, and when a staff is used to prevent the wounding of the urethra, it is still the preferable way of operating in boys. Instead of driving a gorget into

the bladder of a child, which, from the smallness of the parts, is a most perilous stroke, even in the hands of an expert surgeon, we would introduce a small staff, cut upon it till we reached the bladder, then introduce the fore and middle fingers, well oiled, into the rectum, bring forward the stone, and, by cutting directly upon it, force it out. There is no difficult dissection, no depth of parts, no protracted sufferings, no mangling with the forceps, no possibility of doing harm—the staff prevents the bladder from being severed from the urethra. It is performed in two minutes, and this method of operating we would invariably recommend in operating on boys under 14 years of age.” Thus we see that with slight modifications the Celsian operation was in favour with some surgeons for over two hundred years after the account of the Marian was published. In spite of its many defects the apparatus major found many ardent supporters. And it was taken up and run as a special procedure by the Collots, the first of whom, Laurent Collot, was appointed to the position of Court Lithotomist, in 1556, by Henry II of France. The Collots were famous lithotomists for eight generations, but they kept their exact method of operating a secret. There are two statements as to how this became known—one that a book was found in the closet of the elder Collot, written in his old age, containing an authentic account of his operation; the other and more exciting version being that some surgeons bored through the ceiling of the operating theatre at La Charité in order to watch the great operator at work. They were rewarded for their trouble by seeing him do an operation which was only a slight modification of the Marian, which was well known to all those practising lithotomy. The operator was Jerome Collot, who died in 1684. The Collots were strong supporters of dilatation; indeed, they considered that the whole secret in operating lay in the dexterous use of the dilators, and when the gorget was invented, one of this family took upon himself to defend the dilator, which it was intended to replace. The gorget was not at first a cutting instrument, but merely a blunt wedge, a scoop of conical form, which, from the form of its beak, slipped easily along the groove of the staff, and by its wedge-like shape dilated the wound, and by the groove or hollow served as a conductor for the forceps. “I do not deny,” says Collot, “that those who refuse the use of the dilator may find themselves successful with the gorget—the gorget may be a commendable

invention—but this I will say, that those who thought it necessary to invent the gorget must have understood very little the way of using the dilator, for the use of this instrument may be regarded as a sort of secret in the art not to be acquired but by being taught.” Marianus draws attention to the fact “that while the dilator was passed between the male and female conductors it was necessary to hold them perfectly steady and firm,” the reason for this being that unless this precaution was taken they might be forced through the fundus of the bladder, as was actually seen by Saviard in a case operated on by another surgeon. Such was the reality of this danger that some conductors were made with holes through which cross-pins were placed to prevent their being pushed in, others were made with cross handles, like a Roman sword. The wound left after this operation was not likely to heal, nor did it, and in nearly every case that survived the operation a fistula was left for life. A canula was usually inserted into the bladder after the operation, and Collot was active in support of this, for he criticised Frère Jaques for healing the wound too early. The horrors of this operation were so great that as soon as Frère Jaques appeared with his operation he had a considerable following, though the Marian had a fascination for many who had been taught its mysteries. Some indeed, while professing to do it, modified it to a great extent. They commenced by cutting low in the perineum, but added to this an incision in the prostate by running the knife forwards in the deep part of the wound. This of course was against the traditions of the Marian operation, where dilatation was laid down as the foundation on which it stood. One of the most noted men who, in theory, supported dilatation as opposed to incision, was Le Cat, a lithotomist of Rouen, who was ambitious of being considered an original inventor, and would not perform an operation which was not in some sense his own. He was constantly changing his methods and his instruments, and at the same time that he was insisting that dilatation alone was safe he was in practice dividing the prostate with the knife, much as other lithotomists were then doing who had openly adopted the operation of Frère Jaques. In studying the Marian operation we see that it was faultily conceived, and so rough in its detail that the patient stood but a poor chance. The operators desired not to cut into the bladder but to effect an entrance by dilatation. The incision was placed too far forwards, and was in the perineum,

and did not extend into the ischio-rectal fossa, where there was more room for the passage of the stone. The urethra was opened through the bulbous portion, and, as the surgeon was impressed by the idea that membranous parts should not be cut, the membranous urethra, together with the prostate and neck of the bladder, were dilated, or rather torn open, by his instruments. The destruction of so great a length of the urethra, for by the time the operation was completed it amounted to this, led to the formation of a permanent fistula, if the patient escaped the ordeal with his life. As to the actual mortality attending this procedure, a glance at the list of the operations performed in the hospital of La Charité, and collected by Morand on his return from England, where he had learnt the lateral operation from Cheselden, will show that there was room for improvement.

			Cut.	Died.
In 1731	...	...	14	8
In 1732	...	...	11	4
In 1733	...	...	16	8
In 1734	...	...	17	9
In 1735	...	...	13	9
			—	—
			71	38

These operations were performed by the best lithotomists in Paris, and they represent what the actual mortality of the Marian operation was when done under the most favourable circumstances. We do not know the condition of those who escaped death, but we can form some idea of their miserable condition by remembering that probably most of them had incurable fistulæ, with such attendant troubles, discomforts, and dangers as are incident to this condition. While the credit of having introduced the lateral operation should be given to Frère Jaques, it is interesting to know that an almost similar operation was practised by one Pierre Franco, and an account of it published, about 150 years before Jaques was agitating the profession and the public in Paris by his own operation. In 1556 Pierre Franco published a work on the lateral operation and other branches of surgery, and though from his account it was an enormous advance on the Marian operation, no one appears to have followed his description, or to have thought it worthy of notice. Indeed, Ambrose Paré, who published an immense volume of surgery in

1561, makes no mention of Franco's operation. The operation was performed as follows:—With a grooved staff in the urethra, an incision is to be made between the anus and the testicles two or three fingers' breadth from the anus, one or two fingers' breadth from the side of the commissure of the perineum. This must be done with a razor that cuts on both sides towards the point, and cuts well, being small at the point, for it is necessary that it should cut at the point. The razor is introduced into the groove in the staff and passed into the bladder so as to divide the neck, the opening being according to the size of the stone. The razor is withdrawn and a gorget introduced into the groove in the staff and pushed into the bladder; when it is in the bladder, the staff is to be withdrawn and the forceps are to be passed upon the gorget into the bladder. The gorget is now withdrawn and the stone must be removed, or, if too large, must be broken. This operation seems to have been a better one than that first practised by Frère Jaques; indeed, it was in many respects on a par with his second operation, yet Franco was treated with contempt during his life. No one appears to have grasped the advantages of this comparatively simple procedure; and, though he cannot be credited with having induced surgeons to adopt his method, he at any rate brought it to their notice.

When Frère Jaques appeared in Paris in 1697 and exhibited to the profession his method of extracting the stone, there was a general feeling, not only among the profession, but by the public, that here, at any rate, was a method that, so far as extracting the stone was concerned, was less brutal and far quicker than the Marian operation, and that whether the results were good or bad, the patient was spared the prolonged agonies of this procedure. The principle of the operation as performed by Jaques was to cut and not to dilate the deeper parts of the wound. He it was who showed that wounds of membranous parts were not mortal, and that Celsus was right when he said: "It is safer to cut than to dilate." By some he was regarded as one sent from heaven to alleviate the sufferings of his fellow creatures. By his enemies, and he naturally had them, he was spoken of in different terms. He was born of poor parents, in Beaufort, in the year 1657, and his only education was some instruction in reading and writing. When he was 21 years of age, he became the servant of a quack of the name of Pauloni, and for six years he travelled about France with

him, acting as his assistant and helping him with his operations on those suffering with stone. When, however, Pauloni went to Venice, Jacques found his way back to his own country and practised those operations at which he had hitherto only assisted. At about the age of 40 he became impressed with the most enthusiastic sentiments of religion, and resolved to devote his life to works of charity. He travelled over the provinces of France, assuming the name and character of a hermit or religious man, and he cut those who came to him with stone. He appears to have extracted certificates from the friends of those on whom he operated, who were astonished at the dexterity with which he extracted the stone. He, however, had the sense not to wait until the time of cure arrived, but at once passed on to another district, leaving his patients to their fate, many of whom died. Finally, he met with some real success among those of high rank, and one of his patients, a Canon of the Metropolitan Church, advised him to go at once to Paris. This he did and took letters from him to one of the Canons of the Church of Nôtre Dame, together with numerous certificates from the magistrates of the towns and provinces which he had visited. On arriving in Paris he introduced himself at the Hospital of La Charité, through M. Marechal, the first surgeon, but the physicians of that hospital would not allow him to operate, though he had come to Paris with the sole object of teaching a new and particular manner of cutting for the stone. The difficulty was, however, soon overcome, for the Canon, to whom he had been introduced, presented him to De Harley, First President of the Parliament of Paris, who became his friend and protector, and he was permitted to demonstrate his operation at the Hôtel Dieu. Frère Jaques' operation was done as follows:—Having introduced a staff into the bladder, without a groove, he took a long knife with which he made an incision by the side of the left ischium, and cutting obliquely upwards he divided all the parts between the tuber ischii and the staff, which he allowed to remain in the bladder; he cut so freely upon the staff as to admit the finger into the bladder, along the finger he introduced an instrument which he called his conductor, as if to dilate the wound, and along the conductor he passed the forceps. Having introduced the forceps he withdrew the conductor, upon finding the stone he withdrew the staff also, and having seized the stone he drew it out. The interest excited by this operation was so great that M. Mery was requested

by the Lord President to draw up a report on it. This he did, and fully recognised and drew attention to the points in the operation in which, in his opinion, it was superior to the Marian. He considered it more favourable with respect to the extraction of the stone than that in common use, for a wound made thus in the neck of the bladder will permit the stone to pass easily, and, being extracted through the widest part of the opening of the pelvis, it will be brought along without violence; whereas, in the common operation, there being no incision but in the urethra, and the stone being forced through the neck of the bladder still entire, and through the narrowest part of the arch of the pelvis, the operation cannot be accomplished without extreme difficulty, and (whenever the stone is large) with great violence. He considered that the operation of Frère Jaques must be less liable to accidents than that in common use. The muscles of the penis were uncut, and the prostate and neck of the bladder were divided instead of the more vascular bulbous portion of the urethra. The incision in the Marian operation was in the perineum, while that of Frère Jaques was further back, where the exit from the pelvis was wider, thus adding greatly to the facility with which the stone could be extracted. Fistula was also less likely to follow an operation when parts were cut rather than torn asunder. This report of M. Mery's was a fair and impartial statement of the merits of the new operation, but it raised a storm of indignation in the profession, and in a short time Mery, who lacked the strength to maintain his opinion, joined those who were opposed to Jaques, and he condemned the operation he had so recently approved. A further trial of Jaques' skill was required, and the President instructed Mery to make a second report. Unfortunately for Jaques his next two cases were failures. One was a boy whose urethra he nearly severed from his bladder, the other was a female whose vagina he cut entirely across and opened the bladder from the place where the ureters enter, up to the beginning of the urethra. It was therefore obviously impossible to report favourably on these two cases, and Mery now retracted the opinion he had previously given of the operation, and the support of the President Harley was consequently withdrawn. Jaques now went to Fontainebleau, where the Court was, and here he was fortunate enough to gain the friendship of the Court physicians and of the King himself. He became intimate with Duschene, Bourdelot, Fagon, and with Felix, body surgeon to

Louis XIV. Fortune now smiled on Jaques, for when these influential men were expressing the most earnest desire to see him operate on a living body, a boy was found who was badly afflicted with the stone, and on him Jaques performed his operation in the presence of the leading Court physicians with perfect success. The operation was rapidly performed. The boy passed his urine naturally soon afterwards, and in three weeks after the operation he was seen walking in the streets. He cut six others while at Fontainebleau, and the King was heard to say, "This is a man that must not be neglected." Jaques was accordingly lodged and maintained at His Majesty's expense. The King soon returned to Versailles, and Jaques entered Paris for the second time, and, as the report of his recent successes was made known, three patients were brought to him on whom he operated with such success that the President Harley again asked for a report from the surgeons and physicians of the Hôtel Dieu. As a result of this request a meeting was held in the Archbishop's Palace on April 7th, 1698, at which were present the magistrates of the city, the physicians and surgeons, and the managers of the Hôtel Dieu. Mery opened the debate, and now spoke unfavourably of the operation, reflecting the opinion of the surgeons and lithotomists who were hostile to Jaques. Finally, however, the physicians and the friends of Jaques expressed the opinion that he should be allowed a further trial in the hospitals, and, in spite of the hostility shown by Mery and his party, it was decided that he should be permitted to perform operations in La Charité and the Hôtel Dieu. Jaques now operated in public at the hospitals, and so great was the desire of all to see him that sentries had to be placed at the gates to keep the mob back. Men from all parts came to see him operate, and they were greatly impressed with his boldness and rapidity, for it is stated that on one occasion he cut nine patients in three-quarters of an hour, a very remarkable performance when compared with the time taken in operating by the Marian.

For a time all went well and his enemies seemed unable to attack him with any success, but before long his patients began to die, both in the Hôtel Dieu and in La Charité, in such numbers that, disappointed and broken by persecutions, he left Paris and travelled first in the provinces and then in Holland and Germany, where he was well received by those who saw him operate. Impartial observers of Jaques soon discovered that his operation

was a great advance on the Marian, and Marechal in Paris, Raw in Holland, and Cheselden in England adopted it and put it to the test. There was one also who was deeply impressed by this procedure, and that was M. Fagon, who had shown much kindness to Jaques on his visit to Versailles, and had remained true to him even after his misfortunes in Paris. Fagon was himself afflicted with stone, and, in spite of the fact that all the best surgeons in France and Holland performed this new operation, resolved to place himself in Jaques' hands. He therefore in the year 1700 called him to Versailles, lodged him in his own house and persuaded him to go through a complete course of studies and dissections. This he did under the guidance of Fagon, then a series of operations were performed on dead bodies and the parts afterwards dissected by Du Verney the anatomist, who, with Felix, the King's body surgeon, and Fagon, his future patient, discussed the various points of the operation with Jaques. As the result of these experiments he formulated his second operation, giving up the use of the round staff and using a grooved one instead. The incision was now no longer made with the long dagger-shaped knife but with an ordinary scalpel, the position of the incision being similar to that of his first operation. The deeper incision was, however, quite different, for, instead of passing the knife through the cellular tissue that surrounds the rectum or seeking the body of the bladder, the neck of the bladder and the prostate were cut by passing the knife along the groove in the staff and thus incising the prostate. The rectum and pudic artery were out of danger, as the knife was not plunged blindly among the parts. Jaques now put his improved operation to the test and cut 38 patients in Versailles without losing one. He fully recognised the help that had been given him by this staunch supporter, and he saw the value of a knowledge of the anatomy of the parts, of the advantage of the grooved staff, and of the method of making the deep incision by passing the knife along the groove. A critical time now came in Jaques' career, for not only was M. Fagon afflicted with stone, but the Mareschal de Lorges was also the subject of stone. M. Fagon, who had been so largely instrumental in perfecting the operation, had actually been sounded by Jaques when he was prevailed upon by his friends to place himself in the hands of Marechal, who had learned to perform Jaques' operation. This he did and was cut by him with complete success. The Mareschal de

Lorges took every precaution to insure success in his own case at the hands of Jaques. He collected 22 patients with stone, who were cut by Jaques with perfect success. He then submitted to the operation himself, and died in tortures the next day. This was a fatal blow to the reputation of Jaques, and he left Paris never to return. He travelled over the Continent of Europe and operated with great success. At the Hague the magistrates had his portrait engraved and presented him with a set of golden sounds. In Amsterdam, by the permission of the magistrates, he cut patients in the hospitals. In 1707 he was again at Versailles and visited his old friend M. Fagon. He went to Vienna, Venice, Padua, and Rome, and finally died at his native village in 1715. The career of this remarkable man is full of interest and romance, and few men have effected such a change in any surgical procedure as he did in the operation for stone in the bladder.

LECTURE II.

FROM Frère Jaques we now turn to Joannes Jacobus Raw, who became the most famous lithotomist in his day. He was born in 1668, and at the age of 14 was apprenticed to a surgeon in Strasburg, where he lived three years. At the end of that time he appears to have been cast off by his parents, and to have in consequence known the pinch of poverty. For some years he travelled about Germany, Norway, Holland, and Spain. Unlike most men of those times, he hoarded what wages he earned, and, after a time, went to Leyden, and commenced the study of medicine in the Medical School. Then he visited Paris, and studied anatomy and surgery under the best masters, coming under the influence of Du Verney, Mery, Petit, and Marechal. He next returned to Amsterdam, where he taught anatomy and practised surgery; it was at this time that Frère Jaques appeared in the city and performed his new operation, which Raw saw and strongly condemned. Soon after this he was appointed Lithotomist to the city of Leyden, where he made a great reputation. He was invited to teach anatomy in the public theatre at Leyden, and, on the death of Bidloo, was elected to his chair, and finally became Regent in the University in the year 1713. He died in 1719. When he first began to cut for stone, he performed the Marian

operation. When, however, Frère Jaques appeared in Holland, Raw was allowed to examine the bodies of those who died after being operated on by him, and from Jaques he learnt the operation he was then performing. This he practised, though he was probably well aware, both from the opportunities he had of examining such cases as died, and from his knowledge of anatomy, of its dangers and defects. After a time Jaques appeared again, and performed his second and improved operation, that which he had formulated as the result of much dissection and observation under the hands of Fagon and Du Verney, and this operation Raw learned and adopted with great success. At the death of Jaques, it was believed that Raw was the only surgeon in Europe who knew his true method. This was generally believed to be the cutting into the bladder behind the prostate, which was, however, his first and imperfect operation. Raw, from motives of his own, was mean enough to delude the profession into the idea that he continued to make that incision, while all the time he was incising the prostate according to the method adopted by Jaques in his improved operation. Nothing would induce him to impart to his greatest friends or pupils the way in which he made his deep incision. He told his pupils that he had to gain his bread by the operation, and would never say one word about it as long as he lived. He forgot that he was bound, by the position he held, to make known, for the good of suffering humanity, the nature of the operation he performed, and we can only look with contempt on a man who, for personal gain, kept to himself a knowledge of the steps necessary to insure success in an operation for the relief of such a terrible condition, and who allowed surgeons to blunder on in the dark, and patients to suffer, as the result of his meanness. That such an example should be followed was but natural, and Dennis, a surgeon in Holland, let it be understood that Raw had told him on his death bed the full and true account of his operation, and that he was therefore competent to perform it. Considering the care with which Raw kept his secret, and the fact that for the last few years of his life he was in a state of melancholy, and finally died delirious and insane, there was little to support this claim of Dennis, and we may fairly hope that he did not benefit by exploiting this fabrication. Even Albinus, the favourite pupil and assistant of Raw, who had had far more opportunities of watching him than had Dennis, was quite ignorant of

the nature of his deep incision. It is difficult to understand how he could have been deceived, but that he was is evident, for he not only believed he knew the exact method, but published an account of the operation he supposed his master performed, in which he said the bladder was opened behind the prostate. This, of course, was his first operation, which he gave up when Jaques showed him his improved method. Surgeons all over Europe, on reading this description by Albinus, who had had such opportunities of seeing what was really done, followed it, but with results equally disastrous to their patients and to their reputations. Men like Morand followed in every detail the description of Albinus, and also experimented on the dead body, but, in spite of every care, they found that the deep incisions varied in almost every case. In some the prostate was divided for the greater part of its length, in others the neck of the bladder, and in others the body of the bladder. Cheselden, also following the description of Albinus, met with disastrous results, and finally Morand came to the conclusion that Raw did not cut behind the prostate, but had cut the neck of the bladder only, and he accused Albinus of having misled the profession by describing, with so much confidence, an operation that he did not really understand. This seems to have opened the eyes of Albinus to the fact that he had been deceived by Raw, and that his description of the operation was not in accord with the practice of Raw, and he then became conscious that he had unwittingly been the cause of surgeons attempting a procedure that must have submitted their patients to grave risks and much distress. There can be no doubt whatever that the mean, selfish, and grasping nature of Raw, in prompting him to keep his true operation a secret, was the cause of many deaths. When surgeons had by experience found out that, in spite of the account given by Albinus of Raw's operation, the secret of it had died with him, they had to discover a safer method than that attributed to him. We in this country may feel proud that English surgeons not only rose to the occasion, but that one of their number, Cheselden, worked out and successfully practised an operation, which became associated with his name, and that he freely imparted a knowledge of its principles and details to all anxious to learn. The report of his operation rapidly spread, and Morand, then the most celebrated surgeon in France, came over to England as a delegate from the Royal Academy of France, and at the public expense, for the

express purpose of acquiring a knowledge of this operation, and in 1729 he saw the operation performed in St. Thomas' Hospital by Cheselden and learnt its details. He appears at first to have regarded its performance as more difficult than the Marian, but in actual practice he found, to his surprise, that it was infinitely easier, and his praise of Cheselden and his operation was very high. He often saw him extract the stone in 24 seconds, and, when there was a single stone, he seldom took more than one minute. During the time he was attending his practice, Cheselden cut 27 patients without losing one. On his return to Paris, Morand presented a most favourable report to the Academy, and taught Cheselden's operation to all his pupils, and so great was his reputation that almost all the younger surgeons in the cities of France had been his pupils. Thus before long the operation of Cheselden was widely known and practised on the Continent of Europe. It may be well here to briefly recapitulate the various steps by which his operation was evolved. Frère Jaques, in his first operation, aimed boldly at the body of the bladder with his dagger-shaped knife, leaving the prostate untouched, and, though successful in extracting the stone, his patients died in large numbers. He demonstrated, however, that a wound of the bladder in this situation was not necessarily fatal. In his second and improved operation, he gave up the use of his dagger-shaped knife, and dissected carefully on to a grooved staff, and made the deeper incision by cutting the prostate and neck of the bladder upon the groove of the staff. A feature of both these operations was that the incision was not limited to the perineum, but passed backwards into the ischio-rectal fossa, thus greatly facilitating the extraction of the stone. Then Ráw followed in detail the two operations of Jaques, but refused to divulge the mode of performance of the second, and, at his death, which occurred in 1719, the knowledge of this was lost. Cheselden, following the description by Albinus of Raw's operation, failed, as he was only likely to do, to attain his success, and finally systematised the lateral operation. This he performed by a lateral incision, between the accelerator urinæ and the erector penis, passing backwards into the ischio-rectal fossa, and dividing the transversus perinei; the knife was then introduced into the membranous urethra, and, passing along the groove in the staff, divided the prostate. This was the operation he taught Morand, and, though then quite satisfied with it, he had the misfortune later

on to wound the rectum in two cases, and to experience a difficulty in extracting a large stone; therefore in 1731, the year after Morand had returned to Paris with full details of the operation, he altered the mode of the deep incisions. The description of these two last operations is given by Cheselden in the Appendix to his 'Anatomy.' In the fifth edition, published in 1730, he says, after describing the first stage of the operation, "I then feel for the staff, and cut upon it the length of the prostate gland straight on to the bladder, holding down the gut all the while." In this operation he divided the prostate from before backwards. In the sixth edition, published in 1741, he has altered the description of the incision in the deep parts, and says, "I then feel for the staff, holding down the gut all the while with one or two fingers of my left hand, and cut upon it in that part of the urethra which lies beyond the corpora cavernosa urethræ and in the prostate gland, cutting from below upwards to avoid wounding the gut." Such are the descriptions as given by Cheselden himself; but in 1808 Allan published an account of Cheselden's third operation which, based on a description given by Dr. James Douglas in 1731, it is difficult to reconcile with his own. In this he is credited with making the same external incision, but, instead of entering the urethra just before the prostate, to have turned the back of his knife to the rectum, stuck its point into the groove of the staff through the coats of the bladder immediately behind the prostate, and drawing it towards him to have divided laterally the neck of the bladder and the membranous urethra. This operation he is said to have practised until his death in 1752, and the statement seems to have been accepted, in spite of the fact that nowhere in Cheselden's writing does he mention in such terms any such procedure, nor did he communicate any description of this method to the great French surgeon Morand, who came over to learn his operation, and with whom he was in correspondence after his return to France. It is difficult to trace this last operation of Cheselden's, for his second operation, being the one he taught the French surgeons, was widely practised, and must have been well established, both in this country and abroad, before he gave it up in favour of his third. Before long, however, we enter a period when the straight-forward operation of Cheselden, which required a knowledge of anatomy and a careful dissection, was replaced by one that was performed largely

by the aid of mechanical contrivances such as grooved lithotomes, concealed knives, and cutting directors. We find that Le Cat, Frère Côme, Foubert, and Hawkins were pioneers in this direction, and that the simpler operations were suspended for a time to make way for others done with the assistance of these inventions. Le Cat, of Rouen, not satisfied with dividing the prostate in the way taught by Cheselden in his second operation, invented a complicated set of instruments, which, however, he could not induce any one else to use. One of these, named the *gorgeret cystotome dilatoire composé*, gives some idea of the scope and nature of his inventions. His operation was so complicated that it did not receive much support. Another man, who for some time occupied the attention of the public, was a priest, named Frère Côme, who, like Le Cat, had an inventive faculty, but was ignorant of anatomy or surgery. He made the usual external incision, and then introduced into the urethra a concealed bistoury, which was drawn out with the blade so raised as to cut through the prostate and open the neck of the bladder. This was displeasing to Le Cat, who regarded the infringement of his own particular field with much annoyance, and he and Frère Côme engaged in a long and angry correspondence. So much did this agitate the profession that an enquiry was held to decide the respective merits of the two operations. Martinière, first surgeon to the King, presided, and the King himself took an interest in the debates. A number of experiments were made on dead bodies in five of the principal hospitals in Paris. The debates, however, were conducted with such heat and temper that, after 10 sittings of the Committee, they were abandoned by common consent without any decision having been arrived at. The results of Frère Côme's operation seem to have been very bad, many of his patients dying from hæmorrhage, wound of the rectum, or from damage resulting from attempting to drag a large stone through a small opening. Another surgeon who was responsible for the introduction of a complicated operation was Foubert, who, like others, was misled by the account by Albinus of Raw's operation, and believed that his incision was made into the body of the bladder behind the prostate, and that it was necessary to save the urethra and neck of the bladder from injury. His method was to puncture the bladder from the perineum, between the anus and the tuber ischii, with a trocar and canula, to then introduce through the latter a knife, and to enlarge the wound by

cutting from below upwards. Surgeons had long been familiar with the gorget; it was, indeed, the lineal descendant of the conductor of Hildamus, and acted as a dilator and a conductor. An English surgeon, Sir Caesar Hawkins, conceived the idea of converting its right edge into a cutting edge so that it might be pushed along the groove in the staff, and thus divide the prostate more easily and, it was thought, with less danger than by using the knife in Cheselden's operation, and for a time this instrument was generally used. It did not, however, meet with universal approval, for Allan, writing in 1808, considered it "the most dangerous innovation in the whole mechanical department of surgery"; in fact, none of the numerous contrivances which were then so largely used received his support, for he writes: "I am decidedly of opinion that the introduction of complicated machinery into surgery, and the invention of a multiplicity of instruments, has tended rather to retard than to advance the progress of the Art. The man who is a good anatomist can accomplish everything with the knife; and when operating feels resources within himself, which an exact knowledge of his subject can only supply." The chief dangers of the gorget were its slipping from the groove in the staff and passing into the tissue around the bladder. It has even perforated the fundus of the bladder and opened the peritoneal cavity. It failed, in cases where the stone was large, to make a sufficient opening, so that this had to be considerably dilated, while if the instrument was of a large size the pudic artery was in danger of being wounded. The operation as originally formulated by Cheselden, that which he taught Morand, does not seem to have found entire favour with surgeons at that time, probably from the fact that though safe and easy when performed by one thoroughly acquainted with the anatomy of the parts and the details of the operation, it was by no means free from difficulties and dangers when undertaken by those less competent. The dangers were principally incident to the deep incision through the prostate, and the introduction of the forceps. These dangers were likely to deter the timid and to try the nerve of anyone who without due consideration had embarked on this operation. Consequently gorgets almost without number were invented, each with some special feature which was supposed to render it a safe instrument with which to enter the bladder. If failure occurred after using one of these it could be attributed to the instrument and not to the operator.

Writing in 1825 Mr. H. G. Belinaye says: "For after Cheselden had improved the operation of Frère Jaques, so that it merited the appellation of the glory of English surgery, his implements of success were abandoned for others infinitely more susceptible of erroneous management. Hawkins turned the secondary instrument, the conductor, of Cheselden into a primary engine in lithotomy by imparting an edge to one of its blunt sides," and of the gorget he says: "Did time and space allow, by collecting all the anathemas which celebrated surgical writers have pronounced against each other's favourite form of gorget, whilst vaunting their own hobby, we might be saved the trouble of proving the many defects to which this much favoured instrument is liable. From the time when Hawkins first made a knife out of what was never intended but for a conductor, every leading surgeon in England, France, Italy, and Germany has unceasingly altered the form of the gorget." We can, however, trace the decline of the gorget, for Sir Astley Cooper in his 'Surgery,' published in 1836, says: "The knife is now frequently substituted for the gorget, and that which I for some time employed, in various cases, was straight and narrow, with a probed end; in the young this answers very well, and also in a thin adult, but in a deep perineum, or enlarged prostate, I prefer the gorget as being more definitive in its cut," while Syme in his 'Principles of Surgery,' published in 1842, refers to the method of dividing the prostate as follows:—"The simplest mode of effecting this is to use a scalpel or other knife, that may be under the surgeon's command; but as it requires an accurate acquaintance with the relative situation of the parts concerned, and considerable manual dexterity to divide the prostate safely with such an instrument, various apparatus have been contrived for cutting in the requisite direction, and to a sufficient extent, merely in consequence of their form and construction, and without the necessity of precise guidance on the part of the surgeon. But after a hundred years' experience of such substitutes for operative skill, it is now almost universally admitted that the simple knife is by far the safest means for the purpose." Thomas Gutteridge, referring to the use of the gorget, says: "For nearly a century the vices of the exploded method which existed antecedently to the appearance of the French friar infected the performance of this operation; and not till Sir Astley Cooper described the corrective did lithotomy emerge from the darkness in which it had been shrouded so long." With the disappearance of

the gorget a return was made to the simpler method, as introduced by Cheselden, and the lateral operation in its original form held the field. As such it was known to those of us who commenced our professional studies before about the year 1885, when as yet it had not felt the full effect of the revival, under improved conditions, of the supra-pubic operation, and of the great advance made in the crushing operation by Bigelow. From that time its decline was rapid, and there must be many in this room who not only have never practised it but have never seen it. Who can say that it may not, at some future date, be revived? Looking, however, to the excellent results of the supra-pubic operation, and of crushing, in the hands of those accustomed to do it, it seems more probable that the lateral operation is extinct.

The first recorded case of the supra-pubic, or high operation, is that by Pierre Franco, of Lausanne, in 1556. Franco was attempting to remove a large stone by the perineal route from a small boy aged 2 years. Failing in his attempts to get it away, the parents besought him to relieve the child by any means in his power. He therefore passed two fingers into the rectum and pushed the stone up to the lower abdomen, where it was steadied by an assistant. He then incised the abdominal wall over the stone and successfully removed it, and the child finally made a good recovery. In spite of this, however, Franco was not impressed with the possibilities of this method, and he concludes his account by saying that he "does not advise any man to do the like." No more was heard of this method until 1581, when Dr. F. Rosset, of Montpellier, was making dissections when advocating the Cæsarian operation, and it then occurred to him that a stone in the bladder might be removed by opening that organ above the pubes, using a grooved catheter as a guide on which to cut. But, he adds, "the novelty of the operation and the licentious prating of some impudent fellows, put a stop to my undertaking anything of that kind." We cannot wonder at men looking for some safer operation than those in use at that time, viz., the Celsian and the Marian, and Rosset says that, "being moved then by so many and weighty reasons that I had to dread both of these terrible methods of cutting for stone, and pitying on the one side the deadly tortures of those who were cut either way, and on the other side the perpetual anxieties of those persons who ought to be cut, but are deterred from trying the operation as the fox was from visiting the lion, by seeing the tracks of abundance of feet

towards the lithotomists, but a few back again, I have very often thought of some other gentler method of cutting for the stone, for certainly it is lawful to make use of divers remedies against any distemper, provided it be in common attempted by the easiest and safest that can be. And if that old method of Celsus has been changed for that of Marianus, why should not that method also be changed, as I hope, for the better." Soon after expressing these opinions he came across the account of the successful case of Pierre Franco, and this further strengthened him in his opinion. The next step was to make experiments on dead bodies, and he found that by distending the bladder with water it was quite possible to open it without wounding the peritoneum. Rosset gives detailed instructions as to the performance of the operation and how the bladder should be distended. The stone was forced upwards by pressure with two fingers in the rectum. He suggests that if the operator's fingers are too short to raise the stone upwards to the pubes, he may make use of artificial fingers made of prepared leather, or of silver, into which he can fit his own fingers. Though he often practised it on the dead body he never had an opportunity of doing so on the living. He was, however, an earnest believer in the method, and was actuated in his efforts with the desire of benefiting the public, for he concludes by saying, "Whoever can contrive a better, easier, shorter, and safer method than this, let him in God's name do it for the public's good, and may he meet with a good and favourable acceptance." On Thursday, December 13th, 1635, Peter le Mercier proposed the following question for discussion in the Physic Schools in Paris: "Whether or no in cutting for the stone in the bladder the incision should be made at the pubes." He did not recommend filling the bladder with water, but used a curved catheter to force the bladder wall against the anterior abdominal wall, and considered that in cutting for stone the incision should be made at the pubes. Writing in 1682, Hildamus expresses the opinion that though the supra-pubic operation was good for children it was not suitable for adults, for the reason that the fingers were not long enough to raise the stone to the incision in the bladder. Operators by this method considered it essential to force the stone upwards by the fingers in the rectum; probably they were influenced by remembering that in the Celsian operation the stone was forced into the perineum by the fingers in the rectum. They apparently did not recognise with what ease a stone

could be removed from the bladder, by a suitable pair of forceps, when it was opened above the pubes. Hildamus does not seem to have been in favour of this method, for he says: "I do therefore with Master Franco again and again dissuade every faithful and industrious surgeon from making use of this dangerous operation of cutting for the stone. But if the stone be of that great bigness and the patient and the bystanders, by reason of the great and extreme pains under which the patient labours, do very earnestly press and desire help from the physician, then indeed having first implored the divine assistance, and a prognostick being made of the doubtful and uncertain events, I should prefer that cutting in the groin, of which Master Franco writes." The high operation was not, however, practised to any extent, for in 1718 Tolet in his '*Traité de la Lithotomie*' says: "If one finds himself under a necessity of performing the high operation, it seems one might succeed," and then follow certain details as to its performance, but no mention is made of distending the bladder, though he remarks: "The fuller the bladder is with water or the stone, the more it will appear." In 1719 John Douglas, F.R.S., Surgeon to the Westminster Hospital, performed the high operation in this country, and in 1723 published the details of four cases occurring in boys, under 16, all of which were successful. Cheselden also, in the early part of his career, in 1723, published a treatise illustrating his method, which was similar to that employed by Douglas, but soon his attention was attracted by reports of the success of Raw's perineal operation in Holland, and, hearing that the bladder had by some English surgeons been burst by over-distending it with fluid, and that in other cases the peritoneal cavity had been opened, he set himself to do the lateral operation of Raw as described by Albinus. His description of the high operation leaves little to be desired, and we can only wonder why an operation so carefully planned was so quickly discarded. Previous to the operation he had the intestines emptied to prevent their pressing upon the bladder. This was secured by allowing the patient a slender diet for two days and having the lower bowel cleared out with clysters a little before the operation. The patient was placed upon a table in such a position as to relax his abdominal muscles, and was ordered to pass his urine. Having then passed a catheter, sufficient warm barley water was injected to fill the bladder to its utmost natural dimensions, "more being of little or no use to the operator, but

very painful if not dangerous to the patient." He considered that the proper quantity for every patient may be known from the swelling of the abdomen just above the pubes, if the integuments are thin, by the patient's growing uneasy from the distension of the bladder, and from the resistance which the operator feels to his injection. The syringe and catheter were connected by the ureter of an ox. He gives a word of warning which may not be out of place even at the present day. "I must recommend the passing the catheter deliberately, and gently, choosing rather to seem less artful in doing it than secretly to hurt the patient, for the reputation of doing it quick and dexterously, and indeed I judge this no unnecessary caution in every part of the operation." The bladder being filled, the catheter was withdrawn and the penis was grasped by an assistant to prevent the water coming out. The first incision was made with a round-edged knife; this passed through the skin and between the recti, and was about 4 inches in length in an adult. A finger was then placed in the wound and a straight-edged knife was introduced and the tissues in front of the bladder were divided. Finally a curved knife was passed into the bladder near the urachus, and that organ was opened down to the pubes. A finger was then passed into the bladder as a guide to the forceps by which the stone was removed. A very considerable controversy arose as to whether Douglas or Cheselden, who both wrote on the subject in 1723, should be considered as having established the high operation as a mode of practice. Deschamps considered that the credit was due to Douglas. There were isolated instances of the operation having been performed before that date, but it was not in general use until this time. Franco had done it in 1556, Bonnet in the Hôtel Dieu in Paris, and Proby of Dublin in 1700, and Greenfield in 1710, but after 1723 it was taken up by Continental as well as by English surgeons.

The high operation had to compete with the lateral operation which had been perfected by Cheselden and was largely practised, at first in its original form and later on with the various modifications that came into vogue with the advent of the cutting gorget, and in 1750 Samuel Sharp, of Guy's Hospital, wrote of it as follows: "Some of the difficulties which occurred in the execution of it appeared so frightful that it was suddenly disused, and at present there is no surgeon in Europe who continues to practise it; nevertheless, I should not be surprised if it should be revived and

practised with success." This latter observation showed that Mr. Sharp foresaw that the method was capable of yielding good results when carefully performed. Since then various attempts have been made to reintroduce it on what were supposed to be improved lines. In 1758 Frère Côme directed his attention to this question, for he knew that there were certain conditions that rendered the lateral operation undesirable, such, for instance, as a very large stone. He also saw that one great objection to the high operation was the horrible pain produced by the distension of the bladder necessary to make it rise above the pubes, and to obviate this he greatly modified the operation. He first passed a grooved staff into the bladder, then he cut as in the lateral operation on to the groove and opened the membranous urethra; next a grooved director was passed along the staff into the bladder, and the staff was withdrawn. By means of the director a kind of catheter open at the far end and provided with a stilette was passed into the bladder through the perineal wound. An incision was then made about 3 or 4 inches in length above the pubes and in the direction of the linea alba. A trocar, in which there was a concealed bistoury, was next passed into the linea alba close above the pubes, and by projecting the blade from its sheath the lower part of the linea alba was cut from below upwards and an opening was made which was enlarged with a probe-pointed knife behind which a finger was kept so as to push the peritoneum out of the way. The fundus of the bladder was then elevated by depressing the handle of the catheter, and its point was felt for in the wound; the stilette was then pushed through the bladder. Along the groove in the stilette a curved bistoury was introduced, and the bladder opened from above downwards. The bladder was drained by a gum elastic catheter through the perineal wound. Deschamps in 1790 perforated the bladder through the rectum, and through the canula passed an instrument to make the bladder prominent in the same way as Frère Côme did through the perineal wound. Allan in his 'Treatise on Lithotomy' expresses a poor opinion of the operation; he says: "It frequently happens from the continued irritation to which the bladder is kept by the stone that its coat becomes too much thickened and contracted to allow it to be sufficiently distended to rise above the pubes, and if this is the case the incision for the high operation will not reach the bladder, but pass through the peritoneum into the cavity of the

abdomen. If the operator should chance to break the stone in its extracting—though of this it may be acknowledged there is less danger—the bladder cannot be so easily washed out, nor the small fragments carried away by the urine, as in the lateral method, some of them may remain and form a nucleus for a future stone. The urine sometimes does not pass very freely to the wound, but by insinuating itself into the cellular substance excites inflammation and forms sinuses. The peritoneum, like other membranes which line the great cavities, is very susceptible of inflammation, and from its vicinity to the wound, or from being roughly handled, is liable to become inflamed and produce general inflammation of the abdomen. If the bladder is to be filled by injection, much cunning is required in accomplishing it. If too much fluid be thrown in, it excites great pain, relaxes its fibres, and destroys its tone; if not sufficiently distended, the incision will not reach it. And lastly it is observed that the wound does not heal so readily in the high operation as in the lateral operation. These are weighty objections, and must for ever preclude the general use of the high operation.” In 1820 Sir Everard Home, of St. George’s Hospital, performed his modification of the high operation. He passed a catheter with an open end and containing a stilette along the urethra, and having exposed the bladder by a supra-pubic incision, pushed the stilette through the bladder and enlarged the opening with a bistoury. In spite of these and other attempts to improve the operation, it did not commend itself to surgeons as a routine method of treatment, and it was left for such cases as were considered unsuitable for the lateral operation. These were often badly suited for any operative procedure by reason of the length of time they had been suffering from stone and from its consequent size. The high operation done under such circumstances was naturally followed by a heavy death rate, which, taken by itself and without considering the attendant circumstances, was not likely to encourage surgeons to adopt this method. Even Cheselden himself, who practised the operation in a small number of cases with considerable success, gave it up and devoted his energies to the elaboration of the lateral operation, not because he met with complications in his own cases, but because other surgeons, probably less able than himself, were unsuccessful in their cases. It is interesting to speculate on the position the high operation might have been placed in had

he devoted the same energy and thought to this operation that he did to the lateral. Had he done so it is probable that operations by the perineal route would have been abandoned, and that the high operation would have attained a position as the routine method of treatment, and the mortality following removal of stone from the bladder would have been diminished to an appreciable extent. For there can be no doubt that, while in the hands of surgeons having frequent opportunities of dealing with cases of stone the lateral operation yielded good results, it was not so with those who were less familiar with its performance and with its possible difficulties. To such an extent had prejudice and other circumstances militated against the high operation that an American writer, Dr. John Shaw, of Albany, in an article in the 'Journal of Foreign Medicine' for April, 1823, made the following remarkable statement: "We may sum up by saying that all the accidents which are generally assigned as the reason why patients die after the lateral operation are more apt to take place after the high operation." In 1868 Mr. Holmes Cook, in an article in the 'St. Bartholomew's Hospital Reports' upon "Lithotomy and Lithotrity," says: "I have not in these remarks adverted to the high operation. In many cases it is impossible of performance, and in none offers advantages such as I should have ever liked to avail myself of." Why it should in many cases be impossible of performance is not, however, stated. Bearing out these statements as to the position of the high operation, there is a remark by Dr. C. W. Dules, in an admirable paper on the subject in the 'American Journal of the Medical Sciences' for 1875, which is of interest. He says: "Supra-pubic lithotomy, or the high operation, is assigned a very low place in most works upon surgery and is now so rarely practised that there are comparatively few medical men who have ever seen it done; indeed, it has surprised me, in my investigations, to find how little is known of it by men of no inconsiderable eminence in the profession." This condition of affairs must be well within the memory of many Fellows of this Society, for those of us who were students in the seventies hardly ever saw any other operation for stone than lateral lithotomy, crushing at several sittings, and perhaps a median operation. At that time the lateral operation was so firmly established as the routine cutting operation that he would have been a bold man who would have suggested that in the course of a few years its position

of supremacy would be disputed, and that in a few more it would be rarely practised, and that it would so soon be regarded as a surgical curiosity belonging to a past age. It had always been associated with so much discussion, and had occupied the attention of surgeons and the public to such an extent, that it seemed to stand by itself. It was, indeed, regarded as a privileged operation, and, on the day fixed for operating by the surgeons, it was the custom for anyone having a lithotomy to take precedence of his colleagues and to operate first. In an annotation in the 'Lancet' for April 5th, 1825, it is stated that all cases of stone admitted to St. Bartholomew's Hospital for a period of six months were placed under the care of one surgeon, and that the surgeons took it in rotation to act as lithotomists. From a remark of Cheselden in the Appendix to his 'Anatomy of the Human Body,' published in 1741, the same arrangement evidently existed at St. Thomas' Hospital, and Cheselden, in addition to being surgeon to that hospital, was Lithotomist to the Westminster Hospital, where there were wards for the reception of cases of stone. Though, as already mentioned, the high operation was hardly ever performed 30 years ago, its revival was close at hand. In the 'Edinburgh Medical Journal' for October, 1878, Dr. Garson published a paper on "Displacement of the Bladder and Peritoneum in the Male by Distension of the Rectum." As the result of experiments on the dead body he showed the influence of distension of the rectum, or of the bladder, or of both, on the relation of the peritoneum to the anterior surface, and he considered "that in performing the supra-pubic operation for lithotomy or puncture of the bladder that viscus can be as easily raised above the symphysis by distending the rectum as by injecting the bladder, and that in every case where it is not advisable to distend the bladder to a large size, distension of the rectum is all that is required to make the parts suitable for operation." In 1880, Dr. Pietersen, of Kiel, who was present at the reading of Dr. Garson's paper at the Congress of German Surgeons, published an account of experiments made to ascertain the relative position of the anterior fold of the peritoneum and of the upper border of the pubes. As the result of these papers the high operation was again taken up and gradually came into favour. The danger of wounding the peritoneum was minimised by distension of the bladder with fluid and by distension of the rectum by the use of Pietersen's bag. Mr. Richard Barwell, of Charing Cross Hospital, also made experi-

ments on the lines of Garson and Pietersen, and brought the matter before the Royal Medical and Chirurgical Society on March 30th, 1886, when an important discussion took place on the merits of the high operation as then performed. The opinions expressed were by most of the speakers favourable to its superiority over the lateral operation, though some few were not yet convinced of this. As the result of further experience it was found that the anterior fold of peritoneum could be sufficiently raised by distension of the bladder alone; and the rectal bag, which had many disadvantages and some dangers, was abandoned, and the operation was widely practised. It is now, with hardly any exception, the only cutting operation resorted to. The choice of method may lie between cutting and crushing, but if the former is decided on, the supra-pubic operation is performed as a matter of course.

LECTURE III.

AN attempt was made by Deschamps in 1796 to revive the Marian operation on modified lines by what he termed a mixed method. This resembled the lateral operation in the external incisions and the Marian in dilatation of the prostate and neck of the bladder, and he says: "Who knows but at some future time surgeons may not be tempted to return to this method?" In 1819 Sir Astley Cooper extracted a stone as large as a walnut by this mixed method; in 1830 it was advocated by Dr. Buchanan, of Glasgow, and in 1842 it was again brought forward by Dr. Willis. It received the name of lithectacy, and then was heard of no more. By this time the lateral operation was becoming firmly established, and in 1853 Coulson says: "The lateral operation is now universally adopted, not only in this, but in all other countries, and hence we have *prima facie* reason for concluding that, as a general method, it is the best." The rectangular staff of Buchanan was by some preferred to the ordinary curved staff, as facilitating the opening of the urethra and the passage of the knife through the prostate, but this in no way modified the steps of the lateral operation, nor was it at all widely used.

The first idea of the bilateral operation appears to have been due to Le Dran, who, in performing the lateral operation, sometimes found his internal incision was not sufficiently free. He

therefore divided the right side of the prostate as well as the left. Sir Astley Cooper and others adopted the same practice. These operations, however, resembled the bilateral method only so far as the double incision of the prostate. The bilateral operation as a definite procedure was finally established by Dupuytren in 1824, and is described by William Coulsen in his work on 'Lithotrity and Lithotomy,' published in 1853: "The patient is placed in the same position as for the lateral operation, an assistant holding the staff in an exactly vertical direction. The surgeon keeps the integument tense with the fingers of the left hand, and with a double-edged knife makes a semilunar incision in front of the anus. The incision commences on the right side, between the anus and the right ischium, ascends towards the raphe, and terminates on the left side, on a level with the point whence it set out. The middle point of the semilunar incision should traverse the raphe about ten lines in front of the anus. It involves the skin, the superficial perineal fascia, and the anterior fibres of the sphincter ani. The left forefinger is now passed into the wound, and guides the knife during a second incision, which lays bare the membranous portion of the urethra; the nail now guides the point of the knife into the groove of the staff at this part, and the membranous portion of the urethra is opened transversely to the extent of two or three lines, in order to avoid any danger of wounding the rectum. The extremity of the double lithotome is next introduced into the groove of the staff through the small incision alluded to, with its convexity turned towards the rectum, and once fixed in the groove it is pushed on into the bladder. The staff is now withdrawn, and the lithotome turned so as to present the concavity downwards; the blades are opened, and the instrument withdrawn in a perfectly horizontal direction. The parts divided in this second stage of the operation are the membranous portion of the urethra along the middle line, the prostate, and the neck of the bladder on both sides, in a merely transverse direction, and to an extent proportioned to the separation of the blades of the lithotome." The quadrilateral method of M. Vidal de Casis was proposed in 1828. The first transverse incision was made as by Dupuytren, and then the prostate was divided in four directions, but the operation was never taken up. In 1824, Aston Key, of Guy's Hospital, published 'A Short Treatise on the Section of the Prostate Gland in Lithotomy, with a Safe and Easy Method of Conducting the Operation on the Principles of

Cheselden.' In this he gives an account of the staff he invented for the purpose. This he designed to obviate the dangers attending the use of the gorget, and at the same time to adhere closely to the principles laid down by Cheselden in his second operation. His first attempt was made on a child who had died with a stone in its bladder; and having no proper instruments at hand he used a scalpel, a director, and a pair of dressing forceps, and was struck with the ease with which the director entered the bladder. His original staff was therefore made straight, but, thinking that in depressing the handle its point might be caught by a projecting fold in the bladder, it was made subsequently with a slight upward curve at its extremity. The groove was deeper than in the common staff, to prevent any risk of the knife slipping out. The extremity was not grooved, but rounded to prevent abrasion of the prostate, or mucous lining of the bladder. He points out the advantages of a straight over a curved line as a conductor to a cutting instrument, but its chief superiority consists in allowing the surgeon to turn the groove in any direction he may wish.

Before carrying the knife into the prostate, the groove, which has been held downwards for the first incision, may be turned in any oblique line towards the patient's left side that the operator may think preferable. If the surgeon preferred to use a gorget he could do so. The knife used resembled an ordinary scalpel, but was longer in the blade, and both superficial and deep incisions were made with this. The opening in the prostate could be regulated by the angle the knife made with the director. The operation was performed by passing the staff, making the usual lateral incision down to the urethra; the point of the knife was then placed in the groove in the staff. The handle of the staff was next taken in the left hand of the operator and depressed, and the groove in the staff and the edge of the knife were both turned obliquely to the patient's left side. The knife was passed on into the bladder and the prostate divided; on removing the knife, the finger was introduced into the bladder and the staff withdrawn. The forceps were then passed and the stone removed. This operation found great favour at Guy's Hospital, where it was practised for many years. Skey, however, in his 'Operative Surgery,' published in 1850, criticised the straight staff of Key. He considered that, "however successful in his hands, it has this defect, that it forms no guide and, as it were, gives no support to the first

incision. It is, however, very efficient as an agent of directing the second incision into the bladder, when its groove is once opened." He therefore had a staff "made convex in the perineum and straight beyond the curve, to the point," allowing "facility of exposure of the groove, and ease in the transmission of the knife into the bladder." He also advised that the whole operation should be performed with one knife, as was first done by Aston Key. The recto-vesical operation is said to have been performed by the Egyptian lithotomists from time immemorial and was written about in the sixteenth century by a writer under the assumed name of Vegetius. It was described by Hoffman in 1779 and by Martin in 1817. M. Sanson brought it before the notice of the profession in France in 1817. He performed it in two ways. By the first method the patient was placed in the lithotomy position, and a staff was introduced into the bladder, the assistant being directed to keep it perfectly vertical. The left forefinger was introduced deeply into the rectum, and a straight bistoury was passed sufficiently high up (10 to 12 lines) into the gut. The edge was then turned upwards, the point of the bistoury was passed through the anterior wall of the rectum, and, with a single cut as the knife was withdrawn, the external sphincter and the inferior portion of the rectum were divided along the middle line; the lower surface of the prostate was thus exposed. The forefinger then easily felt, through the thin walls of the bladder, the groove in the staff. The point of the bistoury was now made to enter the groove in the staff just behind the prostate, and the wall of the bladder was divided in the middle line for about 1 inch in length. Sanson, however, soon gave up this method and substituted for it the one practised by Vacca. In this, the point of the knife having passed through the wall of the rectum, the sphincter ani and the perineum were divided from the anus to the bulb. The prostate was now exposed, and in front of it the operator felt the groove in the staff in the membranous urethra; he then inserted the blunt end of the bistoury in the groove at this part, and raising the staff a little he passed the bistoury forwards until its point was just beyond the neck of the bladder. The handle of the bistoury was then lowered, and the prostate was divided directly downwards on the middle line. This incision did not go beyond the limits of the gland, or touch the incision already made in the intestine. This method does not seem to have received any real support, for though

by it the stone could be easily extracted, the danger of a recto-vesical fistula resulting was found to be a very real one.

The median operation was to some extent a modification of the Marian. In 1727 Douglas, having observed the capability of distending the urethra under a gradual dilatation, suggested making an opening through the perineum into the urethra and then dilating with gentian and other tents; he came to the conclusion that "these artificial fistula may be dilated so as to extract any stone without cutting the body of the bladder or lacerating any of its parts." In 1796 Deschamps proposed a mixed method, but his incision was oblique and not median, and he dilated, as in the Marian operation, but more slowly. In 1819 Sir Astley Cooper extracted a stone through a fistulous perineal opening enlarged by the hydraulic dilator of Dr. Arnott. The dilatation lasted 30 hours, the stone was as large as a small walnut, the diameter of the passage being dilated to the extent of $\frac{3}{4}$ inch. In the 'Medico-Chirurgical Review' for 1846 there is a review of an operation by Joseph Bresciani de Borsa. This operation was a modification of one by Signor Manzoni, of Verona, published in 1808, and de Borsa states that of 100 cases operated on by that surgeon and himself only one died, and that from causes irrespective of the operation. Manzoni's operation consisted in cutting into the spongy portion of the urethra only, and then dilating the proximal portion sufficiently with the finger to admit the introduction of the forceps and the removal of the stone. De Borsa, however, carried his incision from the bulb to the prostate, not dividing this, but dilating the prostate with his finger. A keen advocate of the median operation in this country was Allarton, who, in 1854, published a work dealing with it under the title of 'Lithotomy Simplified.' His method was as follows:—After introducing a grooved staff into the bladder the left index finger was inserted into the rectum, its point resting against the prostate so as to fix the staff and serve as a guide to the knife. The perineum was next pierced just above the anus, and the knife pushed on with its back to the rectum until it touched the groove in the staff. Its point was then pushed into the prostate for a distance of a quarter to half an inch, and the membranous urethra slit up to its full extent. As the knife was withdrawn the external incision was enlarged to from three-quarters of an inch to one inch and a half by cutting upwards. A bullet probe was then passed along the

groove of the staff into the bladder and the staff was withdrawn. The left index finger was next gradually introduced along the probe into the bladder, and, the forceps being inserted, the stone was removed. He claimed the following advantages for this operation: the impossibility of missing the bladder; the smaller amount of cutting than in the lateral operation; the neck of the bladder was uninjured; only a small quantity of blood was lost, as the prostate was dilated and not incised; the urine was passed at once by the urethra as well as by the wound; the stone was easily reached; it was possible to break or crush the stone if necessary and to wash out the fragments from the bladder; the small amount of pain; the absence of danger from urinary infiltration; no muscle or vessel of any consequence was divided; there was no danger of wounding the rectum, the operation was easy to perform, and recovery was rapid. The operation, however, though extensively practised in the provinces, never found much favour in London.

The occasional passage of a stone by the urethra must have suggested to the careful observer the possibility of dilating the urethra so as to facilitate the passage of a small stone, or to enable one to be seized with a suitable instrument and drawn through the urethra, or of being able to break up a stone, already too large to pass, into small fragments which could be voided with the urine. Indeed the breaking of a large stone had been practised from time to time for many centuries, when it was found to be impossible to extract it through the incision made in the Celsian operation. The Egyptians practised the removal of small stones by dilating the urethra, and the same method was adopted by the Arabians. Tolet, in his 'Treatise of Lithotomy,' published in 1683, quotes Prosper Alpinus, in his 'Book of the Medicine of the Egyptians,' who describes their practice of extracting a small stone without making incision, but only by dilatation of the urethra by blowing into the yard. He, however, owns that he does not comprehend this method, nor does it seem that it could have been of much value. Like many other surgical procedures, the origin of lithotrity can be traced back for many centuries, though it was not placed on a sound footing until nearly 100 years ago. The idea of extracting a calculus from the urethra without cutting was naturally suggested when it was impacted in that canal and was within reach. Such calculi were sometimes extracted whole, at others broken up to facilitate their removal. Hippocrates refers to

Ammon of Alexandria, who broke up calculi with a mason's chisel, and was therefore called Lithotomos. The operation of breaking up urethral calculi was described by Albucasis, a Moorish surgeon, who lived at the end of the 11th century (1090). The penis was tied between the stone and the bladder to prevent the stone slipping back, which was then broken by a kind of drill. Franco, in 1561, refers to the breaking of a stone and gives the drawing of an instrument for perforating the calculus, which he borrowed from Guido de Cauliac (1546). Franco also employed an instrument, which he calls *vesical à quatre*, for the extraction of calculi from the bladder. This consisted of an iron rod supporting four branches at its extremity, and enclosed in a canula. Hildamus used a similar instrument having three branches, and later on these were reduced to two. Similar instruments were used by Hunter and by Sir Astley Cooper. The shape of these instruments may have been suggested by the ball extractor of Alphonso Ferri (1553), which was a three-branched instrument enclosed in a canula, and both worked by a screw. With such instruments calculi were extracted from the bladder as well as from the urethra. In 1506 Antonio Benevieni broke up a stone in a female bladder by percussion; he fixed it by passing a hook behind it, and then struck it with an iron rod. In 1519 Alsaharavius suggested the idea of breaking small friable stones in the bladder with an instrument, but gave no description of it. In 1626, Sanctorius gave the plan of an instrument composed of a tube, one extremity of which was divided into three flexible branches. He says that if a fragment of a stone, or an entire stone, descended from the kidney, and was not expelled with the urine soon after its descent into the bladder, it might be extracted by first filling this organ with water, and then introducing the instrument through the urethra, the branches of which, when arrived in the bladder, should be expanded and applied close to the neck; he thinks that by then letting the water escape, the stone would be carried forwards towards the three branches, seized by them, and extracted by withdrawing the instrument from the bladder. The next advance on this was to suggest that, if the stone was too large to be removed, it should be perforated, and this Haller seems to have suggested, though he believed it to be impracticable. In 1671, Ciucci, an Italian surgeon, speaks of a "*tenacula tricuspis*" for seizing the calculus and breaking it into fragments; and, in 1791,

Thomassini broke up small friable calculi in the bladder. In 1559, an Irish gentleman was cured of a stone by instruments being passed into his bladder by which the stone was broken. The case of Colonel Martin is a somewhat similar one. He first tried to break off fragments of his stone with a catheter with small holes in it, but not bringing away much he then tried a bougie with a serrated extremity, with more success; but, from his own account, it is evident he never really got rid of the stone. The case is referred to by Sir Everard Home in his 'Disease of the Prostate,' and, though the Colonel wrote an account of his case to his friends, in 1791, saying that he was completely restored to health, Sir Everard says: "There is nothing in his own narrative that gives the idea of his being free from considerable distress during any part of the time after the stones are stated to have been removed, and as he was allowed, by his best and most intimate friends, to shoot with a long bow upon ordinary subjects, great allowances are to be made for him upon this, which was his hobby horse, on which he was anxious to be carried down to posterity as a conspicuous character."

In 1813, a Bavarian physician, Dr. Gruithuisen, demonstrated, what was known before, that a large straight sound could be passed on the living subject, and conceived it possible to attack stones in the bladder by mechanical power. Through a straight tube introduced into the bladder he recommended another to be passed conveying a metallic wire nicely adapted to encircle the stone and fix it against the open mouth of the second tube, a small trephine was to be introduced through this tube and with this the stone, which was to be fixed by the loop of wire, was to be perforated. The trephine was to be worked by means of a drill bow. The instrument was, however, never used, and the project was soon forgotten. In 1819, an English surgeon, Dr. Elderton, proposed a somewhat similar instrument, but this was curved instead of being straight. In 1822, Amussat and Leroy introduced two instruments for breaking stones in the bladder. In M. Amussat's the destruction was affected by the pressure of the branches of which it was composed, which were made to act alternately by means of a lever. M. Leroy's instrument consisted of a hollow straight sound through which passed a metallic rod turned by a winch handle, and by this means the stone was to be perforated. The stone was secured by four watch springs united together at one end

by a kind of button, which, when the instrument was shut, formed the extremity of the sound, and when pushed out the two loops crossed and grasped the stone. M. Leroy successfully demonstrated its action on the dead body. He was not, however, satisfied with the instrument and designed another made of a steel tube supporting three branches of the same metal, diverging from each other by their own elasticity and closing again by means of the external tube, which drew them together when they were drawn into this. A drill was passed down the tube for the purpose of perforating the stone. To Civiale is due the credit of establishing the operation of lithotrity. In 1817, when an impecunious medical student working under Dupuytren, he made some models in wood of an instrument for breaking up a stone in the bladder. He then applied to the French Minister for pecuniary assistance towards constructing his instruments, and forwarded a short memoir entitled 'Some Details of a Lithonriptor.' The matter was referred to the Faculty of Medicine, but no notice was taken of his invention. Nothing daunted, Civiale, who was convinced that his method would in time be successful, continued his researches and in 1819 he reduced the six branches of his instrument to four, and in 1820 to three, adding the bow-drill and other improvements. In January, 1824, he again addressed a memoir to the Institute of Medicine and on the 13th day of that month he performed his first operation, in the presence of the Commissioners who had been appointed to report on his work. The patient was freed from his stone in two sittings. On February 4th his second patient was operated on and the stone removed in four sittings, and on March 4th he secured a similar success. On March 22nd the Commissioners, Barons Percy and Chaussier, reported favourably on Civiale, and considered that he not only discovered the principle but the means of carrying it into practice. As the result of this impartial report M. Civiale may fairly be regarded as the discoverer of lithotrity. The actual destruction of the stone was effected, after it had been seized, either by perforation, by percussion, or by crushing. In 1825 Dr. Haygarth invented a sliding instrument for the purpose of extracting small calculi from the bladder, and at the suggestion of Mr. Hodgson, of the General Hospital, Birmingham, a screw was attached to the instrument so that it might be used for crushing, and in the same year Mr. Hodgson tried the instrument. Mr. Weiss had made, in the previous year, a crushing instrument, with the blades placed one over

the other and having a gliding movement. True crushing appears to date from 1832, when Baron Heurteloup produced his percussor; this was soon modified so that it could be used either for percussion or for crushing. Some surgeons, however, returning to the principle of Mr. Weiss, gave up percussion, and crushed either by pressure with the hand alone, or with a screw. Baron Heurteloup's percussor instrument may, therefore, be regarded as having led on to the adoption of crushing. In the same year Dr. Costello introduced to the Westminster Medical Society his improved instrument, consisting of a male and female blade, and a controversy arose between him and Mr. Weiss, whose original instrument was made in 1824, as to priority of invention. Mr. Weiss had at that time demonstrated the power of his screw instrument to Sir Benjamin Brodie, and the screw acted with so much force on a hard calculus that it was feared the bladder might be injured by the force with which the fragments would fly apart, and to avoid this risk Sir Benjamin suggested the addition of a saw. The principle of crushing by means of a screw was, however, rejected for a time, until the use of Heurteloup's percussor showed that the danger from flying fragments was an imaginary one. Since that time many improvements in detail have been made, but the principle remains the same. The object of the surgeon was to crush the stone by repeated operations, or sittings, as they were called, each lasting only a few minutes, and repeated at intervals of three or four days. Some of the *débris* was brought away in the lithotrite, and of that remaining in the bladder, the smaller fragments were expelled by the urethra, and the larger portions were again crushed, and the process continued at suitable intervals until all were removed. There was then, as, indeed, there is now, much difference of opinion as to the respective merits of cutting and crushing operations. In the 'Lancet' for 1835 there is much discussion on this point, and, in an annotation in the number for May 2nd, the position is summed up as follows: "So far as our own observations and enquiries have extended, we are inclined to believe that if lithotrity were to be taught generally in the schools, and brought into ordinary use amongst practitioners, the cutting operation for stone would in a few years become obsolete, because the facility with which small stones could be crushed would leave no large calculi to require the use of the knife." Twenty years later Sir Benjamin Brodie read some "Notes on Lithotrity" before the Royal Medical and Chirurgical Society

on March 13th, 1855, in which he says: "Although the operation of lithotrity has been for many years extensively and successfully practised in a neighbouring country, it has hitherto been adopted only to a limited extent by British surgeons, yet if I may be allowed to judge from the results of my own experience of it, it must be regarded as a method of relieving those who suffer from calculus of the bladder which is attended with much less uncertainty and danger—being at the same time much less formidable to the patient—than the operation of lithotomy." He then quotes the figures of Mr. R. Smith, of Bristol, published in Vol. II of the 'Transactions' of the same Society, as to the deaths after lithotomy. In Bristol they were 1 in $4\frac{1}{2}$, in Leeds 1 in 5, and in Norwich 1 in $7\frac{1}{2}$, and he remarks: "There is no reason to believe that the success of lithotomy is greater now than it was when Mr. Smith collected his observations"; the truth of this observation is borne out by the statistics of the cases operated on in the London hospitals in 1854, collected by Mr. Charles Hawkins. Fifty-nine patients were operated on and 10 died, being in the proportion of rather more than 1 in 6. The deaths in children were 1 to 14 recoveries, while among adults the deaths and recoveries were equal. In spite of the obvious objections to lithotrity as then practised, and of the fact that the instruments were being improved as further experience was gained, no great advance was made until 1878, when Bigelow, of Boston, showed that it was possible to break up a stone so completely at one operation that all the fragments could be washed out through a large evacuator. For some years previous to this, various attempts had been made to remove fragments by suction through evacuating catheters, such, for instance, as the apparatus designed by Clover, but there had been no recognition of the fact that it was possible to completely remove a large calculus on these lines at one operation. Moreover, the use of these evacuating catheters had not proved satisfactory to those best qualified to judge of their efficiency, so that the method introduced by Bigelow was a veritable revolution and struck a blow at the rules previously laid down by experts for the safe performance of the operation. He boldly used large lithotrites and large evacuators, the patient was placed under an anæsthetic, and he did not hesitate to prolong the operation until all fragments were removed. To this procedure he applied the name of litholapaxy, though at the present time the older name of lithotrity is

perhaps more generally used, and is understood to refer to crushing and evacuating completely at one operation. The earlier lithotritists were in favour of short and frequent crushings, and when anæsthetics came into use they considered it undesirable to employ them for fear of possibly inflicting injury to the bladder by prolonged efforts on an unconscious patient. Some few, however, and notably Sir Henry Thompson, frequently used anæsthetics for this operation, and did not meet with any bad results by so doing. With the establishment of Bigelow's operation surgeons were enabled to consider the possibility of dealing with larger stones by crushing than was formerly the case, and also of extending the operation to boys, who up to this time were not considered suitable for this method. Their efforts in this direction were assisted by the improvements made in the construction of the lithotrite, for it was found that while its size could be materially diminished, its efficiency for such calculi as were likely to be met with in boys was in no way impaired. Lithotrity does not occupy the position in this country that it does in India or Egypt. In those countries it is the operation of choice, and the brilliant results that have been obtained there are ample testimony to the skill of the surgeons who have, with an unrivalled experience, brought this operation to a state of perfection that leaves little room for improvement. The large number of cases of stone coming for treatment has enabled them to acquire great manipulative dexterity, and they have demonstrated, beyond any doubt, that in skilled hands and with suitable instruments the operation is well adapted for almost any stone that may be met with. For these advances we are indebted to Keegan, Freyer, Forbes Keith, Dennys, R. Baker, Milton, and many others. It is probable that lithotrity will never be so generally adopted in this country as in those where stone is so common, for it is essentially an operation that requires much practice to enable the surgeon to become thoroughly efficient, and it is evident that with us the opportunities for treating cases of stone are becoming less frequent; while, therefore, it is practised by some in certain selected cases, there is no doubt that, under the circumstances here, the supra-pubic operation is on the whole preferable. The operation of perineal lithotrity was first performed as a definite procedure by Dolbeau, a French surgeon, in 1862, and some years later was reintroduced by Mr. Reginald Harrison. It is performed by passing a grooved staff into the bladder and making a

small incision, with a tenotome, through the perineum into the membranous portion of the urethra, which is then dilated to the required dimensions either by the index finger or by a specially constructed pair of forceps, or by the passage of metal bougies. This dilatation must be just sufficient to allow the lithotrite to pass without difficulty. If too extensive, the water will escape from the bladder, and difficulties will be caused by the contracted condition of that organ. The advantages claimed for this operation by Mr. Reginald Harrison in the 'Lancet' for April 7th, 1894, are:—

1. That it enables the operator to crush and evacuate large stones in a short space of time.
2. It is attended with very small risk to life as compared with other operations when any cutting is done, and is well adapted to old and feeble persons.
3. It enables the operator to wash out the bladder, and any pouches connected with it, more effectually than by the urethra, as the route is shorter and the evacuating catheters employed are of much larger calibre.
4. The surgeon can usually ascertain, either by exploration by the finger or by the introduction of forceps into the bladder, that the viscus is cleared of *débris*.
5. It enables the surgeon to deal with certain forms of prostatic overgrowth and obstruction complicated with atony of the bladder in such a way as to secure not only the removal of the stone, but the restoration of the function of micturition.
6. It allows of efficient drainage by means of a tube through the wound.

Mr. W. H. Henderson refers to this operation in the 'Indian Medical Gazette' for August, 1900, and points out that it can be performed when the urethra will not admit a sufficiently large instrument, or when the stone is large and hard; that convalescence is very rapid, and that micturition is usually a voluntary act; the wound consequently is not irritated by the constant passage of urine. Dr. P. Durrell Pank, writing in the same journal, says: "Lateral lithotomy is, in my opinion, the best operation when it is necessary to do a cutting operation at all, and if the stone be so large that the surgeon has doubts of successfully extracting it through the perineum, then I think the best thing he can do is to make a small median perineal incision on a grooved staff into the bladder, sufficiently large to admit a lithotrite big enough to crush the stone, the fragments of which should be removed by a large canula and aspirator, as one would operate by litholapaxy in the female." He reserves this operation only for those cases which, from some very uncommon cause, cannot be operated on by litholapaxy. This

method has not met with much support, and it is doubtful whether, even in the few cases that are considered suitable, it offers any advantages over a supra-pubic operation.

In order to ascertain what operations surgeons are performing for vesical calculus in this country, I ventured to send out certain questions to those attached to the larger hospitals, with a request that they would favour me with replies. I should like to take this opportunity of thanking all those who have returned answers to my enquiries for the trouble they have taken in supplying me with the information I required. Before dealing with the several points at issue, I wish to draw attention to some general remarks that have been made on the subject; and first as to the prevalence of stone. Quite a number of surgeons have remarked that they do not see so many cases of vesical calculus in their hospitals as formerly, and this statement does not refer to any particular part of the country, but to districts widely separated. For instance, from Norwich: "We scarcely get any cases of stone in the bladder now, though fairly common in the kidney; this is a great change, as I can remember about 30 years ago seeing three lithotomies in one morning." From Liverpool: "Stone in the bladder is comparatively rare here, certainly 10 in the kidney to one in the bladder." From Northampton: "Used to have a number of stone cases, but for the last 10 years have been almost none." A London surgeon says: "Very few cases of stone (vesical) come into the London general hospitals." From York it is stated that "cases of stone are very scarce in this district," and practically the same remark is made from Oldham, Sunderland, Sheffield, Bradford, Chester, Bristol, Cumberland, and Huddersfield. There seems to be a very strong expression of opinion that vesical calculi are not as commonly met with as formerly, though renal calculus is regarded as being more frequent. It may be that improved methods of diagnosis have demonstrated the presence of calculi in the kidney that formerly would have been undetected, and that might not have shortened the patient's life. Why stone in the bladder should be less common now than formerly is an interesting and difficult question, but is one that is outside the scope of these lectures. Another point to which attention has been incidentally drawn, is how far it is advisable for a surgeon to perform lithotrity when his opportunities of acquiring practical experience of it are limited. Several surgeons have expressed their opinion on this point, and the views

they hold may be summarised by saying that unless you see enough of stone to become proficient in lithotrity it is better to cut. To the first question, What operation do you usually perform for the removal of a stone before the age of puberty? there were 221 replies, and they may be grouped as follows:—Supra-pubic lithotomy, 144. Lithotrity for small stones, supra-pubic lithotomy for others, 35. Lithotrity if possible, 9. Lithotrity, 7. Supra-pubic lithotomy as a rule, sometimes lithotrity, 9. After four years, lithotrity; before, supra-pubic, 2. After seven years, lithotrity; before, supra-pubic, 1. Lithotrity almost invariably, but in large hard stones in very small children, supra-pubic, 6. Lithotrity if no permanent cystitis, 2. Lithotrity or supra-pubic, 1. Lithotrity or lateral lithotomy; if the stone is large, supra-pubic, 1. Median lithotomy, 1. Lateral lithotomy, but lately supra-pubic, 1. Supra-pubic, and if the stone re-forms, median or lateral lithotomy, 1. Lateral lithotomy, rarely lithotrity, 1. From an analysis of these figures it is clear that the supra-pubic operation is the one usually performed. Seven only refer to lithotrity as the method adopted, without any reference to the size of the stone or other circumstance. The others who perform lithotrity do so only after making choice of such cases as seem suitable in their opinion for the operation. The lateral operation as well as the median is still mentioned, though apparently very seldom performed.

To the second question, What operation do you usually perform for the removal of a stone from the male bladder after puberty when there is no evidence of prostatic enlargement? there were 240 replies, as follows:—Supra-pubic lithotomy, 116. Lithotrity, 29. Lithotrity as a rule, 28. Lithotrity for small stones, supra-pubic lithotomy for others, 48. Almost always supra-pubic lithotomy, otherwise lithotrity, 8. If the stone is small and smooth, lithotrity; an oxalate or a stone of 1 inch diameter, supra-pubic lithotomy, 3. Lateral lithotomy occasionally, especially when the urine is foul, 2. With persistent foul cystitis, supra-pubic lithotomy in two stages, the bladder being attached to the deep part of the incision in the parietes and opened in 48 hours, 1. Formerly lateral lithotomy, of late supra-pubic lithotomy, 1. If the stone is large median urethrotomy with crushing after the method of Reginald Harrison, 1. If stone is small, median or lateral lithotomy; if large, supra-pubic, 1. Lithotrity except with sacculation or sepsis, then supra-pubic lithotomy, 1. Lithotrity if possible, if not, supra-pubic lithotomy, 1.

These returns show that surgeons are prepared to consider the advisability of performing lithotrity in the adult more frequently than in boys, but the number of those who practise the supra-pubic operation is in excess of those who use lithotrity, and it should be noted that of these a large number reserve it for small stones, doing the supra-pubic operation for large ones. The third question, as to the treatment of stone when there is evidence of prostatic enlargement, elicited 224 replies, as follows:—Supra-pubic lithotomy, 202. Perineal prostatectomy and lithotomy combined, 1. Supra-pubic operation if there is obstruction with residual urine and cystitis; crushing and washing out if no cystitis, 1. Supra-pubic operation and perineal drainage, 2. Supra-pubic operation, rarely a perineal with enucleation, 1. Lithotrity with well elevated pelvis, or supra-pubic if necessary, 2. If slight enlargement lithotrity; if considerable, supra-pubic lithotomy, 6. Lithotrity if possible; if not, supra-pubic lithotomy, 5. Lithotrity in the majority of cases, 3. Sometimes perineal lithotomy with removal of prostate, 1. For the treatment of stone in the presence of an enlarged prostate the supra-pubic operation is, from these returns, the method adopted by almost all surgeons, only 16 out of 224 being prepared to discuss the desirability of attempting lithotrity under these conditions. The fourth question dealt with the treatment of the wound in cases of supra-pubic lithotomy. There were 230 replies, as follows:—Complete suture of the bladder and of the abdominal wall without drainage, the urine being normal, 33. Complete suture of the bladder, suture of the greater part of the abdominal wall with drainage, either by a tube or by gauze above the pubes, 71. The same with, in addition, a catheter in the bladder, 9. Complete suture of the bladder and of the abdominal wall without supra-pubic drainage, but with a catheter in the bladder, 5; or with the passage of a catheter at regular intervals, 1. Partial suture of the bladder and of the abdominal wall, with drainage by a tube entirely, 9; by a tube for a time and then by some apparatus, 5; or by a catheter, 1; or by drainage at once by some apparatus, 1. No suture of the bladder or of the abdominal wall, drainage by a tube entirely, 42; by an apparatus, 18; by a tube for a time and then an apparatus, 24; by a tube and catheter, 1; by pads only, 2. Suture of bladder to abdominal wall and drainage by a tube, 4; by an apparatus, 1; without either tube or apparatus, 1. No sutures or drainage, 1. Perineal

drainage, 1. The chief point of interest in this question is as to suture of the bladder and of the abdominal wall, and whether a drain is used or not. It is evident that there are few surgeons who venture to sew up the bladder and close the abdominal wound without some form of drainage, though there are many who will close the bladder and use a drain to it; while rather more than half the number prefer to use either partial suture or none at all.

Such is the condition of practice for stone in this country at the present time, and though it is always uncertain as to what changes may take place in the future, it does not seem probable that there will be any great alteration in the immediate future. No doubt, under modern conditions, the lateral operation would yield good results, so far as the mortality of the operation is concerned, if done by surgeons who had fairly frequent opportunities of performing it. But, in addition to those dangers which might be avoided by a skilled operator, there is the possible injury to the ejaculatory ducts, and consequent sterility, which is beyond the control of the surgeon. There does not seem to be any real effort at the present time to displace the supra-pubic operation by crushing, nor does it seem likely that any great improvement can be made in the details of the former, so that we may fairly regard the mode of treatment of to-day as likely to continue for some time. I have ventured to bring this subject before this Society in the belief that it is good at times to review the methods we adopt. I can only hope that by so doing I have aroused an interest in the past, and have shown that we are indebted to no small extent to the labours of those who have preceded us.

