

**On the treatment of stone in the bladder by medical and mechanical means
/ by R. Willis.**

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ON THE TREATMENT
OF
STONE IN THE BLADDER,

BY

MEDICAL AND MECHANICAL MEANS.

BY

R. WILLIS, M.D.,

OF THE ROYAL COLLEGE OF PHYSICIANS, PHYSICIAN TO THE ROYAL INFIRMARY FOR
CHILDREN, ETC.

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1842.

ON THE TREATMENT

PART I.

STONE IN THE BLADDER.

The first thing to be done in the treatment of stone in the bladder is to ascertain the size and position of the stone. This can be done by feeling the perineum and the rectum. If the stone is small and in the neck of the bladder, it may be removed by the urethra. If it is larger, it may be removed by the lithotomy. The lithotomy is a surgical operation in which an incision is made in the perineum and the stone is removed. This operation is performed by a surgeon who is specially trained in lithotomy. The patient is placed on a lithotomy table and the surgeon makes an incision in the perineum. The stone is then removed and the wound is closed. The patient is then allowed to get up and walk. The recovery from lithotomy is usually rapid and the patient is able to return to his normal life within a few days.

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P R E F A C E.

THE Urinary System affords a kind of neutral ground on which Physic and Surgery encounter,—not in hostile array, but in friendship and strict alliance.—The diseases of the kidneys, as entirely beyond the reach of manual interference, fall naturally to the care of the physician; the diseases of the apparatus subordinate to these important organs, in which mechanical means are often of so much avail, belong to the surgeon. As the kidneys, again, are always the theatre of the morbid actions that lead to the deposition of concrescible matters from the urine, and indeed are all but constantly the primary seat of such depositions when they occur, the subject of GRAVEL and STONE has naturally engaged the attention of the physician, and been mainly advanced by his labours. The physician has therefore had it in charge by internal medicines and regimen to amend the states of health that are connected with the production of urinary concretions, and farther to endeavour to dislodge and destroy them when they have been produced. But medical means having failed in this last direction, and the stone as a foreign body beginning to interfere with natural functions and to be rebelled against by the living parts with which it is

in contact, measures of a mechanical nature must be appealed to, and the surgeon as the administrator of these has to be summoned. The physician and the surgeon are therefore necessary, and ought to be inseparable associates in dealing with stone in every period of its existence.

For a long time, however, every means save those of a mechanical nature appeared to have been lost sight of in the treatment of stone. Surgeons and the public seemed even to have persuaded themselves that lithotomy, the operation always resorted to, was neither very formidable nor very dangerous in itself; whoever had a stone in his bladder was *cut* as a matter of course, and without an effort to procure relief in any other way. Surgery in regard to stone, it might be maintained, has continued in arrear of surgery in reference to almost all the other ills that flesh is heir to; the glory here has not yet been to avoid an operation, but to have it to do. The brilliancy of the procedure apparently has dazzled both the operator and spectator, and disastrous consequences in unfortunate cases have always been merged in the temporal redemption that is achieved for the sufferer in those that prove successful. But of all of every age and sex who submit to lithotomy one in seven or eight will inevitably be lost immediately, and among those who are in years when the life of man is most truly precious, one at least in three or four will fall its victim.

No wonder, then, that despite the benefits which

lithotomy has conferred—and these I hold to be great and incontestable, seeing that almost to the present hour every unhappy sufferer from stone must have died without its aid—men not devoted to its practice should from time to time have turned their minds to finding some substitute for it.

Such a substitute was on its first introduction, and for some considerable time afterwards, believed to have been discovered in LITHOTRITY. But this is beyond all question a rotten staff, which leaned upon by all who suffer from stone will certainly fail five sixths of the number; nearly one half will find that it is totally inapplicable to their case; from one third to one fourth will fall immediate victims to its determined application; and from one third to one fourth will escape to lead miserable lives from diseased bladder, and then to die of diseased kidneys: not more than one in three or four of all who were held favourable subjects will find it a safe, effectual, and final remedy for their disease.—The public and professional mind has been singularly abused in regard to the value of lithotripsy as a general means of treating stone in the bladder.

Conviction of these truths has lately led physicians back to the long neglected class of medicines called *Lithontriptics*, and there is already evidence enough extant to satisfy us that these medicines, taken internally and used in the way of injection, have even greater powers than were suspected in the palmy days of their employment some century ago.

But lithontriptics, like all other medicines, have no more than a certain limited range of power ; and supposing them to fail, and manual interference to become indispensable that the sufferer from stone may have a chance for his life, have we no resource but lithotomy as the general and lithotripsy as the exceptional rule ? I believe that we possess an almost unfailing refuge in the operation which I have described under the title of LITHECTASY. By this procedure the brilliancy of the operation by which a stone is now generally extracted from the bladder will be gone ; but the life of the patient will be safe ; and this surely is the end which all who are engaged in the practice of medicine as an art, or who are striving to advance it as a science, have in view. Surgical operations generally have been becoming less frequent and less dangerous, ever since the Revival of Letters in Europe. I believe that by the judicious use of lithontriptic medicines, and the adoption of lithectomy, they may be made both much less frequent and infinitely less dangerous than they have yet been found in reference to the treatment of stone in particular.

25, DOVER STREET,
January 1842.

* * * The first three Chapters of the following Treatise formed the subject of a Paper which appeared lately in the *British and Foreign Medical Review*. The Work, however, was written as it now stands, the Treatment of Stone in the Bladder having been embraced in the whole of its parts.

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TREATMENT

OF

STONE IN THE BLADDER.

THE circumstances connected with the formation of urinary Calculi, their different species, the symptoms to which they give rise, and other matters of a preliminary nature, having been treated of at length in my work On Urinary Diseases and their Treatment, I pass over these topics in this place, and enter at once upon the consideration of the means, medical and mechanical, which ingenious men have at different times devised for the removal of a STONE IN THE BLADDER.

The means by which a stone in the bladder has been sought to be removed are these :—

1. By effecting its solution ; and this has been attempted in two ways : *a*, By the agency of medicines administered by the mouth ; *b*, By chemical agents thrown into the bladder.

2. By removing it through the urethra entire ; and this plan has been essayed in two ways : *a*, With previous dilatation of the urethra ; *b*, Without previous dilatation or preparation.

3. By grinding or breaking it down in the bladder, and removing it piecemeal through the urethra, (Lithotrity.)

4. By removing it through an incision practised about the neck or fundus of the bladder; the parts which oppose the exit of the stone being dilated when it is small or of moderate size, and torn when it is large, (Lithotomy.)

5. By removing it without tearing or violence, through an incision into the urethra in the perineum, and slow dilatation of the membranous and prostatic portions of that canal, and of the neck of the bladder, (Lithectasy, Cystectasy.)

CHAPTER I.

REMOVAL OF STONE BY SOLUTION.

1. *By means of medicines administered by the mouth.* Until the discovery of the chemical composition of urinary calculi was made, none but blind and empirical attempts in this direction could be undertaken. In a science like medicine, however, empiricism has sometimes led to fortunate results; and in reference to the treatment of stone by the use of internal medicines,—which from their supposed virtues were called “lithontriptics,”—it may be said that if less were known, nearly as much had been accomplished, before science had shed any light upon the way, as has been achieved since she poured a noon-day splendour upon its course. The use of the alkaline earth, lime, is as old as the age of Pliny, and the medicines of Stephens and her immediate successors, if less elegant in their forms, were essentially of the same nature as those that have generally been employed up to the present hour.

Very different degrees of credit, however, have been attached to the powers of lithontriptics at different times: faith in their virtues was for ages universal, and such was the enthusiasm excited by

the fame and accredited success of the medicines of Joanna Stephens for stone a century ago, that her secret was purchased by a parliamentary grant of money to the amount of £5000.

But specific remedies of every kind seem destined to the same fate. Each is introduced with a flourish loud and long,—its propounder has unvarying success in its administration ; but beyond him the success does not extend ; he who essays the medicine next, has nothing but disappointment ; the stream has turned ; another and another have no better fortune, and then the article falls into the ranks of the hyssop, and sage, and thyme, and marjoram of our great-grandmothers. The few articles of the materia medica which continue to stand their ground, very certainly do so in virtue of their power to influence one or other of the natural systems of organs which compose the body,—to excite vomiting, purging, diuresis, sweating, &c. or to allay all excitement, and to narcotize the economy,—never to attack the groups of disproportioned symptoms which we designate diseases.

Like other specific remedies, lithontriptics were of course proposed as of universal efficacy, and having failed to do impossibilities they were then proclaimed as useless. But whilst many of the articles which were once regarded as possessed of powers to attack stone in the bladder have deservedly shared the fate of the generality of specifics for individual diseases, others, I maintain, have been very unfairly involved in the same neglect and oblivion.

In the nature of things, from the admitted laws

of the animal economy and of chemistry, we know that there are certain articles which influence the renal function in a way that bears directly upon the disposition of its product, the urine, to deposit one or other of its concrescible elements, and which must necessarily, therefore, be of avail if directed aright in cases of calculus. Moreover, we know that there are certain substances which, administered by the mouth, pass off by the kidney, still possessed of their original power to combine with, to dissolve, or to disintegrate the greater number of these concrescible elements when deposited in the shape of urinary calculi. The confidence once universally reposed in alkaline medicines in cases of stone could not, therefore, have been all misplaced. Unless the human body be held as abstracted from the laws that influence chemical attractions and combinations,—which it very certainly is not,—they must have done good in many instances when they were empirically prescribed, as they undoubtedly do good in the present day, when their mode of action is much better understood.

But an unlucky star seems still to have dominated every proposal to find a remedy for stone save in the way of operation. The advocacy of a Fourcroy may have forced the consideration of medicinal means upon the attention of the profession for a time; but opposed by the most influential of that class of practitioners who are almost alone consulted in cases of calculus, they have generally soon sunk back into the shade. The contest, however, in regard to the value of lithontriptic medicines is by no

means yet decided ; it has been renewed of late years with spirit, and has hitherto been waged with nothing like defeat to their advocates. On the contrary, the most candid inquiry would lead to the conclusion that the extent to which alkaline medicines especially may prove beneficial in cases of calculus has been under rather than over-estimated.

The alkalis when first propounded as of sovereign efficacy in calculous complaints, were exhibited either in the state of subcarbonate or pure. This implies administration in a large quantity of fluid ; and then the conditions were fulfilled which were necessary to the best effects of these medicines. The concurring testimony of all the best authorities of the times gives us assurance of the signal benefit that was often derived from the use of Stephens's medicines, as well as from those of her immediate successors. Stephens's remedy consisted especially of a mixture of calcined egg-shells and Castile soap, which was always washed down with copious draughts of some simple vegetable infusion or decoction. The lithontriptics of all the medical practitioners of the same period were of the same essential nature. The ingenious Dr. Whytt, who enjoyed an extensive reputation for his treatment of calculous complaints, relied upon about an ounce of Castile soap and two or three pints of lime-water in the course of the twenty-four hours. Dr. Chittick, a less ingenuous man than Whytt, though ingenious enough in his way, and who had a large share of the metropolitan practice in cases of gravel and stone, had a tin vessel of the capacity of two quarts filled with weak veal-

broth sent to his house every morning for medication, and this quantity of diluent with some solution of potash added to it, was the dose which each of his patients took during the day.

Now, provided the stomach did not rebel against a course of this kind, we are certain, as chemists and physiologists, that it was calculated to act beneficially in a large proportion of cases of stone; in all cases, to wit, in which calculi of lithic acid, of the lithate of ammonia, and, as recent experience has shown, of the triple or mixed phosphates are contained in the bladder. The oxalate of lime calculus, indeed, is the only one upon which the urinous solution of the neutral carbonate of potash or soda thus brought into contact with it must not have had a decided action in the way of solvent or disintegrator.—There is, perhaps, no fact in therapeutics better established on the basis of experience than the influence of weak alkaline solutions upon the matter composing the generality of urinary concretions; and I cannot therefore but hold it a grave error to suppose that the healthy urine is of itself as powerful a solvent of stone in the bladder as any we possess. The most healthy urine always contains a certain proportion of matter so highly concrescible that it will infallibly be precipitated in the solid form if it but meet with a point on which to rest. Qualities, on the contrary, can readily be communicated to the urine by the use of saline and other medicines, that give it positive solvent or disintegrating powers, which, though not of any great force, are nevertheless quite decided, and have only

to be maintained for a sufficient length of time to prove of signal efficacy in the end.

Much good, then, was done during the period that alkaline medicines were administered in this way: some were freed from their calculi entirely, and many more escaped from a life of absolute torture to one of comparative ease; for the alkalis have this most admirable quality in addition to the one they possess as direct solvents of stone, that they allay the irritability of the living tissues with which the foreign body is in contact to such an extent that frequently its presence ceases to be perceived, and the person with a stone in his bladder comes at last to be in little worse plight than another who has nothing of the kind.

The progress of chemistry and pharmacy by and by led to the preparation and prescription of the neutral carbonates and of the bicarbonates instead of the caustic alkalis, as heretofore. In the case of the individual,—the celebrated anatomist Mascagni,—who first directed particular attention to this modification, it was attended with all the benefits of the old system. Mascagni himself recovered completely from two or three severe attacks of gravel which he endured, and finally gained entire immunity from any recurrence of his disease under the use of the bicarbonate of potash. But he used this medicine in the old way, that is, along with plentiful dilution. The alkaline carbonates and bicarbonates, however, are so mild, so totally without destructive action on the living tissues of the body, that they soon came to be administered in no larger a quantity of water

than was necessary to get down the dose ; and then they certainly lost a considerable portion of their efficacy. At a subsequent period a respectable chemist, experimenting under the auspices of a surgeon possessing a wide-spread reputation, announced that calculi of the lithic acid, the most common of all, were not acted on by saturated solutions of the bicarbonated alkalis, a proposition which in proclaiming a truth also involved an error ; and so the confidence of the profession and of the public came to be entirely shaken in the powers of these medicines to benefit the sufferers from stone, who were, therefore, taught to cast aside every hope of relief, save in recurrence to the operation of lithotomy.

Nearly half a century before the epoch at which the medical treatment of calculus attracted a kind of particular attention, the surgeon had begun to show himself the rival of the physician in that walk of practice which has derangements of the uropoetic system for its object. This took place especially from the improvement that was made in the cutting operation for stone about the beginning of the last century,—an improvement mainly due to the circumforaneous operator, Jacques de Beaulieu, more commonly known under the name of Frère Jacques. The religious character of this apostle of lithotomy, the crusade which he undertook against stone in the bladder through a considerable portion of continental Europe, the unquestionable piety, the rare charity of the man, and the exaggerated estimates that were formed of his success, contributed powerfully to direct public attention to the treat-

ment of stone by mechanical means, and to instal the surgeon as principal, often as sole referee in cases of calculus. At the very time, too, when the medical treatment of stone was pursued with the greatest zeal and success, another lay lithotomist of singular dexterity, Jean de Baseilhac, better known under his title of Frère Côme, made his appearance upon the stage, and by his boldness and numerous reputed cures, succeeded in completely diverting the tide of public confidence from physic to surgery in seeking a remedy for stone. The history of medical science since this change took place assures us that, whilst unremitting attention has been bestowed upon the improvement of the mechanical treatment of stone in the bladder, medical means,—such means as the physician relies on,—have until very lately been more and more neglected. Surgery, in fact, outstripped physic in the race here, and won the field for herself; and the physician has thereby been long placed in something like an awkward position as regards the surgeon, and in a false one as regards the patient when summoned to deliberate in a case of calculus. In England, indeed, the physician is scarcely consulted, save at second hand, in regard to stone in the bladder. In ninety-nine cases in a hundred the surgeon has already been spoken to by the sufferer; and the operator's mind is soon made up as to the procedure in such a case,—the stone must be cut out, or it must be crushed; and circumstances not being very untoward, the cutting or crushing operation is forthwith undertaken; circumstances being less favourable, the physician is

called in to consult, and medicines and other means are, as a matter of course and routine, prescribed with a view to allay irritation, and to bring the patient into a condition that will enable him to endure lithotomy or lithotrity. Here it is obvious that the physician is hardly a free agent; he scarcely feels himself at liberty to propose a course which in the event of its success would render the interference of the operator unnecessary. Instead of being upon a footing of equality with his brother practitioner, he is almost necessarily compelled to play a subordinate part.

There is even something in the shape of an apology to be offered for the conduct so commonly pursued in such circumstances. To say nothing of the doubt that has always hung around their efficiency and practical applicability, the medical means we possess of attacking stone in the bladder are very slow in their effects; and all know how difficult it is to manage the generality of patients in cases where perseverance is indispensable, and where the result has to be looked forward to at a distant date. In the present time, too, the generality of practitioners are but indifferently acquainted with urinary pathology,—the subject is one that is little studied; or they have no confidence in lithontriptic medicines. The surgeon, indeed, may be little or no better provided than the physician in the important article of the particular pathological knowledge that is necessary here, but he has sounds, and catheters, and lithontriptors and scalpels at hand, and in these he has unlimited faith.

The patient with a stone in his bladder, then, who consults the physician, is usually put into the best plight possible, and anon comes in the surgeon, and in two or three minutes' time exhibits to him the cause of all his sufferings firmly held between the chaps of a pair of tongs. A triumph of this kind is not lightly to be foregone ; and so long as mechanical means of removing a stone from the bladder are held on the whole to be tolerably safe in their application, it never will be foregone. Neither is it to be expected that any others, necessarily of slow operation and of which the triumph must be altogether without eclat, will be anxiously sought after by the operating surgeon. Nevertheless it will be seen in the sequel that all the mechanical modes hitherto devised and generally practised for the removal of a stone from the bladder are fraught with so much danger both present and prospective to the patient, that the interests of humanity and of true science alike command us to go on and strive to improve upon aught that has ever been done in the way of treatment otherwise than by operation ; and further, should the necessity for operating arrive, to inquire whether there be not better methods of proceeding than those that are in common use at present.

The chemists, especially of France, have mostly shown themselves warm advocates for the treatment of gravel and stone by medical means. Fourcroy and Vauquelin raised their voices long ago to proclaim the reasonableness of these means, and it is from France that the awakening in very recent times in regard to the importance and the efficiency of

internal medicines in the treatment of calculus has come.

In a short essay on the mineral waters of Vichy, published in one of the volumes of the *Annales de Chimie* for 1826, M. Darcet called the attention of professional men to the property which these waters have of rendering the urine of the drinker alkaline, and to the advantage that might be taken of this circumstance in the treatment of stone in the bladder. He found that from three to four glasses of this mineral water, which contains about fifteen grains of the bicarbonate of soda per glass, taken in the course of the twenty-four hours, sufficed to maintain the urine in an alkaline state. M. Darcet remarked further, that the urine of those who drank the Vichy water was singularly transparent, though the portion which was secreted during the night was often high coloured; and, contrary to wont, that it even continued limpid after putrefaction had made great progress.

Dr. Charles Petit appears to have been the first, after M. Darcet, to investigate the effects of the Vichy water in the direction which that excellent chemist had particularly indicated. In his little work "On the Medical Treatment of Urinary Calculi," (Paris, 1834,) Dr. Petit already adduced what it is impossible to regard as other than strong evidence in favour of the solvent powers of these waters, which might aptly be spoken of as a solution of bicarbonate of soda presented to us by the hand of Nature; and in the "Additional Observations" (1837) and the "Appendix" to the tract of M.

Patissier "On the use of the Vichy Water in Gout" (1840) of the same writer, the subject is continued, and other and yet more signal instances of success are adduced.

It is very generally agreed that fragments of urinary calculi of the lithic acid and lithate of ammonia, and of the mixed and triple phosphates, are speedily reduced in size by solution and disintegration when exposed to the action of the Vichy water out of the body;* and it seems also undeniable that several persons in whose bladders the presence of calculi had been ascertained by searching, had them either notably reduced in size, or got rid of them entirely, all the symptoms of stone being at the same time relieved or removed whilst using this water internally.

Much about the time that Dr. Petit appeared as the advocate of the waters of Vichy, M. Robiquet, in a paper read before the Royal Academy of Medicine of Paris, (1836,) adduced several instances of the successful exhibition of the bicarbonates of potash and soda, aided by plentiful dilution, in cases of stone in the bladder, patients finally passing the kernels of calculi which had formerly been too large to enter the neck of the bladder, and to get rid of which the operation of lithotomy had been proposed. †

The range of cases in which the alkaline carbonates were found to be useful was also greatly extended by the experiments of these various inquirers, particularly of Dr. Petit and M. Chevallier. ‡ It had long

* See Appendix, (A.)

† Vide Case 3, p. 22.

‡ Vide his *Essai sur la Dissolution de la Gravelle*, Paris, 1837.

been generally allowed that weak solutions of the vegetable and mineral alkalis in the state of carbonate exerted more or less of a solvent effect upon calculi of the lithic acid ; but it was hardly suspected that these substances had fully as much power over concretions of the phosphates, not, however, in the way of solvents, but of disintegrators, the alkali seizing upon the animal matter, which is a principal bond of union in the great majority of urinary calculi, and the particles of earthy salt then separating and subsiding in the shape of an amorphous powder. M. Darcet, in the course of his experiments, found that even so solid a substance as a *bone*, exposed for a length of time to a solution of bicarbonate of soda in distilled water, was at last completely disintegrated ; a solution of gelatin,—a gelatinate of soda,—composing the supernatant liquor, the earthy matter,—phosphate mixed with a little carbonate of lime,—forming the powdery precipitate which lay at the bottom of the vessel. Dr. Petit found that calculi of the mixed and triple phosphates, exposed to the action of the Vichy water, actually suffered in many instances a more rapid loss of weight than those of lithic acid or the lithates. *

These interesting and remarkable results could hardly fail to attract the attention of the medical world at large, and particularly of that portion of it in the hands of which the practice in calculous complaints principally lay at this time. And as lithotripsy had now reached its climax, having been re-

* See Appendix, (B.)

ceived by the public at large with a degree of enthusiasm which in the domain of medical science is only accorded to success in surgical operations, the lithotritors or stone-grinders, like a community threatened by neighbours with an invasion that might involve the loss of goods and hearth and home, soon raised their voices against Dr. Petit, in especial, and against all others,—chemists, pharmacists, and physicians, who had lately aided and abetted in this heresy of daring to hope for succour to patients affected with stone in the bladder otherwise than by the means of an operation,—their own operation in particular.

M. Civiale, as head lithotrotist of the French metropolis, has thought it incumbent on him to be very forward in this hostility to the medical treatment of calculus; but he has been joined in it most cordially by M. Leroy, his ancient enemy, his constant rival. After many articles in the journals of the day, which were met in counterblasts with admirable temper and excellent taste by M. Chevallier and Dr. Petit, M. Civiale concentrated his strength in a work entitled "*Traité de l'affection Calculeuse*," which was published in the course of the year 1838, and then in another laborious compilation superscribed "*Du Traitement Medical et Preservatif de la Pierre et de la Gravelle*," which issued in the course of 1840. The first of these two works is beyond question one of the most learned and elaborate productions which has fallen from the medical press of the present age. I have somewhere seen a summary of the number of references to authors and

authorities, ancient and modern, and in almost every language spoken on the face of the civilized earth, which this remarkable book contains; they amount, I think, to something like a couple of thousand.*

The entire doctrine of the formation, of the chemical and physical characters, of the causes and effects of calculus are exhausted in this work; in the second, in opposition to its title, all idea of finding a remedy for stone, save in a mechanical operation, particularly lithotrity, is utterly scouted, those who had recently ventured to entertain hopes of affording relief in any other direction being treated with very slender ceremony.

Messrs. Civiale and Leroy, then, however opposed upon other points, are very brothers in their hostility to the notion of ridding the bladder of a calculus by medical means. M. Leroy has introduced his "*Histoire de la Lithotritie*" (1839) with certain reflections on the solution of stone in the bladder, rich in reasonings wherefore the alkaline carbonate, as it is found in the Vichy water especially, should

* Some of M. Civiale's countrymen have not scrupled to say that there is but one man in France at the present moment who is competent to put forth such a work, "a man not less distinguished by his vast erudition than by the facility with which he writes and his unwearied industry;" and this is not M. Civiale but M. Jourdan. Men engaged in the duties of a laborious profession are not always agreeable or ready writers, and it were hard to quarrel with M. Civiale for entrusting his materials to such competent hands as those of M. Jourdan,—taking it for granted always that he did send an order to his author for this among sundry other books.

not succeed in dissolving or disintegrating an urinary calculus, but very poor in facts to support these reasonings, which, indeed, being built upon false principles, are unsupportable. More than this, M. Leroy has been charged with giving the particulars of one at least of the two cases which he quotes in aid of his views neither so completely nor so correctly as was desirable. The case in question is that of M. G——; and as it is of great consequence to know the *animus* in which disputed points are handled, it seems proper to cite this case at length.

M. G——, then, went to Vichy in the month of June, where he remained for thirty-nine days drinking the water and bathing every day. During the whole of this time M. G——'s general health was excellent, and he was even believed to be cured of his stone or gravel. Scarcely had he taken his seat in the carriage to return home, however, than he began to experience pains in his loins and bladder, and the urine soon became catarrhal. A fortnight after the patient's return to Paris, M. Leroy extracted several small stones, some of them crushed, some of them entire and of a rhomboidal form, in the hollows of his instrument. In the letter to the Royal Academy of Medicine, in which he first mentions this case, M. Leroy states that the gravel so extracted, upon analysis by Messrs. Bourson and Guibourt, had been found to consist of a mixture of carbonate and urate of lime; a composition which he adduced as proof positive that it had been formed under the influence of the alkaline waters of Vichy. But M. Guibourt, on be-

ing applied to by Dr. Petit, the unwearied and in all his statements the unchallenged advocate of the Vichy springs, replied that what M. Leroy had stated "*n'était nullement exact,*"—was nowise according to fact,—that what he had found in the concretions in question was a mixture of *carbonate and phosphate of lime*, which is the usual composition of prostatic calculi. And it was certainly an omission on M. Leroy's part not to mention that M. G—— had long suffered under a grave affection of the prostate; that the neck of the bladder was even partially plugged by an excrescence which had always to be pushed aside by a bougie before he could pass a drop of water; and that it had several times been proposed to the patient to have this excrescence excised by means of, an instrument of M. Leroy's invention.

M. Leroy also stated, in the same letter, in reference to M. G——, that calculi had been reproduced four times in the course of three years, and always by so much the more speedily as the patient had drunk the Vichy water in larger quantity. But it seems that the patient in question assured Dr. Petit in the most positive manner that *he had never drunk any Vichy water either at Vichy or at home* before the month of June last, the date at which he came to drink at the fountain head. (*Exposé d'un Rapport fait à l'Académie Royale de Médecine au nom d'une Commission, &c., pp. 32 and 34, Paris, 1839.*)

From this account it will be seen that the zeal of our dear brothers across the channel carries

them somewhat far. But it is extremely difficult to arrive at the truth on every point connected with the important subject of the treatment of calculus. Lithotrity has from first to last been surrounded by an all but impenetrable crust of falsification, which it is as distressing as it is difficult to break through. And from what has just been said, it is plain that the lithotrists are no more scrupulous in reporting cases having reference to the solution and removal of calculus by internal medicines than they have been truthful, as we shall have occasion to see, in rendering an account of the successes and mischances of their own operation.

Probably one of the documents the most to be relied on in regard to the value of the alkaline bicarbonate, as it exists in the Vichy water, is the "Rapport"* just quoted. The fame of this water in calculous complaints had induced the Royal Academy of Medicine of Paris to appoint a commission to inquire into its effects, and the chairman delivered a Report, of which the following are the general conclusions :—

" 1st. Urinary concretions are attacked by the urine when it has been rendered alkaline by the use of the Vichy water taken internally and used in the way of bath ; 2nd. It has not been proved that urinary concretions of such a size as to constitute proper calculi, have been entirely removed by

* The original may be found in the Bulletin de l'Acad. Royale de Medecine, tom. iii. p. 699. Paris, 1839. It was reprinted by Dr. Petit with critical remarks, letters, &c., under the title just given.

these waters ; * 3d. Such a removal is nowise impossible ; there is even considerable likelihood of its being accomplished ; 4th. The question can only be decided by experiment ; 5th. The experiment does not seem to present any danger. The committee therefore request the minister of the public works, &c. to accede to the demand of M. Petit," which was to the effect that he might have a certain number of patients affected with stone in the bladder confided to his care at Vichy, with a view to decide the question as to the power or impotency of the natural alkaline waters in this disease.

It is impossible not to see that the Report of the committee is extremely guarded ; under any other circumstances, in connexion with almost any other pathological state, the facts adduced would have been held adequate to authorize a far bolder and more favourable tone. Let me instance one or two of these.

CASE 1. M. de Longperier, aged 51, had been affected in his bladder for two years. Sounded in 1836 by M. Leroy, a small calculus was discovered ; and the operation of lithotrity was proposed to the patient as his only resource. He, however, went to Vichy, and on the 19th day of taking the waters, a calculus the size of a large lentil was expelled, after which M. de Longperier recovered completely. The concretion expelled, " although remarkable," says the Reporter, " by the disappearance of the super-

* This judgment was given before the case of Denis B. Jacob had occurred, which will be found mentioned immediately.

ficial layers, which do not cover or inclose each other completely, may nevertheless be thought referable to the head of *gravel* rather than of *calculi*.”—But where a patient has suffered for two years, and an operation is proposed to him by one of the most competent men in France as his only remedy, it seems in vain to dispute about terms.—M. de L. had a foreign body in his bladder for which lithotrity or lithotomy was held the only remedy, and after drinking the Vichy waters for 19 days, he expelled a concretion of lithic acid by the urethra, the laminae of which did not inclose each other, and which had therefore necessarily undergone solution to a certain extent—to an extent, in a word, which enabled it to pass off with the flood of urine.

CASE 2. M. Larigaudie, after having passed gravel at different times, had been a prey for the last two years to all the symptoms of stone in the bladder. Sounded, a stone of middling size is discovered. The use of the Vichy water begun in August 1837, is followed after 20 days by the repeated expulsion of “*parcels of calculus* ;” the patient is completely restored.—Unfortunately this patient was not sounded after his recovery ; but up to the present day he has not made any new complaint, and there is no reason in the world to refuse assent to the conclusion that the cure was and remains complete.

CASE 3. A man aged 52, having suffered from all the symptoms of stone, was sounded and declared to have several calculi in his bladder, which were judged to be about the size of hazel nuts. He

was directed to take two drams of bicarbonate of soda dissolved in about two pints of water daily. From this medicine he felt immediate relief. On the eighth day of the course the patient complained of excruciating pain, and utter inability to pass a drop of water. One of the calculi had entered the internal orifice of the urethra and obstructed the passage. The concretion was pushed back into the bladder with a catheter, and the alkaline solution was continued. At the end of a month the patient, without suffering any great amount of pain, voided eleven small concretions, which together weighed but four grains, and the sound now introduced into the bladder found it completely free from calculi.—Comment upon this case is unnecessary. One calculus at least was of such a size as to stick fast in the neck of the bladder; pushed back into its cavity and acted on by the alkali for a month, it was so much reduced as to escape along with the rest, after which the patient recovered, and his bladder being searched was found empty.

CASE 4. M. Valerix, aged 56, had suffered from stone for two years. Sounded, a small calculus is found. On July the 16th, 1837, the use of the Vichy water is begun, and on the 6th of August a fragment of stone is passed; but though there is improvement, the cure is not complete. The patient returns to the waters the following season, and another calculus is passed. The patient sounded 14th September 1838, nothing could be discovered in the bladder. The calculus analyzed by M. O. Henry was found to consist of a mixture of uric acid

and the phosphates ; it was in the form of a mushroom, and evidently corroded.

CASE 5. M. Fournier came to Vichy the 3rd of July, 1838. He had suffered under symptoms of stone for two years. Sounded, a voluminous stone with a rough surface was immediately struck. On the 9th August the patient was sounded by M. Leroy, who then declared the stone to be of the size of a large walnut. The patient already suffered so little that he believed his complete recovery close at hand. Up to the 1st September M. F. passed large quantities of gravelly concretions, and at this time his health was so perfect that the cure was imagined to be complete. Sounded again, however, by Dr. Petit and M. Leroy, the calculus was at first encountered at once by the instrument ; but the sounding continued, the mass escaped all perquisitions for a long time, and was only again found with great difficulty. M. Leroy thought it had decreased in size. To Dr. Petit the difference between the size of the calculus on the 3rd of July and its size at the end of September appeared comparable to the difference in the dimensions of a hen's egg and of a very small pea. M. F. still continued to take a solution of bicarbonate of soda at home ; his health continued excellent, and in a letter written shortly afterwards he says : " I can bear the jolting of the roughest carriage possible going at speed, and the trotting of a horse, as well as I could have done when I was five-and-twenty."

In reference to M. Fournier's case, the Reporter says : " If this case still leaves any doubt as to the

entire disappearance of the calculus, no one surely will be found to doubt of the notable diminution which this large stone must have undergone."

I am happy, through the politeness of Dr. Charles Petit, to whom I ventured to address myself for farther information in regard to this interesting case, to lay the sequel before my readers. M. Fournier, then, continued the alkaline medicine at home for some little time; but suffering nothing, he soon gave up his medicine, and would not believe that he had any remains of a stone in his bladder. He enjoyed uninterrupted health for more than a year. In the month of October last he was seized with fever of a bad type, to which he fell a victim. On opening the body after death the long-shaped nucleus of a stone, the size of a shelled almond, was discovered.—It is impossible not to see this case as little less satisfactory than it would have been had the last fragments of the large concretion which once occupied the bladder been dissolved or discharged.

CASE 6. M. Pirel came to Vichy in the summer of 1838. Sounded by Dr. Petit, a large stone was discovered. After twenty days of treatment the patient went to Clermont, where M. Fleury examined him, and in his turn ascertained the presence of a calculus which he believed to be very hard and of considerable size. M. Fleury declared that it seemed to him impossible that a stone of such dimensions could ever be removed by Vichy water. M. Pirel returned to Vichy, nevertheless, towards the end of July. In the beginning of August M. Leroy ex-

amined the calculus, and ascertained its dimensions to be an inch in the one direction, and five lines in the other. The waters were continued, and the patient sounded again by M. Fleury on the 2nd of November, the calculus had to be searched for before it could be discovered ; it was now found of a cylindrical shape, of the thickness of a pencil of nitrate of silver, and about ten lines in length.

This patient returned to Vichy in the season of 1839, but unfortunately his circumstances did not admit of his making the sacrifice of time necessary to secure his complete recovery. Dr. Petit, however, informs me that on this occasion he improved greatly under the use of the waters. " I searched his bladder several times before his departure," says Dr. Petit, " and had always great difficulty in finding the remains of his stone, which I had formerly struck the moment I passed the sound. I had no doubt of its having still farther diminished in size, and I saw him quit Vichy with the greater regret, as I felt persuaded that a little while longer would have sufficed to complete his cure. I urged the patient strongly to return in 1840, but he only visited the waters for eight days ; he suffered extremely little from his stone, and I found it impossible to keep him longer."—A little more perseverance, or rather, the power to have persevered a little longer, and this patient would very certainly have got rid of the kernel of his calculus ; as it was, what remained of it had ceased to be a source of any annoyance to him.

CASE 7. M. Jullien, aged 50, long a sufferer from

stone, could only walk short distances with great difficulty, enduring repeated calls to make water, and passing blood along with it; for a year he had not ventured into a carriage of any kind. In the month of July last he began taking the Vichy water at home, the presence of a stone in his bladder having been ascertained by M. Segalas. Sounded again in the beginning of October, M. Segalas seized the stone several times with his instrument, which indicated it to be about an inch in diameter; but the moment he began to press it, the stone immediately escaped, a circumstance which proclaimed it to be of greater diameter than an inch. The treatment by the Vichy water is continued. The catarrh of the bladder under which the patient laboured has almost entirely disappeared; the urine is no longer bloody; walking is not now distressing; the jolting of coaches and cabs is borne without suffering. Of late, new symptoms have appeared;—the jet of urine is free and strong at first, but towards the end it is thin and feeble, and the patient complains of some pinching about the neck of the bladder, and the act of sitting down at this moment, and any pressure made upon the perineum, are painful. The pinching sensation generally lasts for about ten minutes. On one occasion, however, the stream of urine was interrupted completely, and the painful sensation accompanied with retention of urine, continued during four hours, after which it subsided, and the patient was able to make water as before. These symptoms indicate very certainly that the calculus is so far reduced in size as to enter the neck of the bladder or

vesical orifice of the urethra in a greater or less degree.

M. Jullien, Dr. Petit is kind enough to inform me, finding it impossible to quit Paris for a residence of any duration at Vichy, and seeing that the treatment at home was likely to be tedious, by and by determined to have the remains of his stone crushed. The operation was done by Dr. Amussat, who found the whole of the outer layers to yield with extreme facility, doubtless from the change which had been produced in them by the action of the alkaline water. The patient had no bad symptom and recovered.

CASE 8. Delhumeau, aged 81, affected with deafness and dementia senilis, was operated on by lithotrity by M. Guersant in June 1838, and a calculus of the triple phosphate removed. In December of the same year D. was found to be labouring under calculus again, and on the 3rd of the month the calculus explored by a member of the commission was ascertained to be eight lines in diameter in one direction, and six in another. The patient was put upon a litre of Vichy water every day, which was continued to the 11th of January, when he sunk and died in a state of adynamia.

The calculus which was taken from the bladder of this patient after death, presented to the academy by the Reporter of the commission, was found to have diminished to the extent of a line in each of its chief diameters,—it was now seven lines long by five broad. "Its surface," says the Reporter, "is remarkable by the number of porosities which render it un-

even, and which attest, in a striking manner, the solvent or disintegrating action of the menstruum in which it had lain."

CASE 9. D. B. Jacob, aged 53, entered the Hôpital Beaujon on the 28th of August, 1838, labouring under stone in the bladder, which had tortured him for several years. A fortnight after his admission lithotrity was attempted ; the stone was seized several times, and splinters were detached, for many pieces were voided on the day of the operation ; but acute inflammation of the bladder having supervened, no second operation could be attempted. Even on the 20th of October the patient was extremely ill, complaining of great weakness, of inappetence, and of a fixed and severe pain in the hypogastric region. The excretion of the urine was frequent and painful, and the fluid deposited a great quantity of purulent and glairy matter.

On the 20th of October the patient was put upon the use of the Vichy water in the dose of from a bottle and a half to two bottles a day ; almost immediately the urine became less turbid, the appetite and the strength revived, and by the 5th of December he felt himself so much better that he insisted on quitting the hospital.

On the 8th of March the patient returned to the Hôpital Beaujon with a renewal of his calculous symptoms. On the bladder being searched a stone was readily struck. He was ordered the Vichy water for the second time ; but none could be had before the 18th. The course once began, however, was continued to the 18th of June, the date at which

Jacob was visited by the members of a committee of the Royal Academy of Medicine, for the purpose of being examined previously to his being sent to Vichy at the public expense. The stone in the bladder was caught nine different times by means of a lithometer; the greatest diameter ascertained was seventeen lines and a half, the smallest seven lines (rather more than one inch English in length, by something more than half an inch English in breadth or thickness.)

Placed under the care of Dr. Petit at Vichy in the season of 1839, the patient proved refractory, and only followed the treatment prescribed for him very irregularly. Nevertheless, when he was examined on the 30th of September by the committee, the longest ascertained diameter of the stone was but fourteen lines; the smallest eight lines and a half.*

Previously to being remanded in the season of 1840, the stone in this patient's bladder was repeatedly seized by a committee consisting of Messrs. Civiale, Blandin, and Berard, and ascertained to be of the diameters of 13, 14, and 15 lines. The treatment by the Vichy waters, begun on the 23d of June, 1840, was pursued with great regularity to the middle of September, the patient taking from 12 to 25 glasses of the water and a bath daily, and

* The particulars of the case so far may be found related in Dr. Petit's "*Reponse à quelques allegations contre la Dissolution des Calculs Urinaires*," which is appended to a republication of a Report by M. Patissier on the Use of the Vichy Water in Gout. 8vo, Paris, 1840. For what follows I am indebted to the politeness of Dr. Petit.

in addition having a stream of the water sent through his bladder by means of a double-current catheter, once, twice, and even thrice a day for some considerable time. In the beginning of August the patient began to pass fragments of his stone, and at the same time he obtained complete relief from his sufferings. On the 18th of September he was sent back to Paris, where, having been sounded on two different occasions by the several members of the committee, it was formally declared that there was no longer any stone in the bladder.

—When this patient was first placed under the care of Dr. Petit on the 20th of October, he was so alarmingly ill that his life appeared in danger to Messrs Marjolin and Laugier, Surgeons of the Hôpital Beaujon ; M. Marjolin, in particular, recommended Dr. Petit to find a patient in circumstances more favourable for a decisive experiment. Had there been any choice of patients Dr. Petit would have followed this friendly advice ; as it was, he had to content himself with the man whose life had been brought into jeopardy by the course of his disease and the ill advised attempt that had been made to perform lithotrity. These adverse circumstances, however, only make the triumph that was finally achieved the more signal.

Two grand objections are constantly raised to the use of alkaline or any other kind of internal medicine in cases of calculus ; first, that much valuable time is lost in their administration ; and second, that the alkalies especially, far from dissolving or disintegrat-

ing urinary calculi, tend rather to cause precipitation from the urine, or at most to change one diathesis into another.

The first objection is taken obviously enough upon the presumed inefficacy of internal remedies generally in cases of stone. This is a presumption, however, which very certainly is nowise warranted by one item in our knowledge of the pathology of calculus. Stone in the bladder, indeed, is not one of those diseases the natural tendency of which is to get better; on the contrary, it is one that tends ever to get worse, and finally to destroy life, without the successful interference of art in one way or another. But there really seems to be no fact better established in therapeutics than this:—that the symptoms of stone, those symptoms which directly bring the life of the sufferer into jeopardy, are in the majority of instances either entirely subdued or greatly alleviated by a course of alkaline medicines or of the Vichy water. Patients who have been reduced to extremity by ceaseless pain and want of sleep, tortured every hour or oftener with calls to pass their urine, and from whose bladder a mingled muco-purulent and urinous and highly fœtid fluid was discharged, when put upon such a course have, with few exceptions, immediately begun to suffer less; the muco-purulent discharge from the bladder has either notably decreased in quantity, or has disappeared entirely; the urine has become clear, has ceased to be offensive, and has been evacuated at longer intervals, and especially in larger quantities at a time.

The committee of the Royal Academy of Medi-

cine give a definitive judgment upon this point. "It cannot but be admitted as a general proposition," says the Reporter, "that during the administration of the Vichy water the health of calculous patients is ameliorated, and that the urinary passages undergo no changes from its action which could make the operation of lithotrity or lithotomy ulteriorly more hazardous." * On the contrary, I venture to add, if they have a soothing and *healing* influence, to use a common phrase, which I maintain they have been satisfactorily proved to possess, is it not obvious that they must, as a matter of course, render either of these operations much safer than it would have been undertaken upon a patient with his bladder in a state of active inflammation, and his system fevered and disjointed by pain? Doubtless, many cases will occur which are too far gone to be benefitted by the Vichy or any other kind of earthly water. But does lithotrity or lithotomy supply a remedy for every case of stone that presents itself in practice? Far, very far from it; with irremediable ills upon us, Nature at length in mercy reaches us a draught from the waters of Lethe, and then we cease from suffering.

The second objection, that the alkalis, far from dissolving urinary concretions, tend rather to cause precipitation from the urine, and to change one calculous diathesis into another, is one that is now of ancient date, that originated in a groundless assumption, and that has been answered over and over again. Urinary calculi of the lithic acid, the most

* Bullet. de l'Acad. Royale de Medecine, tom. iii. p. 714.

common calculi of all, exposed to the contact of a solution of an alkaline carbonate, or bicarbonate, however weak, are necessarily and in the nature of things acted upon and decomposed. A new salt is formed of sparing solubility, indeed, but still soluble,* and the animal matter which formed a principal bond of union between the integral particles of the calculus being greedily abstracted by the alkali, these particles fall away from one another, and the stone becomes powder.

As to the change of diathesis, this too is a mere assumption; nay it is more, it is an error; the alkaline mineral waters and attenuated solutions of the fixed alkaline carbonates have no such power as to cause a deposition from the urine of either the phosphate or carbonate of lime, of the urate of soda, or of the triple phosphate of magnesia and ammonia. The urine of every one who makes habitual use of the fixed alkaline carbonates even in large quantity and sufficiently diluted, is remarkable for its brightness and limpidity. The urine of the female whose case Dr. Bostock has recorded,† when taking *two ounces and a half of subcarbonate of soda daily*, was pale and perfectly clear and limpid; and the urine of the drinkers of the Vichy water has been universally remarked for its transparency, a quality which, unlike other urine, it preserves even after it has become highly putrid. More than all this, calculi of the phosphates are attacked by solutions of the fixed alkaline bicarbonates whether prepared by

* See Appendix (B.) Solubility of the alkaline urates.

† Medico-Chirurgical Transactions, vol. v.

art or presented to us in mineral springs, at least as vigorously as those of the lithic acid.* The stone in one of the cases quoted in the Report of the Royal Academy of Medicine (Case 8th) which in little more than a month diminished to the extent of a quarter of an inch in its circumference each way, and which was universally porous on its surface, must have been of the phosphatic kind.

The medical treatment of stone in the bladder has indeed assumed an entirely new aspect of late years, and the subject is not yet by any means exhausted. In the preceding paragraphs the effects of the alkaline mineral waters of Vichy have been particularly dwelt upon, because the influence which these waters exert upon the urine, and through it upon urinary calculi, have been very carefully studied in recent times. The Vichy water however influences the urine and the greater number of the deposits that take place from that fluid solely in virtue of the bicarbonate of soda which it contains; this salt administered in simple water, or in water surcharged with carbonic acid in imitation of the natural mineral water,† of itself possesses properties chemically and physiologically of precisely the same kind as the Vichy water. Simple solutions of soda, and artificial mineral waters, however, are never borne so well by the stomach as those that are presented to us by the hand of Nature. This is particularly the case with the artificial Vichy water. Nor is this

* See Appendix (C.) Experiments on urinary calculi.

† See Appendix (D.) Composition of the Vichy waters.

objection met in every point by the use of the transported natural mineral water. A course of mineral water at the spring has the vast advantage of securing the individual whilst pursuing it against countervailing influences of every kind ; to say nothing of the circumstance that the water costing little or nothing at the fountain head, is always taken in quantities that would be felt as ruinously expensive if used at a distance.

The bicarbonate of soda in solution, or as it occurs in the Vichy water, is of service in cases of calculus by rendering the urine alkaline. But the alkaline carbonates, whether of soda or potash, are not the only nor perchance the best salts that may be employed in this direction. The neutral citrate, malate, and even tartrate of potash and of soda taken by the mouth render the urine very promptly alkaline, and have precisely the same effect as the carbonate and bicarbonate of the same bases. These neutral salts are in fact decomposed in their transit through the body, making their appearance in the urine in the shape of carbonates, and attacking urinary concretions contained in the bladder just as the bicarbonates do when administered directly by the mouth. These neutral salts, composed of a vegetable acid and an alkaline base, have this advantage over the bicarbonates, that they do not combine with and render inefficient the natural acid of the stomach, which we now know plays so important a part in the function of digestion ; they can therefore be taken for even longer periods than the bicarbonates without weakening the stomach,

and without interfering with the changes which the food must undergo in that viscus to be made fit to furnish the body with materials for its growth and nourishment.

There are yet other alkaline salts which pass readily from the stomach into the blood, and from thence find an exit by the kidney, which have a still more decided action as solvents of lithic acid than the alkaline carbonates. These are the borates of potash and soda. I am not certain, however, that the borates are really so well fitted as the carbonates to attack the generality of urinary calculi. They have not been shown to possess the same faculty of combining with and dissolving the mucus or animal matter that enters into the constitution of the majority of calculi in such large proportion, and so they may fall short of the carbonates in disintegrating power. The borate of potash or of soda may nevertheless be found useful in certain cases. It may be taken in doses adequate to keep the urine constantly impregnated with it for months, without any detriment to the function of digestion or to the general health.

The very latest researches have added another substance to the catalogue of legitimate lithontriptics, which will very certainly yet be found of signal service in the treatment of numerous varieties of calculous diathesis. This is the Benzoic acid, one of the few substances of its class which is readily absorbed into the system, and like the alkalis, finds its way out again by the kidney. It is but yesterday since this acid, from its physiological affinities and its known capacity to combine with the uric

acid, and to convert a most insoluble into an extremely soluble substance, was recommended in gout by Mr. Ure, * as calculated to prevent the deposition and even to effect the removal of the tophaceous masses of urate of soda, which are so commonly seen about the joints in inveterate cases of that disease; and if the urobenzoic acid which is found in the urine when benzoic acid is exhibited by the mouth have the power of combining with the earthy phosphates, as I have been assured it has by the ingenious surgeon just named, we are weaponed afresh and more effectually than ever against urinary concretions, for the urobenzoates are all salts of most easy solubility. † By treating a small calculus of uric acid alternately with a solution of biborate of soda and of benzoate of ammonia, I certainly found it reduced, dissolved, and disintegrated with singular rapidity; and there can be no doubt of the immediate effect which the benzoic acid and the benzoate of ammonia taken into the stomach have in rendering the urine clear and limpid in cases where it had long been turbid in consequence of depositing the lithic acid and lithate of ammonia. M. Leroy, of Paris, is reported to have used these substances with complete success in a case in which renal calculi of the lithic acid had for a long time been formed in large quantities. I believe them fully competent to prevent the formation of every modification of lithic acid gravel and calculus.

* On Gouty Concretions, in Trans. of Royal Med. and Chir. Society, vol. xxiv. Lond. 1841.

† Vide Berzelius, *Traité de Chimie*, tom. vii. p. 366.

2. *Solution of Stone by reagents thrown into the bladder.* This is a method of treating stone from which every addition recently made to our knowledge would lead us to anticipate great and decisive results. Nevertheless, it is one which has not attracted so much attention lately as the indirect mode of treatment through medicines administered by the mouth. More than a century ago (1732) our distinguished countryman, Dr. Stephen Hales, appears to have been in labour with the idea of dissolving the stone by way of injection. In the course of his experiments he found that a certain menstruum, of which the active ingredient was subcarbonate or carbonate of soda, attacked and dissolved urinary calculi with considerable vigour. This menstruum he also ascertained could be thrown into the bladder of a living animal without injury, and he invented a double-current catheter for its easy and effectual infusion; but he never proved its powers upon a stone in the bladder of man. Dr. Hales's views were, however, carried into effect about twenty years later in another and far more clumsy way by Dr. Rutherford, of Edinburgh, with the assistance of Mr. Butter, then a clinical clerk in the Royal Infirmary, and with a result powerfully calculated to arrest attention.

The subject of Dr. Rutherford's experiment was a man forty years of age, who had suffered from all the ordinary symptoms of stone in the bladder for four years. On searching the bladder "a stone was distinctly felt, and it seemed to be a large one." The patient was put upon the internal

use of soap and lime water ; and from four to five ounces of tepid lime water were thrown into the bladder morning and evening. The symptoms which from the first began continually but slowly to decrease under this treatment, abated rapidly and signally when a larger quantity of lime water could be injected, and when this, on being returned, began to let fall a copious chalky precipitate, which it did by and by. In somewhat more than two months the patient was sounded again, and upon careful searching it was imagined that the nucleus of the stone "could sometimes be felt by slight touches upon the catheter;" and the patient himself said he was quite sure that what remained of it was a very small bit, because he sometimes had a feeling as if it was entering the urethra. The same course being continued for a fortnight longer, the searching was repeated, but this time without any vestige of a stone being found.*

It is truly remarkable that so plain and so conclusive a narrative as that which Dr. Rutherford has left us in Mr. Butter's little book should not have borne fruit. Had we records of the example there set having been vainly followed in numerous instances, we should be content to reconcile ourselves to the neglect into which the treatment of stone by the way of injection had fallen. The medical treatment properly so called has indeed been revived, and with what I cannot but hold good promise of many triumphs ; but the treatment by

* Butter a method of Cure for Stone, chiefly by Injections. 12mo. Edinb. 1754.

injection has not yet found its Petit. Nevertheless, the two methods ought to be held as inseparably conjoined. Beneficial as each in the nature of things is calculated to prove by itself, the two in conjunction ought to accomplish, and will accomplish far more than either separately. In Dr. Rutherford's case they were combined : the soap by the mouth rendered the urine alkaline, and the lime water injection, besides its own disintegrating powers upon the stone, by depriving the neutral carbonate of soda dissolved in the urine of its acid, exposed the calculus to the action of a weak solution of caustic soda. In the case of Jacob just narrated, the two means were also combined, and it has been seen with what success.

The treatment by injection, however, has not been entirely neglected ; the object which Gruithuisen had in view when he contrived instruments to perforate stones in the bladder, was not their destruction in the way of grinding, but that he might open up a passage to their centre for suitable solvents. In pursuit of the same end Gruithuisen revived or reinvented the double-current catheter of Hales, for passing a continuous stream of fluid through the bladder ; but this ingenious man, like Hales, seems never to have tried the measure he advocated. It was, however, had recourse to by Messrs. Magendie and Amussat, in the case of an English gentleman under their care, but with only partial success. Sir Benjamin Brodie was more fortunate, and the solvent which he used, a weak solution of nitric acid in distilled water, was original.

By means of injections of this composition two concretions of the mixed phosphates were finally so much reduced in size as to escape by the urethra. *

In the course of my researches among the records of medical experience upon this interesting subject, I have met with another successful instance of solution of stone in the bladder, which as it is quoted nowhere else, I shall place briefly before the reader here. The subject of this case was a gentleman about 40, in whom symptoms of stone in the bladder and the sufferings that accompany it had been gradually increasing in severity for some considerable time. At length they gained such a degree of intensity that the operation of lithotomy was resolved on; but this having been delayed by the engagements of the surgeon in attendance, Dr. Ritter of Cassel proposed to the patient to try the effect of some of the chemical means that had then recently been propounded by Fourcroy for the solution of the stone. The patient gladly assented, and was forthwith directed on going to bed to take a glassful of a solution of caustic potash in water, of such strength as just excited a feeling of warmth in the mouth, and in the morning, after having made water, to have three ounces of the same solution warmed to 98° Fahrenheit, thrown by means of a catheter into the bladder. After the lapse of an hour and a half, the bladder was emptied. The discharged fluid was found turbid, and seemed to have lost all its alkaline properties; it let fall a considerable deposit of mu-

* Lond. Med. Gazette, June, 1831.

cus, and on the surface of this a thin stratum of a grayish or yellowish pulverulent precipitate. The injection was repeated in the evening, when another glassful of the alkaline solution was taken by the mouth. In a few days the strength of the injection was increased ; and the patient was in addition placed in a warm alkaline bath every morning for three quarters of an hour. Towards the eighth day of the treatment decided signs of improvement in the patient's state were manifest. The precipitate from the injected fluid, on its being returned, became more and more copious, and without being absolutely sandy, it was still rough to the touch, and had here and there little masses of a bright yellow or reddish colour interspersed through it. In the same proportion as the precipitate increased did all the symptoms of stone diminish. On the 38th day of the treatment, the pulverulent deposit from the injected fluid having ceased entirely, and the patient complaining no longer of pain or uneasiness of any kind, but feeling himself perfectly well, everything was discontinued. The whole of the precipitate collected together weighed two and a half loths, or about one ounce and a quarter avoirdupois. The patient was seen by Dr. Ritter several years afterwards in perfect health, never having had any return of calculous complaint.*

In this interesting case the means pursued were of the most active kind, and were perfectly adapted

* *Chemische und medicinisch-praktische Bemerkungen über menschliche Harnsteine, von Hofrath Ritter, in Hufeland's Journal. Band xxv. S. 119.*

to the end proposed. Commentary upon it would be wasted; the important inferences to be drawn from it stand out in sufficiently bold relief.

The particulars of another remarkable case are narrated by M. Jurine, Professor of Anatomy, &c., Geneva,* and deserve to be referred to in this place. Under the influence of an injection of simple water into the bladder every day for several months [!], a large calculus, which must have been of the phosphatic kind, was so completely dissolved and disintegrated that at last it was reduced to a mere shell, and then broke down into a hundred pieces within the bladder. This case unfortunately terminated fatally; the patient, a female, seems to have suffered so much in her general health before Jurine saw her that no moment propitious to any kind of manual interference could ever be seized. It is worth while to state that the object of the practitioner in this instance was not to dissolve the stone, but to dilate the neck of the bladder and urethra to such an extent as to admit of its extraction. Had the injections been of another nature than simple water, and the whole procedure been instituted and carried on under the guidance of better information and of sounder discretion than they appear to have been, the result would, in all probability, have been different in this instance. Mechanical dilatation of the urethra practised at an early period in the treatment might have saved the patient.

† Bulletin des Sciences Médicales de la Société Médicale d'Emulation, tom. v. p. 400.

On the subject of remedying calculus by the means of injections, then, it seems clear that so much has already been done as to hold out every inducement to perseverance. In the nature of things, indeed, perseverance guided by the better knowledge we now possess of the agents that attack urinary calculi, and of the manner in which these operate, must of necessity be crowned with success in a very considerable proportion of cases.

I see many difficulties, however, in the way of an extensive, continued and fair trial of injections for the cure of stone in the bladder. Surgeons, for example, are disinclined to lend themselves to any means for the cure of stone that do not involve an operation; their education and their habits do not generally fit them to appreciate or incline them to confide in chemical remedies; distrusting the powers of these remedies, they reject them untried; they have a means at command in which they place implicit confidence, and they therefore and naturally give this the preference. Physicians again, in the present conventional division of professional labour, have little opportunity to try any means of removing stone; they are seldom consulted independently in stone cases; and then the physician who meddles with anything *mechanical*—and there is no moving in the treatment of calculus without sounds, &c.—is held as going beyond his province, and is immediately looked upon with jealous eyes, first by his own fraternity, and then by his near kindred the surgeons; so that timidity and the wish to stand well with all,

hinder him from profiting by such occasions as he does encounter.

The mode of treating stone in the bladder by injection, is nevertheless in accordance with the ascertained laws of chemical affinity, which are just as determinate and as much to be relied on as those of gravitation; this mode of treatment is therefore reasonable. Farther, it has been applied with complete success in more than one instance, and on the ground of experience it may be said that it will surely succeed if fairly tried again.*

* See Appendix (E.) Composition of injections for the solution of calculi, and the means of using them.

CHAPTER II.

REMOVAL OF ENTIRE CALCULI THROUGH THE URETHRA.

1. *With previous dilatation of the canal.* The fact that persons after suffering from symptoms of stone in the bladder often obtained relief by the accidental escape of the concretion amidst a flood of urine, and that others who suffered in the same way constantly felt the stream of urine interrupted by the stone falling against the vesical orifice of the urethra, must have led, at an early period in the history of medicine, to the use of measures calculated to aid the escape of calculi:—Had the canal of the urethra been but a little wider, the stone that became engaged in its vesical extremity would have passed through. The most simple and natural method of favouring the passage of calculi was to enlarge the urethra; and accordingly we find that one of what we must presume to have been a very early means of ridding the bladder of calculi other than by the knife, had dilatation of the urethra as its essential element. Prosper Alpinus informs us in his *Medecina Ægyptiorum* that he saw more

than one Egyptian practitioner extract calculi the size of an olive, and, as he says, even of a small walnut, through the urethra previously dilated by the insufflation of air and the introduction of certain extensible cartilaginous (doubtless dry membranous) tubes, of different sizes, which were susceptible of being expanded by insufflation. When the urethra was held to be sufficiently dilated, a wooden canula was passed into it, and the patient being placed in a proper position, the operator with a finger in ano pushed the stone into the neck of the bladder and into contact with the canula. The mouth was now applied to the outer end of the tube, and strong suction being made, the instrument was slowly withdrawn, the calculus following it as a plug. This ingenious procedure of the Egyptians is as applicable as ever, and in good hands, and with the substitution of an exhausting syringe for the mouth, would certainly succeed in some cases in which patients are now made to run the risk of their lives by being subjected to operations of a far more hazardous kind. The preliminary part of the process has indeed been revived in modern times, but with modifications that are not improvements; solid bougies, for instance, that act as wedges, have been substituted for the extensible membranes of the older practitioners, and as an inferior degree of dilatation only can be effected without pain and the risk of inflammation by these hard instruments, so less good has been done; and then the second and highly important part of the procedure has been thrown by entirely.

Nevertheless, modern surgeons have several times succeeded by the introduction of graduated bougies in getting away calculi which would otherwise and without their interference have remained in the bladder till they had grown beyond all chance of being extracted through the natural passages. Ledran,* for instance, advised a patient who had voided many small calculi, but who still retained one in his bladder which would not come away, to introduce bougies, with a view to dilate the orifice of the bladder and the urethra throughout its length, and so permit the stone to escape. He at the same time recommended the patient when he made water to lean forward that the stone might be directed towards the outlet. On the fifth day of the treatment the patient got rid of his calculus, which was of the size of a large pea. Baron Boyer † also succeeded in getting away four considerable calculi by following the same procedure. Sir Benjamin Brodie ‡ in like manner informs us that by the use of diluents and a full-sized bougie, the instrument being withdrawn when the bladder was distended with urine, and the patient placed in a favourable position, he was so fortunate as to procure the discharge of three considerable calculi, for the removal of which an experienced surgeon had recommended the patient to submit to the operation of lithotomy.

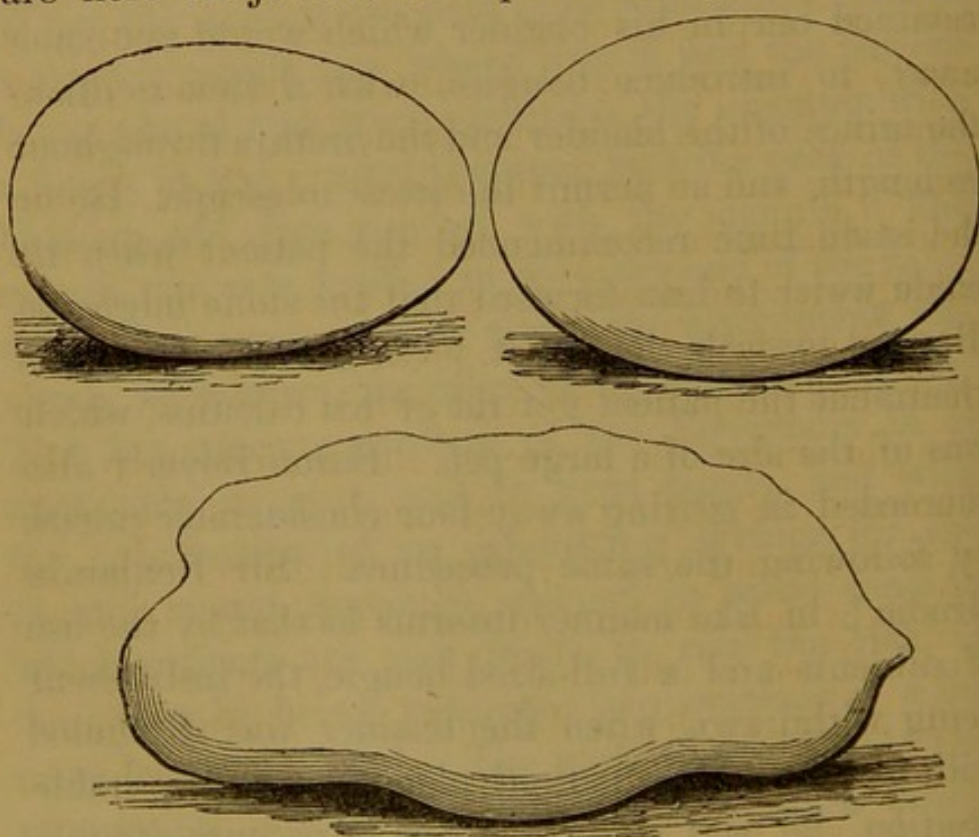
But if less confidence have been given to dilatation of the urethra in the male than I think it deserves, and if this means have been called into requisition

* Consult. de Chirurgie, p. 471.

† Traité des Maladies Chirurg. tom. ix. p. 308.

‡ On Diseases of the Urinary Organs.

less frequently than I believe it might, the case as regards the *female* is different. Such confidence have surgeons now in the dilatibility of the female urethra, that the use of the knife appears to have been for some considerable time past completely laid aside in the treatment of calculus among women. When such masses as those of which the outlines are here subjoined, will pass through the female



urethra, there never can be any pretext for incising it. The largest of the three calculi here figured, was actually discharged spontaneously, literally forcing a passage for itself, after a great amount of suffering doubtless that might have been much abridged, and in great part spared, by the interference of enlightened art.*

* Vide an "Account of a very large Calculus passed by a young woman without operation, by Mr. Harris:" Guy's Hos-

But this knowledge, and the advantage that has been taken of it, are not of yesterday. The dilatability of the urethra was well known to many both of the older and later writers. Wier, in his "Medical Observations," (1557,) states that the female urethra "*eatenus commode tendi posse ut magnum digitum non difficulter intro admittat*;" Tolet, in his "*Traité de Lithotomie*," (Paris, 1681,) says in express terms, "*il n'est pas croyable combien l'urèthre se dilate tant aux hommes qu'aux femmes*;" Ledran never made any incision in removing calculi from the female bladder; Bromfield* dilated the female urethra for the extraction of calculi with the bowel of a small animal inflated, &c. But these facts, and the practice connected with them, had fallen into oblivion, when they were again brought under the notice of the profession by Mr. Thomas† about thirty years ago, he having succeeded in removing an ivory implement three inches in length, which had been introduced into the bladder, after the use of no more than a couple of sponge tents of very moderate dimensions. These he found had so far dilated the urethra in about twelve hours, that he was enabled easily to pass his finger into the bladder and dislodge the intruder. The example once set was in this instance speedily followed, and the practice had soon many signal triumphs to boast.

pital Reports, vol. iii. 1838. The other two calculi were brought away after the use of Weiss's dilator,—the one in the practice of Sir Astley Cooper, the other in that of Mr. Green.

* Chirurg. Observ. Lond. 1773.

† Med. Chirur. Trans. vol. i. Lond. 1812.

The only objection that can be urged to the practice as at present pursued is, that the instruments commonly employed to procure the dilatation are by no means the best that have been contrived, and that the process is all but invariably carried on too rapidly. *

2. *Without previous dilatation of the urethra.* It had been occasionally observed, that catheters introduced into the bladders of persons who had suffered from retention of urine in consequence of the presence of gravel or calculus were withdrawn with small concretions sticking in their eyes; and this circumstance deserves especial attention, as having led to very important consequences. The accident alluded to must have occurred ever since canuli for the urethra or catheters were invented; but he who first attempted to take advantage of it was M. Bourguenod. In a modest paper in the 6th volume of the "*Annales de Montpellier*," this practitioner gives the particulars of three cases, in which as

* Ergo urethræ dilatatio!

Casus mihi nuper narratus est a quo urethræ vis ad dilatationem insita, modo insolito et sane mirabili demonstratur.

Quidam, familiæ generosæ, ad chirurgum Dublinensem celeberrimum venit, consilium de uxore nuperrime nuptâ rogans. Hanc, dixit, multa dum jura sua conjugalia agerentur passam esse, et præterea semper urinæ incontinentiæ captam, loturam ad momentum coitus et subinde super eum et seipsam fœdè et inhonestè efudisse.

Quum fœminam visit chirurgus, meatum urinarium valde amplum et urethram locum vaginæ sicuti tenentem comperuit. Maritus, mehercule! impatiens atque pollens, ad noctem nuptiarum, viam, ut apparuit, per meatum urinarium coegerat, ad vesicam penetravit, et postea coitum *per urethram* infelicis semper egit, nunquam per vias proprias et naturales!

many as five small calculi were successively removed from the bladder by its means. He used what the French call *sondes a demeure*—elastic catheters fitted with a plug left permanently in the bladder. The eyes of the catheter were split to a certain extent, and the cessation of the flow of urine through the instrument was the signal that the concretion had entered the trap set for it. This generally took place in the course of three or four days. The concretion removed in one of the instances was as long and as thick as the end of the little finger; and in another the operation of lithotomy was rendered unnecessary by the successful issue of the simple expedient employed.

The first case which M. Bourguenod encountered was that of a man suffering from retention of urine to whose assistance he was summoned. The bladder in this instance had been so greatly distended that it seemed to have lost its contractile power, and it therefore became necessary to draw off the urine continually. To save trouble, a flexible catheter was left in the bladder, and the patient relieved himself from time to time. After the lapse of four days M. Bourguenod visited his patient for the purpose of cleansing the catheter. He found the greatest difficulty in withdrawing the instrument, and fancied it must have become thickly crusted with deposit. After injecting a little oil, the instrument was with an effort brought forward about two inches, when suddenly it slipped and was then removed with the greatest ease. On being examined, the catheter was found without incrustation; but one of its eyes was dilated and irregular, which led M. B.

to believe that a small calculus having been engaged in this eye, had caused the difficulty experienced in withdrawing it ; on attempting to introduce the instrument, in fact, it was stopped about two inches from the neck of the bladder, a point beyond which it could not be urged ; and with a finger in ano a hard lump could plainly be felt in this point of the urethra. All attempts to bring this mass forward were found futile, and the patient was by and by taken with complete retention of urine, which lasted for twenty-four hours, when happily the concretion was pushed back into the bladder by a silver catheter, and present relief obtained. An elastic catheter, having its eyes cleft, was now introduced, and ordered to be retained as before. In three or four days afterwards the patient sent for his attendant, the urine having ceased to flow by the instrument ; and this being withdrawn with great deliberation, brought away a calculus "*presque aussi grosse et aussi large que le [bout du, I presume] petit doigt,*" a calculus nearly as long and as thick as the end of the little finger. The patient recovered completely from this time.

CASE 2. Some time afterwards M. Bourguenod was summoned to another patient labouring under suppression of urine. He was relieved, and an elastic catheter left in the bladder. In a few days this was replaced by one having the eyes slightly split. By and by no urine passing by the instrument, the patient withdrew it gently himself, and between the eyes he found a calculus as large as a pea. In the course of a few days more, the catheter being still retained, the same event occurred

again, and a second calculus somewhat larger than the first was removed. The patient now recovered ; but relapsing after an interval of between five and six months he passed the catheter himself as before, and for the third time, with success, for many days had not elapsed till he withdrew a third concretion by its means. From this time forward the patient continued well.

CASE 3. M. Bourguenod, after these instances had occurred, was requested to visit a child aged five and a half years, affected with stone, that he might do the ordinary operation for its relief. Recollecting his former successes, however, he passed first one elastic catheter and then another, until he was able to introduce one of medium size. This was split at the eyes, and set as a trap for the calculus. But a whole month elapsed before it became engaged ; at length one day the urine ceased to flow through the instrument as heretofore, and on being removed, a small calculus, the size of a clove, was found fixed in one of the eyes. This patient immediately recovered, and remained well afterwards.

The Baron Boyer also informs us (*Mal. Chirurg.* tom. ix. p.318) that upon one occasion, on removing an elastic catheter which had been left in the bladder of a patient affected with stricture of the urethra, he found a calculus the size of a haricot bean sticking in the eye of the instrument.

Mr. George Bell has given a very interesting account of the case of a Scotch clergyman who had suffered for many years from enlarged and indurated prostate, to which had succeeded stone

in the bladder, an event that so frequently happens. This gentleman had endured repeated attacks of retention of urine, and had in fact passed little or no water save with the assistance of the catheter for years. On more than one occasion a small calculus had been found sticking in the eye of the instrument when it was withdrawn, and this gave the patient himself the hint of a very ingenious means of relief, which he soon practised with much success. Having cut off the end of a large silver catheter, he had this plugged nicely with a ball of silver attached to a wire. The instrument thus fitted could be readily passed into the bladder; and this was done particularly when the viscus was full of urine; once introduced, the terminal ball was withdrawn by means of the style, and the forefinger of the right hand being applied to the outer orifice, the quarry of stones was soon discovered, when, the finger being quickly withdrawn, the gush of urine that followed was very often accompanied by one or two of the calculi. In this way 150 concretions of various sizes had been removed, and many more were subsequently brought away. Although one larger calculus still remained behind, the patient had derived so much relief from getting rid of all smaller concretions, that he could never be brought to take the chances of lithotomy in the hope of obtaining a complete cure.*

Finally, the late Sir Astley Cooper, having left a catheter in the bladder of a patient whom he was at-

* Bell in *Edinburgh Journal of Medical Science*, vol. ii.

tending at this time for an attack of inflammation of the bladder and urethra, induced by an attempt to dilate the latter canal by means of bougies to permit certain small calculi which were known to exist in the bladder to be flooded out with the urine, was informed by the patient that on removing the catheter he had several times found concretions sticking in its eyes. Sir Astley upon this told the patient that he should call next day and withdraw the catheter himself, and this being done, a calculus was actually found impacted in one of the eyes. The advantage that might be taken of this circumstance immediately presented itself to the mind's eye of the great surgeon; he resolved, by means of a pair of forceps, to seize the calculi where they lay, and to extract them through the urethra. A suitable instrument was soon constructed, with the assistance of the ingenious surgeon's instrument maker, Mr. Weiss, and this was plied so successfully at intervals during several weeks, that as many as eighty-four calculi in all were extracted; and the quarry being at length exhausted, the patient went home well.*

This method of extracting stones is no new discovery, however; passing by Alsaharavius and the more ancient writers, the extraction of small stones from the cavity of the bladder is particularly mentioned by Sanctorius, (*Comm. in Avicen. Venet. 1626,*) who even contrived an instrument for the purpose. The account and the drawing which he

*An Account of a Case in which numerous Calculi were extracted from the urinary bladder without the employment of cutting instruments. By Astley Cooper, Esq., *Med. Chir. Trans.* vol. xi.

has left us of this instrument are faulty, but I find no difficulty in following its mechanism and mode of application. It consisted of a forceps having three elastic branches, which, that they might be introduced into the bladder through an outer canula, (per syringam,) were held together by a little cap upon their points. The instrument having been passed into the bladder full of urine, the cap was first pushed forward a little, by which the blades were set free, and it was then withdrawn through the hollow stem by means of the stylet. The urine escaping at the same moment, the stone was carried between the chaps of the forceps, where it was easily secured by this being drawn a little way into the outer canula. An instrument very nearly on the same principle, and having two elastic blades, was invented by Dr. Hales, but this was for the extraction of stones arrested in the urethra, a direction in which it was used successfully by Mr. Ranby upon more than one occasion. The same implement was reproduced by Mr. Hunter, and he or some cotemporary must have proposed going into the bladder and extracting calculi from its cavity, for the proposition may be found commented on in terms of great severity by M. Deschamps, in his classical work entitled "*Traité pratique et dogmatique de la Taille*," (1796,) where a figure of Mr. Hunter's forceps is given. I have farther been favoured, by Mr. Curling of the London Hospital, with an original drawing of a three-bladed forceps acting by its elasticity and the pressure of a canula, which was repeatedly used by the late Sir William Blizard, at

the London Hospital half a century ago, for the very purpose in question.

With regard to the value of the idea of extracting calculi from the bladder in the manner and by the means indicated, this has been very differently estimated by different writers. One excellent surgeon has proclaimed it as among the greatest achievements of modern surgery (Brodie); another has said that it could hardly fail to prove highly injurious (Syme); and a third has declared it imprudent and murderous (Deschamps). There must be cases, I believe, in which, in the absence of other and better means, this procedure would be found useful if cautiously instituted. Hale's, Hunter's, Blizard's, Cooper's, and other forceps, have, however, all been superseded by one or other of the instruments used in lithotrity, which are of better construction and superior efficacy.

That the extraction of urinary calculi by means of forceps through the unprepared urethra is an operation not without danger is quite certain; it is no such unmingled good as it was proclaimed and believed to be after Cooper's first success. Proof of this may be had by turning to an early volume of the London Medical Gazette, where a case is reported in which death ensued, though the forceps were in very competent hands, and no more than two attempts to use them were made. In this unfortunate instance three calculi, the size of plum stones, were removed on the 9th of March, and in the afternoon of the same day, a fourth was expelled with the urine. On the 28th, two more calculi

were extracted, but with great pain to the patient, and some bleeding from the urethra. From this time the patient became alarmingly ill; he complained of constant pain about the neck of the bladder and in the course of the urethra, which was greatly aggravated so often as there was a call to urine. Things went on from bad to worse, and the patient finally expired on the 13th of April. On opening the body after death, the bladder was found to contain sixteen calculi of all sizes, from that of a horse-bean to that of a large walnut; the coats of the viscus were thickened and contracted; the ureters and pelves of the kidneys were attenuated and dilated; their lining membrane was softened and of an ash-grey colour. The membranous portion of the urethra was deeply discoloured, as if from gangrene, and a small opening actually led from the canal to the cavity of an abscess situated between the bladder and rectum.

CHAPTER III.

REMOVAL OF THE STONE PIECEMEAL, BY DRILLING,
GRINDING, OR CRUSHING IT WITHIN THE CAVITY
OF THE BLADDER.—LITHOTRITY.

THE modern history of LITHOTRITY, by which is now understood destruction of the stone within the bladder by mechanical means of any kind, begins with the accounts we have of the case of Major-General Martin, the fullest and best of which are from his own pen. This distinguished officer was a native of Lyons, and arrived in India in the capacity of a common soldier; but from this humble position he soon emerged, and finally attained the very highest rank that could be won in the Honourable Company's military service, owing his advancement to his talents and worth alone.* The

* On the tomb which he constructed for himself during his lifetime, on the under-ground floor of a "grotesquely magnificent house which he built at Lucknow," are these words from his own pen :

" MAJOR-GENERAL CLAUDE MARTIN,
BORN AT LYONS, JANUARY 1738,
ARRIVED IN INDIA AS A COMMON SOLDIER,
AND DIED AT LUCKNOW [15TH OF SEPTEMBER, 1800,]
PRAY FOR HIS SOUL !"

(*Emma Roberts, Scenes and Characteristics of Hindostan*, vol. ii.)

first published account which we have of General Martin's case is in the 1st volume of the Medical and Physical Journal (Lond. 1799). It is in the form of a letter from the General to Sir John Sinclair, dated Lucknow, July 9th, 1798; he here describes his process particularly, and transmits one of the files with which he operated. There is, however, a communication, earlier in point of date, though later in regard to the time of publication, extant in the 10th volume of the *Annales de Montpellier* (Montpel. 1809). It is entitled, "Fragment d'une lettre de M. Claude Martin, &c. à M. Pictet de Genève, communiqué par M. P. Fine," and bears date, Lucknow, Dec. 10th, 178(9?)5. The letter is in French, and is extremely interesting. The writer informs his friend, M. Pictet, that he had been so fortunate as to cure himself of a stone in the bladder, which he imagines must have been of large size, by means of a contrivance of his own,—a file, curved to correspond with the canal of the urethra, and having the teeth which are confined to the convex side of the instrument, and extend to about a quarter of an inch from its extremity, set obliquely so as to cut in the withdrawing. The person suffering from stone, he continues, must be the operator himself, for it is impossible that any one can either introduce the instrument or use it so well as the patient. "By standing up and leaning forward, the stone is brought to the neck of the bladder, and it is then that it must be attacked with the file; or if the stone does not come into this position, the patient by injecting tepid water, or discharging his urine, may bring it within reach of the file." General Martin continued his opera-

tions through a succession of months, filing on an average three times a day, but often as many as ten and twelve times. "I filed to such purpose," he concludes, "that at length I brought away the last fragment of my stone, and am now perfectly well."*

The editor or correspondent of the "Annals of Montpellier" comments favourably on this procedure, and thinks that it might sometimes be applied with advantage. General Martin's case has been noticed repeatedly since; more particularly in the 1st volume of the Journal of the Royal Institution in 1816, and by Dr. Marcet the year after, in his work On Calculous Diseases. But this case remained without results long after its publication.

The next stage in the history of lithotrity is unquestionably the publication of Dr. P. E. Gruithuisen's paper in the Medico-Chirurgical Journal of Salzburg in the year 1813. The title of this paper is as follows: *Are we then to abandon the long-cherished hope of removing stone in the bladder by mechanical or chemical means?* (Ob man die alte Hoffnung aufgeben sollte den Stein aus der Blase auf mechan-

* General Martin was probably less successful in ridding his bladder of stone than he believed,—the organ, after his death, is said to have been found still including a calculus. But this circumstance is nowise at variance with the facts as stated. The bladder at one time probably contained two stones, one of which was destroyed by the use of the file. Baron Percy, in 1823, gave some particulars of a monk of Citeaux who, by means of a small *chisel* introduced through a canula, and struck with a hammer, succeeded in detaching innumerable fragments from a stone which he carried in his bladder. He had a boxful of the shivers which he showed to the curious.

ische oder chemische Weise einst noch wegschaffen zu können ?) and it is a truly remarkable production. The author declares himself a strenuous advocate for the idea of dissolving the stone. He instituted experiments to determine the extent to which calculi were attacked by being placed in a current of water, pure and holding different acids and saline substances in solution. Among other implements he describes and figures a canula, through which was passed a noose of wire to secure the stone, in the same way as a loose cork is secured in a bottle, and a small trepan with which the concretion was to be perforated, its nature ascertained, and its centre opened up to the action of the appropriate solvent.

This brilliant idea was, however, never carried into practice; Gruithuisen's paper attracted no notice in the scientific world of Germany, and it seems to have remained unknown to the rest of Europe. It therefore influenced in no way the measures that were subsequently taken towards effecting the mechanical destruction of the stone in the bladder.

The stream of improvement in treating stone did not, in fact, set from Germany, but from England, where alone of all the countries in Europe was the subject of Urinary Pathology cultivated with anything like zeal or success about and previously to this time. In both France and Germany, the study of the uropoietic system and its derangements had, indeed, been long at a discount. With the discovery of the urate of ammonia calculus by Fourcroy and Vauquelin in 1799, the successful researches of French chemists

in the domain of urinary concretions may be said to have begun and ended ; for the knowledge we possess in regard to the nature of every other concretion deposited by the urine, with a single exception, we are indebted to English chemists,—to Drs. Wollaston and Marcet especially, although these great names only cast into the shade the inquiries of several other excellent men,—Pearson, Brande, Henry, &c., who all contributed to keep attention alive to the subject.

What may be called the “ General and Special Urinary Pathology,” too, found tongues and pens in England alone, to proclaim its importance, and to push it forward, about the end of the last and during the first quarter of the present century.

The striking work of Dr. Rollo on the Diabetes Mellitus, with the observations of Mr. Cruickshank “ On the condition of the urine in different diseases,” preceded the contributions of Wells, Bostock, and Prout to the pathology and chemistry of the urine in many special diseases, and were indeed heralds and necessary preludes to such remarkable productions as those of Blackall and Bright on dropsies.

If we turn to the operation for stone, again, and contrast the labours of France with those of England, we find that from the date of the work of Deschamps (1796) to that of the thesis of Dupuytren, (1812,) there was little or nothing produced by the former country that either added to knowledge or influenced practice ; whilst in England we observe the labours of Earle the father, (1796,) Dease, (1798,) Simmons, Thomson, Allan, (three

in one year ! 1808,) Trye, (1811,) Carpue, (1819,) Pattison, (1820-1821,) Martineau, &c. &c., succeeding each other in rapid succession, the whole profession as it were labouring heart and hand at the improvement of lithotomy. In a single volume of the Transactions of the Medical and Chirurgical Society, (the 11th, 1820-21,) there are actually as many as *seven* most interesting papers connected with the treatment of stone in the bladder ; and these papers are so remarkable and bear so essentially upon my position, that in England did the fecund germs of lithotrity take shape, that I give their titles at length below. *

If we now regard the diseases of the urethra, we perceive that from the appearance of the “ *Traité des Maladies des voies urinaires*” by Chopart in 1792, with the solitary exception of Nauche’s “ *Nouvelles recherches sur les Retentions d’urine*” in 1806, a

* They are as follow :

1. A Statistical Inquiry into the frequency of Stone in the Bladder in Great Britain and Ireland. By Richard Smith, Esq.
 2. A successful Case of Lithotomy. By Charles Mayo, Esq. (The stone weighed 14 oz. 2 drs. avoirdupois, and measured ten inches in its largest and eight and a half in its smallest circumference.)
 3. History of a case of Lithotomy. By W. B. Dickinson, Esq. (The stone being fixed by a small blunt midwifery hook, was broken into pieces with a hammer and chisel. The pieces collected together weighed $8\frac{1}{2}$ ounces.
 4. Remarks on the danger of extracting large Calculi ; with the description of an instrument to break them down. By Henry Earle, Esq.
 5. Observations on Renal Calculi. By Henry Earle, Esq.
 - And, 6. A Paper on Lithotomy. By P. M. Martineau, Esq.
- It is impossible to overlook the importance and the bearing of the various items contained in this catalogue.

work of no name or likelihood, nothing was contributed by our neighbours till the work of M. Ducamp appeared, so late as the year 1823, and this work appears to have been borrowed in every essential particular from the English, more especially from Dr. James Arnott's book upon Strictures of the Urethra, which was published in the course of 1819.*

In England, on the contrary, the publication of Mr. Hunter's work (on the Venereal Disease, London 1786) was followed at brief intervals by those of Home (1795, 1803, 1821,) Whateley (1801 and 1804,) Bell (1811 and 1820,) Wadd (1815,) Howship (1816 and 1823,) Arnott (1819 and 1821,) Bingham (1820 and 1822,) &c. &c. France, in short, had little or no share in all that led the way to what is now generally esteemed her highest surgical glory—the method of treating stone in the bladder by grinding and crushing. Returning to which subject I remark, that

The third direct stage in the history of this invention in these times was the appearance of a paper entitled, Description of an Instrument for destroying Urinary Calculi within the Bladder, with a plate; by John Elderton, surgeon, in the April number of the Edinb. Med. and Surg. Journal for 1819. This, in fact, is the first broad annunciation we possess in these times of the principle of lithotrity. Mr. Elderton's instrument is ingenious,

* I shall by and by show the important influence which I conceive M. Ducamp's acquaintance with this book, and with English medical literature, had upon the invention of lithotrity.

and under favourable circumstances would almost certainly have been used with success : the first softish stone to which it had chanced to be applied would have given way and crumbled into fragments between its blades. Unfortunately Mr. Elderton published his invention before he had proved its applicability ; it was passed unheeded as a vain speculation by the medical world at large, and I cannot see that it had any immediate influence on the treatment of stone in the bladder, though it was, doubtless, one of the steps necessary to the conclusion that has since been attained, and it was probably neither unnoticed nor unused by those whose attention chanced to be particularly directed to this subject. There is, at all events, the honour due to Mr. Elderton of having the first invented what I cannot but hold to be an available instrument for the express purpose of destroying a stone in the bladder.

The fourth and most important step of all in the history of lithotrity, as I conceive, was the publication of "A Treatise on Stricture of the Urethra, by James Arnott, Lond. 1819," and of "Cases illustrative of the Treatment of Obstructions in the Urethra, Lond. 1821." In these works, however, allusion is only made incidentally to a mode of ascertaining the nature of a calculus still contained in the cavity of the bladder. "If the smallest particle of the stone could be procured," says Dr. Arnott, (Cases, &c. p. 85), "its chemical composition might with certainty be determined. With this view the following means may be adopted : When the stone comes to the orifice of the bladder, let an open pointed catheter

(having of course a ball-ended wire filling it during the introduction) be passed till it touch the stone ; by this a small circular saw like a trephine may then be introduced, to grate off from the calculus, by a few turns, a sufficient quantity of dust for examination."

Dr. J. Arnott was at this time intent, in concert with his distinguished brother Dr. Neil Arnott, upon finding a means of destroying calculus in the bladder by solution. After indicating the method, by the injection of certain menstrua into the bladder, which had already been essayed, and speaking of the double current catheter which they had rediscovered for themselves, as affording important advantages over the old plan of proceeding, Dr. J. Arnott goes on to describe a bag of gilded cloth which had been contrived by his brother, capable of being introduced into the bladder closed, and of being expanded there, with which he thought the stone might be caught. This done, and the mouth of his bag closed again, he proposed to throw in strong solutions of acids or of alkalies, according to the ascertained nature of the stone, so as rapidly to destroy it. "The experiment of removing calculus," says Dr. J. Arnott, "was made by my brother upon a stone in a narrow-mouthed glass vessel with such an apparatus, and perfectly succeeded."

Dr. J. Arnott goes on to speak of "the removal of stone by mechanical attrition," and instances Col. Martin as having "thirty years ago removed a stone from his bladder by files introduced through the urethra." He also intimates that Dr. Darwin suggest-

ed or described an apparatus which might be used to break the stone into distinct portions. In spite of what he has already said of a means of ascertaining the nature of the stone, and in the very next sentence to that just quoted hinting that "better instruments might be constructed than any which have as yet been proposed for the purpose (of breaking up the stone)," he nevertheless expresses himself as adverse to the idea, and even goes so far as to say that so much manual dexterity would be required and the operation prove so tedious, that except in such cases as that of the individual just mentioned (Major General Martin) who united in himself the requisite ingenuity and manual dexterity, it is scarcely probable that the thing will be again attempted.—How dangerous it is to venture predictions upon what may or may not be attempted! Such discouraging views, however, never impede the progress of science. Other men are formed to have different opinions, to take different views of the same subject, and immediately we have self-esteem enlisted on the opposite side, and redoubled efforts follow to make these views prevail.*

But I have not yet done with Dr. James Arnott.

* In this decision Arnott was probably influenced by Darwin, who says in express terms,—and it is interesting to observe genius foreseeing objections as well as devising means,—that the immediate effect of breaking up a stone would be to increase the number of stones, leaving them of an irregular form, and in both ways more likely to irritate the bladder, without the certainty of making any of the fragments sufficiently small to escape by the urethra. Darwin certainly touches here on one of the prime sins of lithotrity.

In commenting upon the fact that stones of considerable size had often been expelled through the female urethra especially, either by the efforts of nature alone, or assisted by dilatation of the passage (op. cit. p. 111), he speaks of the Arabian mode of extracting calculi from the male bladder by widening the whole length of the urethra, and by and by he gives the particulars of a case in which a stone was removed from the bladder of a patient through an opening in the perineum after dilatation of the membranous part of the urethra and neck of the bladder by means of a new dilator, which had been contrived and already successfully applied for the removal of strictures of the urethra.

The subject of this case was a gentleman of middle age, who had some nine months previously undergone the usual operation for stone, in the course of which the rectum had been wounded, so that a fistulous opening remained between the bladder and the bowel, fæces passing with the urine and urine escaping with the fæces. In this state, and still suffering much from pain and irritability of bladder, the patient placed himself under the joint care of Drs. Neil and James Arnott, and Sir Astley Cooper. With a view to cure the fistulous communication between the urethra and rectum, Sir Astley Cooper made an opening into the urethra from the perineum, by which he passed a female catheter into the bladder, and immediately struck a stone. As it was likely to be small, Sir Astley did not object to the proposal now made by the Drs. Arnott, to try the effect of the new dilator in opening the passage for

its removal. This instrument was accordingly used, and in the course of thirty hours the passage in the perineum, the membranous portion of the urethra and the neck of the bladder, were opened up till they were about two inches and a quarter in circumference, or three quarters of an inch in diameter. The lithotomy forceps was then introduced by Sir Astley Cooper into the bladder, and the stone immediately felt, seized, and extracted. It was as large as a middling-sized walnut.

This operation was eminently successful. During the process of dilatation the patient had an uneasy feeling of distension, but nothing approaching to pain. In four days all the irritation of the bladder had subsided; the patient was able to retain his urine, and left his bed-chamber. On the ninth day the wound in the perineum was whole, and he began to take exercise abroad.

This case unquestionably exerted a very considerable influence at the time upon the views of practitioners in this country. At the meeting of the Medico-Chirurgical Society which was held on the 22d of June, 1819, it was particularly mentioned by Sir Astley Cooper, who spoke in high terms of the plan of operation pursued; and its publication immediately preceded Mr. Earle's paper on the means of breaking down large calculi, and Sir Astley Cooper's communication on the extraction of calculi from the male bladder without cutting. The knowledge of this remarkable case was, further, much more extensively spread by being given at length in the immediately ensuing number of Dr. James John-

son's Journal, in connection with a very flattering review of Dr. Arnott's book on Stricture, which is highly lauded, and spoken of as the best on the subject in the English language.

At the end of this very number of Dr. Johnson's publication, page 331, it is not unimportant to observe the name of M. Ducamp, Docteur en Médecine, rue St. Martin, à Paris, among the list of recent subscribers. All that was passing in the medical world of England must consequently have been perfectly well known to Dr. Ducamp, who, indeed, had already signalized himself as an English scholar by translating, among other works, Dr. Bree's book on Asthma into French; and I have, besides, seen his name among the list of contributors in the department of English literature to a Parisian medical periodical publication of the time—the *Revue Médicale*, if I remember rightly.

In the course of my researches for information upon the various particulars embraced in this summary, I was struck by the essential similarity of the ideas and means of cure proposed by Arnott in his Treatise on Stricture (London, 1819), and by Ducamp in his *Traité des Rétentions d'Urine* (Paris, 1823). It was obvious at once that Ducamp had made very free use of Arnott, though without any acknowledgment, for he only quotes the English writer once, (p. 171,) and then it is to accuse him of filching from Desault! This single citation of Arnott suffices of course to prove that the "Treatise on Stricture" was known to Ducamp, whose references besides to Home, Whateley, and Bell, show

him to have been familiar with the English works of highest authority on the subject of strictures of the urethra. It is not likely that he would have neglected the last publication on the subject, especially as he must have seen it spoken of in Dr. Johnson's Journal, as "the best that had appeared in the English language." Ducamp, nevertheless, must have been an ingenious man; he deserved some portion at least of the praise that was so lavishly bestowed upon him by the Committee of the Royal Academy of Sciences, to which his work had been submitted in manuscript. Most of his instruments were improvements upon those already in use, and though in general they existed in other shapes, they could only have been completed by one possessed of mechanical genius, and who had an intimate knowledge of the fitness of means to particular ends.

In the course of my farther researches for information on lithotrity in its embryo state, I was a good deal struck by observing Ducamp's name frequently quoted in the work which M. Leroy published in the year 1825, entitled "*Exposé des diverses procédés employés jusque à ce jour pour guérir de la Pierre sans avoir recours à l'opération de la Taille.*" The first implement which this gentleman imagined for perforating the stone was, he tells us, (op. cit. p. 126,) "a button covered with asperities, or a *small trepan*, supported upon a slender and flexible stem similar to that which supports the port-caustic of *Ducamp*." He mentions Ducamp again at page 144 as having given him the idea of the bow to work his drill instead of the

crank-handle, which was his own invention. He speaks of Ducamp a third time at page 151, and recommends an instrument similar to one which Ducamp had imagined for measuring the extent of strictures, as calculated to bring back the stone when tending to escape from the lithoprione or stone saw. Leroy in the same work further describes and figures a pouch for catching a stone in the bladder, and at page 168 he says, "if this pouch be intended to receive solvent injections," &c. &c. Now it struck me as extraordinary on perusing all this, that the man who had vindicated his claims to the character of ingenuity in one department of the diseases of the urinary organs, should in another and still more interesting division of the same diseases have done nothing for himself, but been contented with giving useful hints to his "*friends*," My astonishment was increased when I saw that M. Leroy's ideas, so naïvely narrated as his own, were essentially the same as those of Arnott;—we have the trepan, for instance, for piercing the stone, the object in doing which was among other things to ascertain its nature, and we had even the pouch for catching the calculus previously to attacking it with chemical reagents.

But my amazement at this harmony of views and means subsided in a very considerable degree when I chanced to turn to a work entitled "*Recueil d'Observations médicales confirmant la doctrine de Ducamp sur la cauterization de l'urèthre*," &c., published by M. P. L. A. Nicod at Paris in 1825. Ducamp, who died prematurely and much regretted in

the spring of 1823, seems to have pointed to Nicod as a fit successor in his practice, and M. Nicod in the preface to his work (*Recueil, &c.* p. xvi. et seq.) gives the following information, which I cannot help viewing as strongly confirmatory of my persuasion that the entire subject of lithotrity in France took its origin from Ducamp, who in his turn derived his ideas from the literature of England, particularly from the two publications of Dr. James Arnott. "To an inventive genius," says M. Nicod of his friend, "great dexterity, and rare powers of observation, Ducamp added an activity of mind that would have led him to other discoveries of equal importance had he not been prematurely snatched away from science. His researches on the urinary passages had given him *the idea of an instrument intended to destroy calculi in the bladder without recurring to the operation of lithotomy* which instrument served subsequently as the model of that of M. Leroy, in taking advantage of which M. Civiale showed such address. Ducamp would probably have perfected his stone-breaker had he not hampered himself with the idea of a pouch in which he proposed to retain the fragments with a view to dissolve or to extract them subsequently."

There is the stamp of truth upon this narration, the rather, as these ideas of Ducamp are the same in effect as those of Arnott: he made a pouch in which he meant to catch the stone, and *having broken it into pieces* (and here he went beyond Arnott) to dissolve or wash it out. M. Leroy has hitherto maintained a character among his countrymen for can-

dour and fairness. He has shown much of these excellent qualities to his rivals, doubtless; but them I conceive he has always had upon the hip; to them he could afford to be generous; but he has carefully avoided the mention of his deceased friend Ducamp, in each and all of his publications, as having invented an instrument for breaking stones in the bladder. Yet he must have known that Ducamp had contrived something of the kind; Ducamp gave him the flexible stem upon which his piercer was supported, and made fit to act through a bent tube; Ducamp gave him the bow instead of the crank. After this any one might be pardoned for inferring that Ducamp had had some share in setting him to work at the destruction of the stone in the bladder in the first instance, and that the same ingenious man had also had some considerable part in contriving the instruments originally constructed for this end. The circumstances attending the announcement of lithotrity in the year 1822 point with something like a necessity, indeed, to a common centre whence the ideas emanated; for no fewer than three competitors for the honour of having discovered lithotrity actually stepped upon the stage in France nearly at one and the same moment.

These competitors were Messrs. Amussat, Leroy, and Civiale. The first in point of time is M. Amussat. This gentleman had already been engaged in studying the structure of the urethra, and had called attention to the neglected fact, that straight sounds are readily enough passed into the male bladder. The title of his communication in reference to litho-

trity is remarkable. It is as follows : “ Note sur la possibilité de sonder l’urèthre de l’homme avec une sonde tout à fait droite, &c., ce qui a donné l’idée d’extraire des petits calculs urinaires encore contenus dans la vessie, et de briser les gros avec la pince de Hunter modifié,” in *Nouveau Journal de Médecine*, Avril, 1822. This announcement is very striking. If there were an enquirer in the direction he took who was independent of his contemporaries, it was M. Amussat. He informs us that on the dead body and in presence of his pupils he had repeatedly practised the extraction of calculi from the bladder, and broken others of the size of walnuts within it, having none larger at his disposal. The instrument was composed of a couple of strong blades, toothed towards their extremities, opening by their elasticity through a canula. The stone being felt was firmly grasped between these blades by their being drawn within the canula, and the pressure thus exerted upon it broke it in pieces.

Still there was nothing of novelty in these ideas. Mr. Hunter’s forceps was already before the world as an instrument fitted to penetrate into the bladder and thence to extract calculi ; and this had already been done in England not upon the dead body but in the living subject by Sir Astley Cooper, when he freed the bladder of Mr. Bullen of its eighty-four calculi without cutting. And with regard to the second idea, that, to wit, of breaking calculi which were too large to pass, the only new point was the strength of M. Amussat’s instrument ; for Mr. Weiss the cutler, informed of the difficulty or im-

possibility of removing calculi from the bladder that were above a certain and very moderate size with the forceps which he had already constructed, made another in the course of the same year (1821) upon a similar principle, but of tempered steel, and of such strength that its power of resilience sufficed to crush calculi of considerable dimensions, especially when they happened to be soft.

The next in sequence is M. Leroy, the title of whose communication is short, and to the point: "Note sur un nouveau procédé pour détruire la Pierre dans la Vessie, par M. James Leroy," in the *Revue Médicale* for June, 1822. In this Note an instrument for seizing the stone is described. It consisted of a double or outer and inner canula of silver, eight inches long, between which a number of watch-springs, connected together by a terminal button, which served to close the canula and admit of its introduction, were passed. These straight springs could be expanded by being pushed forward one after another, when they formed a kind of cage within which the stone being caught was readily fixed, and then perforated by means of a small circular saw or trepan passed down to it through the inner canula. The power of this instrument to reduce and remove piecemeal within the crown of the trepan those calculi that were too large to pass by the urethra is spoken of. It is farther stated that "the instrument may supply us with a means of turning the discoveries of modern chemistry to profit. . . . Among the reagents capable of dissolving a stone, there are several," it is observed,

“ that may be introduced into the bladder without detriment or danger ; but in ignorance of the kind of calculus with which we have to deal we might perchance be adding to its size instead of dissolving it. The lithoprione, by making us acquainted with the intimate nature of the stone, would enable us to choose with certainty the reagent capable of destroying it.”

It seems impossible to overlook the similarity of ideas here with those of Arnott, already quoted. Even the language rendered back into English is almost the same. In his “ Exposé,” too, M. Leroy tells us that he had suffered his mind to go astray after the idea of constructing a pouch in which the stone might be inclosed, and then dealt with by means of appropriate chemical reagents. He must even have gone to some considerable expense in attempts to have a tissue woven, first of fine platinum wire, and then of asbestos, to make the pouch ; but not one of those that were fabricated would hold water. M. Nicod tells us that Ducamp got entangled with a net or pocket with which he proposed to surround the stone and keep the fragments of it together after having broken it down. M. Leroy it would seem did so likewise : “ To one of the modifications of the lithoprione,” he says, (Exposé, p. 168,) “ you may adapt a net to retain the fragments,” &c. Now, though we may expect that ingenious men in pursuit of the same object will exhibit a certain similarity in their means of attaining it, still they will differ from one another in some particulars, their contrivances will not be identical.

When they are, we must presume that they come from a common source.

The instruments of M. Amussat and M. Leroy were as it happened accidentally laid together before the Royal Academy of Medicine in the month of July, 1822. They were of the construction already described; that of Amussat being Hunter's forceps with the blades separated, and acting by breaking the stone in pieces; that of M. Leroy being a cage of four watch springs for fixing the stone, which was then to be reduced into fragments by being repeatedly pierced with a trephine or borer, moved with a bow in the manner of an ordinary drill. The Academy immediately appointed a committee to report on the capabilities of the two instruments now laid before it, and experiments on the dead body were forthwith ordered and instituted in the presence of the committee by the two inventors. One of the hardest kinds of calculi of the oxalate of lime was chosen for the proof. Unfortunately M. Amussat's instrument (*"ingénieusement conçu, mais grossièrement exécuté,"* says Leroy, *Hist. de la Lithotritie*, p. 21) broke without being able to bite the stone. M. Leroy had rather better luck; the stone was seized with his lithoprione and pierced, turned and pierced again and again, so that M. Amussat was thrown completely into the shade, and he appears to have retired from the field discomfited with his ill-made but really very available instrument.

M. Leroy, though he carried off the palm on this occasion, does not seem to have been altogether sa-

tified with his lithoprione. He went to work again, and in the middle of April, 1823, presented to the Royal Academy of Surgery a second instrument, greatly simplified, and infinitely more facile of manipulation than the first.

In his Memoir to the Academy upon this occasion M. Leroy says he now saw that he had taken a great deal of trouble to find what lay as it were ready made to his hand. The ball-extractor of Alphonso Ferri (which the Hale's and Hunter's forceps resemble, save that they have two blades instead of three) supplied him with a simple means of securing the stone; and to admit the perforator, nothing more was required than to turn into a hollow tube the solid stem which in the original instrument carried the blades.

With this instrument the stone was very readily seized; it had but to be touched, in fact, and the blades expanded over it in order to be embraced. Instead of proposing to reduce the stone into pieces by repeated perforations, very tedious at all times and sometimes impossible, M. Leroy had now also contrived a slender rats-tail file, mounted upon a spring which gave it a tendency to diverge from the straight line. This file introduced into the perforation first made and worked by the bow, soon scooped out the whole interior of the stone and reduced it to a mere shell, which by and by could be crushed into fragments by the pressure of the blades of the forceps—a very happy idea, for the stone once seized was now in some sort at the mercy of the operator; it had not to be disengaged from the instrument and caught in another direction in order

to be perforated afresh, a process often attended with difficulty to the operator, and very constantly with pain and irritation to the patient.

M. Leroy seems, however, to have found no opportunity of trying this instrument on the living body, and as this essential element was wanting, it probably attracted less attention than it deserved. This second instrument of M. Leroy, however, united every element of excellence: it was about as perfect as an instrument acting on the principle of perforation could be.

It was not until the year 1823 that we hear anything of M. Civiale in connexion with the subject of lithotrity. In this year he published a small work entitled "*Nouvelles considérations sur la rétention d'urine; suivies d'un Traité sur les calculs urinaires, sur la manière d'en connaitre la nature dans l'intérieur de la Vessie, et la possibilité d'en opérer la destruction sans l'operation de la Taille.*" The part of the work on strictures of the urethra is a mere epitome of Ducamp and therefore of Arnott, or of Arnott and therefore of Ducamp. Had Ducamp and Civiale been friends, (and I do not know that they were not,) I should almost imagine that the former had said to the latter, "*regardez un peu, mon ami, here is an ingenious enough little book, of one portion of which I have made such good use, that my fortune is secure; there is another portion which I have not publicly touched, but which well worked out may possibly do as much for you.*"

M. Civiale, in the introduction to the portion of his work which treats of Calculus, tells us

that having witnessed a most cruel operation for stone in the year 1817, which ended fatally, he began to think of finding some means of avoiding the necessity for having recourse to it altogether. He therefore informed himself of what had been done on this subject, (" Je pris connaissance des travaux qui avoient été fait à ce sujet,") and, satisfied that the notion which he had conceived was quite new, and that by its means it would at all events be possible to ascertain the composition of calculi in the bladder, he embodied the results of his meditations and experiments in a short memoir addressed to the Society of the Old Faculty of Medicine of Paris in the year 1818. This memoir in the work just quoted is alluded to under the title, " Quelques Détails sur un Lithontriptique," by which M. Civiale says he meant an instrument for grinding stone in the bladder; but on referring to the notification of its reception at the Society, I find it designated, " a notice and drawing of an instrument invented by M. Civiale, student in medicine, and which he proposes for the operation of lithotomy " (Bullet. de la Société de la Faculté de Médecine, Août 1818).

Grave doubts have, from the very first discussion of the subject of lithotrity, been raised as to the truth of these early pretensions of M. Civiale. The authenticity of the document which existed in the hands of Baron Percy in 1824, and which was shown as that originally addressed to the Faculty of Medicine, has been formally called in question; and as no satisfactory answer has ever been rendered by M.

Civiale to this arraignment, and as more than one Report of the Royal Academy of Sciences, delivered when there had been ample time to sift the subject to the bottom, has put him altogether aside as the *inventor* of lithotrity, we must conclude that his pretensions are without foundation.* The cruel operation for stone which the student of medicine, Civile, witnessed, led him in all probability to think of an instrument by which he fancied it might be rendered less severe. The severe part of the operation in lithotomy is the extraction of the stone, and he probably conceived that if the stone were caught in a delicate pouch, it would be apt to be removed with more ease than it is when grasped between the thick blades of forceps—an idea that has struck others as well as M. Civile.† We have only

* The manner in which this authenticity has been disputed is really something curious in the curious annals of literary controversy, and I translate it for the edification of my readers, though no translation can do justice to the biting severity of the out-of-the-way French in which it is conceived: "On what does M. Civile rest his claims to having led the way in 1817? On a scrap of paper, misshapen, tattered by handling, crumpled and dirty, worn at the edges and full of erasures, ill written, and having on its margin a pencil sketch representing indifferently an instrument with a pouch for catching the stone,† and by the side of this the figure of another instrument bearing a considerable resemblance to the one which he has lithographed in his work (*Nouvelles considerations, &c.*) but *drawn more freshly* (*dessiné plus fraîchement.*) Is this informal scrap actually that which M. Civile presented to the Academy, or to the minister of the home department in 1818? For my own part I hold this document to be suspicious, and I say so." (Heurteloup, *Lettre à l'Académie des Sciences, Paris, 1827.*)

† This explains the title under which the communication of

to do with M. Civiale, therefore, from the year 1823.

Let us examine his method of removing stone from the bladder without cutting: It is proper to begin, he says, by dilating the urethra, and he refers to the Arabian method of treatment, and immediately afterwards to Cooper's case of extraction of calculi through the urethra, "Un chirurgien très distingué (Astley Cooper) a tout récemment fait choix, m'a-t-on assuré, de cette méthode pour extraire de la vessie les calculs qui ne sont pas trop volumineux." To effect the dilatation bougies are objectionable; what he employs is a piece of the intestine of a cat, which is introduced upon a bougie or sound, and this being withdrawn, the gut which is left behind is then injected with water or air, till the dilatation deemed necessary is obtained. (This is Arnott's dilator.) After this the *lithontrip-tor* is to be introduced. This is an instrument constructed of two hollow cylinders or canulæ, of such dimensions relatively that the one can readily be received within the other, and of a stylet which in its turn is received within the inner canula; connected with the inner canula are four branches, the elasticity of which causes them to separate, unless they be kept together by being drawn somewhat within the outer canula. The stylet is a very im-

1817 is spoken of in the Bulletin de la Faculté de Médecine, Août, 1818, which is to this effect. "M. de Chabrol adresse la notice descriptive et le dessin d'un instrument inventé par le Sieur Civiale, élève en médecine, et qu'il proposé pour l'opération de la Taille."

portant part of this instrument, and has two principal objects, viz. to aid the elasticity of the branches and effect their separation, and to attack the stone once it is seized.

On looking at the figure of M. Civiale, this essential difference appears between the drawing and the description, that in the former the blades of the forceps are *jointed*, whilst in the latter they are spoken of as possessed of *elasticity* to cause them to separate; they are jointed however; each consists of two pieces which are connected by a simple hinge; and it was this structure that made the inferior cone of the perforator necessary; the blades of the forceps possessed of elasticity would have required nothing of the kind to make them expand; but as figured, the blades *have no elasticity*, and could only have been opened by the backward pressure of a wedge or cone.

In considering this figure and the description given of it, positive evidence meets us, first of a want of mechanical skill, and then of harmony between them; the drawing and the printed account do not agree; the description looks like an after-thought. Such a machine as the one depicted in this work was certainly unavailable; it never could have been used to seize and perforate a stone in the bladder; there is absolutely nothing for the operator to hold by, and the drill is to be worked by being turned between the fingers! Very certainly a calculus never could have been reduced to fragments by such an apparatus.

Such as this miserable instrument is, it was pre-

sented along with a memoir entitled "Nouveau moyen de detruire la Pierre dans la vessie sans l'opération de la Taille," to the Academy of Sciences in March 1824; and this illustrious body having appointed M. Chaussier and Baron Percy to report upon the memoir and instrument, Baron Percy drew up a document that at once arrested the attention not only of France but of Europe, and placed the then obscure Civiale on a pinnacle from which he has continued to overlook not only all the men of his standing, but almost every other, however eminent, in his own walk of the profession. To me indeed M. Civiale appears to be one of those favoured children of fortune for whom, to use a vulgar phrase, the bowls always run aright; one of those who without speed is nevertheless foremost in the race, who wins the victory or ere the battle be joined. M. Amussat charges a stone in the bladder of a dead subject; his instrument fails him at the very onset, it goes to pieces, and he is disarmed and retires from the struggle. M. Leroy succeeds him, and makes a hole or two in the stone; but it is a tedious business; all present get tired, and the instrument is at length withdrawn, the stone being left behind but little the worse for the encounter. He perseveres, however; he sees the defects of his apparatus; he has the ingenuity necessary to remedy them, and is effectually implemented at length; but he finds no opportunity to try his fortune on the living body for something like a year, and when the opportunity does at last arrive, the circumstances are unfavourable and he fails.

How different the course of the man on whose birth the genius of good luck has waited! He publishes a machine inferior in point of conception to every other already contrived, imperfect to such a degree that it could never have been used; still he proclaims himself ready to take the field, and scarcely has he done so when he finds not one but two, nay three occasions as "happy prologues to the swelling act" of his final greatness. His own instrument would not have served him indeed, but what signified this? M. Leroy had been sent before by Providence to provide him tools,* and to work he went. Of course he succeeded—succeeded signally! In the first case which he encountered the patient was delivered of his stone in two sittings (Jan. 13th, 1824); in the second case (Feb. 4th) the stone was reduced to powder in four sittings; in the third case (March 4th) it was destroyed with the same ease and expedition.

It was on the strength of these triumphs that Civiale came before the Royal Academy of Sciences,

* "To sum up," says M. Leroy, (Hist. de la Lithot. p. 15,) "if we take all for granted as stated by M. Civiale, it follows that in 1823 he had no notion but of a forceps with four blades without a vice, [to hold the instrument by] or a bow, [to work the drill,] *that in the following year he made use of a forceps having three blades, and furnished with a vice, and a mandril and bow,* consequently that the instrument with which lithotomy was first made practicable [and was first performed] was not his but Leroy-d'Etiolle's." "M. Civiale," says Heurteloup, (Lettre à l'Académie, p. 99,) *ne s'est jamais servi, et ne se sert pas maintenant de la pince qu'il a fait lithographier, parce qu'elle ne peut pas servir, mais de celle présentée à l'Académie par son compétiteur M. Leroy.*"

and it was with his mind's eye still dazzled with their glance that Percy drew up the report to which allusion has been made, in which infinitely more than was his due is awarded to Civiale, and far less than belonged to him by indefeasible right is given to M. Leroy. Civiale had indeed the good luck to find the opportunity of performing the operation on the living subject first; but he contributed nothing to the means by which he triumphed. His boasting in regard to lithotrity must be viewed as of a piece with that of the poor furnace-man, who lights the fire and turns on the steam, and then arrogates to himself the beautiful mechanism of the steam-engine and all the wonders it performs.

The world, indeed, is apt to say that the great merit of everything lies in its application. True, if this thing have been abandoned by its projector, and be rusting unemployed; but it is otherwise when the inventor is still occupied in perfecting his work, and is not only waiting but eagerly looking out for an opportunity to bring it into play himself. And this was precisely the case with M. Leroy and lithotrity; he has shown himself a good workman in numerous instances since, and lithotrity was altogether independent of the interference of M. Civiale; it would have been at least as far advanced had he never existed. M. Leroy's countrymen did him something like justice by and by, and all he has had is well deserved;* for in spite of my strong per-

* Extracts from the reports of the committee for the adjudication of the Monthyon prizes in different years. 1825, "Honourable mention to be made of M. Leroy for having imagined the in-

suasion (in which, however, I may be mistaken) that the idea of removing the stone from the bladder, and even the first hints of the means of accomplishing this end, were not so original as he has by this time brought himself to believe, I feel it impossible not to admire M. Leroy for his mechanical ingenuity, and for the temper and forbearance he has shown towards M. Civiale, who certainly has exhibited none in regard to him.

Lithotrity, as we have followed it hitherto, had for its object the wearing down and comminution of the stone by perforations performed repeatedly and in different directions. But this is not the only mode of getting rid of calculi that has been imagined or that has been employed. Between the practice of extracting small stones from the bladder (1821), and the idea of breaking up such as were a little too large to be brought away, the distance is not great; and accordingly we have already seen that the maker of Cooper's forceps, Weiss, almost at the same time gave to the blades of this instrument such strength as he believed would enable them by their spring-power to crush calculi into pieces. By and by (Feb. 1823), at the suggestion of that excellent surgeon, Mr. Thomas Davis, apparently, Weiss in-

struments of lithotrity." 1826, "A reward of 2000 francs to M. Leroy, who first made known the instruments of lithotrity." 1828, "M. Leroy, already known as the principal inventor of the instruments of lithotrity." 1831, "A reward of 6000 francs for the importance of his labours generally in lithotrity, and especially for his application of the three-branched forceps, an instrument so essential, that without it this operation would never have reached the degree of perfection to which it has attained."

creased the strength of this forceps still farther ; so far, indeed, that the action of a screw became necessary to open the blades. We have also seen that M. Amussat's instrument acted on the crushing principle, and that Elderton's, although not proposed, was applicable in the same direction. The idea and even the practice of breaking down the stone is, therefore, almost as old as that of wearing it down by perforations. Rodriguez, a surgeon of Malaga, delivered a patient of his stone among other means by striking or pounding it with a catheter every day or every other day (Alibert, in Journ. des Connais. Méd., tom. i.), and it is matter of tradition that the late distinguished surgeon, Mr. Thomas Blizard, when he met with a soft calculus, was in the habit of breaking it to pieces by means of a steel sound or catheter passed into the bladder.

Mr. Weiss, having made an instrument with a screw handle to *open* the blades, seems very shortly to have seen the vast advantage he would gain by using the screw to *close* them ; and in the course of the same year (1823) he actually constructed an instrument which may still be seen at his shop in the Strand, which differs in no essential particular from the screw lithotrite now in general use in this country, and also extensively known on the continent as Heurteloup's Percuteur. This last instrument, however, acts by the blow of a hammer, not, save adventitiously, by the pressure of a screw like Mr. Weiss's ; the two instruments are nevertheless essentially the same ; the means only of procuring the power are different. M. Leroy also seems to have

turned his attention to this mode of destroying the stone, and Professor Jacobson of Copenhagen at a later period contrived a very beautiful and very effective modification of the crushing lithotrite, which with a slight alteration from the hands of Dupuytren is probably to be reckoned among the most generally available instruments we possess.

I shall pursue this subject no farther.* Our in-

* In the preceding view of the origin and progress of lithotrixy I have followed the stream in the channel along which I conceive it to have flowed. The idea of getting rid of a stone in the bladder by breaking it up, appears, however, to have taken shape in different countries, particularly in Italy, oftener than once, but always to have died again without leading to any important consequences. Ant. Beniveni, for example, gives the history of a certain nun who appears to have been seized with suppression of urine in consequence of the impaction of a calculus in the neck of the bladder. "As the obstacle could neither be removed by the catheter nor by medicine," says our author, "adopting an unusual but most opportune procedure, I pass a hook behind the calculus, that in striking it in front it might not be forced back into the bladder. I then strike the calculus with an iron rod, blunted at the end, until by repeated blows it is broken into pieces; then taking great care that no internal part should suffer, I withdraw the hook and the iron rod together, upon which the urine and the fragments of the stone escaping simultaneously the woman is immediately cured." ("De abditis, &c. morborum causis," in a Collection published by Winter of Andernach at Paris in 1528, fol.)

Alessandro Benedetti (1533) described certain methods of triturating the stone in the bladder. Sanctorio's proposal to extract small calculi entire, has been repeatedly quoted; but the still more remarkable statements of Ciucci, (*Promptuarium chirurgicum*, 1671,) have been overlooked till lately. "Of all the means of curing the stone," says Ciucci, "there is none to be compared to the *tenacula tricuspis*,"—an instrument with which, in a word,

struments are quite perfect, in so far as the end to be attained by their means is concerned ; in the vast majority of instances no difficulty is now experienced in seizing and reducing to pieces even large calculi still contained within the cavity of the bladder. But has this object, so eagerly pursued, so completely attained, answered the expectations that were even as dearly cherished of its being extensively useful to humanity ? I answer unhesitatingly *No!* The value of lithotrity as a general means of treating stone in the bladder has been immensely overrated, and its indiscriminate application to all kinds of cases has cost many valuable lives. To such an extent, indeed, has this already occurred, that it might be made a question whether M. Civiale's first successes ought not rather to be made subject of regret than of rejoicing, for successes in desperate operations are known to do vast mischief in the end,—one is saved, ten perish prematurely in consequence. But lithotrity *assumed as a general operation* is unquestionably a desperate one; the statistics of the plan prove as much. It has hitherto, however, been a most difficult matter to get at the fact of the advantages or disadvantages of lithotrity. Operators generally have been excessively chary of saying much upon the subject of the mortality. M. Civiale is in fact probably the only man who has had such ample personal experience of lithotrity as to be in a condition to speak from a large number of cases upon

the stone was to be seized and broken up into fragments. Cittadini, in *Il Filiale Sebezio*, March, 1840, quoted in Forbes's *British and Foreign Review*, January, 1841.

this point. But it is greatly to be regretted that little or no credit has been accorded to M. Civiale's reports of his practice.

In his *Traité de l'Affection Calculeuse*, p. 613, he speaks of the number of persons affected with calculus who had sought his assistance up to the year 1836. They amounted to 506. Of these 199 were either unfit subjects for lithotrity, or were otherwise prevented from submitting to the operation. Supposing the whole of the 199 to have been really unfit, this would be in the proportion of one in two and a half very nearly, to whom lithotrity held out no chance of relief, or who, were they subjected to the operation, would almost certainly lose their lives. We have, therefore, 307 subjects favourable for the operation. Of these, says M. Civiale, (*op. cit.* p. 630,) 296 were completely cured; 7 died; 3 were only partially relieved; and in 1 the issue is not known.

But when we turn to such public documents as we possess, we are amazed to find how little the conclusions as there stated accord with the numbers of M. Civiale. In a report presented by Barons Larrey and Boyer to the Royal Academy of Sciences in the month of April, 1831, upon a *compte-rendu* or statement in regard to the patients affected with calculus confided to the care of M. Civiale at the Hôpital Necker, we find it stated with something like a censure that M. Civiale should have confined himself to the mention of five cases in which he had recurred to lithotrity with a success more or less decided; but passed by in silence the

patients who underwent the operation of lithotomy (after having been vainly essayed by lithotrity), so that, say the Reporters, "we should have remained in complete ignorance of the fate of these individuals had we not seen the *movement* of the Hospital, which M. the Controller was obliging enough to lay before us. We find," continue the Reporters, "that twenty-four patients (not sixteen, as stated in M. Civiale's *compte-rendu*) had undergone the operation of lithotrity or lithotomy. Of these twenty-four patients, of whom *six* were cut, [after lithotrity had been essayed in vain,] *eleven* died more or less immediately after the operation." *Eleven* deaths in *twenty-four* cases immediately after the operation! Verily there is little to boast of here, and we can already afford M. Civiale "seven deaths in 307 cases!" and yet find four at our disposal to carry to the next account.

Let us go on to public document the second. This is a report to the Royal Academy of Sciences presented by Messrs. Boyer, Double, and Larrey, upon the operations performed at the Hôpital Necker during the years 1831 and 1832. "Fifty-three patients affected with calculus were received at the hospital. Of this number twenty-seven treated by lithotrity were discharged completely cured; sixteen having had various attempts at lithotrity made upon them, the operation was definitively found impossible, or useless, or it proved fatal. Of these sixteen ten died and six remained unrelieved. Eight other patients were subjected to attempts at lithotrity and then to lithotomy; of these five died

and three recovered." If we analyze this statement we find fifty-three receptions and twenty-seven recoveries; which is as nearly as possible one recovery in two cases by means of lithotrity; but as three recovered by means of lithotomy after the failure of lithotrity, we have three to add to the list of cures, which therefore amount to thirty in all. On the other side we find ten deaths as immediate consequences of lithotrity, and five more after lithotrity and lithotomy combined, that is, fifteen deaths in all. Eight cases remain unrelieved, which must terminate fatally within a brief period, all the more quickly, for the sounding, &c. which the subjects of them doubtless underwent at the Hôpital Necker. *Fifteen* dead, *eight* unrelieved and expecting death, make *twenty-three* cases of non-success to *twenty-seven* of success by lithotrity. Surely neither is there aught to be proud of here; the cases in which no relief could be afforded were actually within *four* of being as numerous as those in which lithotrity was found of avail! And this is an operation that boasts of all but invariable success! of "three hundred and odd cures to seven untoward results!"

Turning from public documents, let us see what some of M. Civiale's contemporaries have made out by an analysis of his cases, somewhat more rigorous than his own. M. Velpeau,* than whom there is no more honourable man or trustworthy writer in

* Médecine Opératoire, 2de Ed. tom. iv. p. 649.

France, has given an analysis of five series of M. Civiale's cases, and I here append his Table :—

Series.	Number of Cases.	Cured.	Dead.	Unrelieved, the stone remaining.	Otherwise	
					Success in	Failure in.
1st.	83	41	39	3	41	42
2nd.	24	13	11	0	13	11
3rd.	53	30	15	8	30	23
4th.	30	18	8	4	18	12
5th.	16	6	7	3	6	10
	206	108	80	18	108	98

That is to say, of 206 patients operated on, 108 (a very little more than *one in two*) recover immediately ; 80, or nearly *one in two and a half* die ; and 18 retain the stone, and will be lost. *One hundred and eight cases cured, to ninety-eight in which death is immediately induced* or may not be averted within a brief interval of time. This is a very different tale from the one told by M. Civiale himself ; the reader may adopt the conclusions of whichever of the two statements he pleases. There can be no question as to the one that conveys the truth.

But M. Civiale can readily be convicted of misstatement out of his own mouth, or by the act of his own pen ; indeed it is from data furnished inadvertently by himself that M. Velpeau has arrived at the conclusions as just given ; and whoever will be at the trouble to turn to the work entitled "*Parallele des diverses moyens de traiter les calculeux*" will straightway find himself picking his steps over a sort

of battle-field. In ten pages of the preface he will meet with a registry of *eight deaths*, and between the 12th and 65th page of the body of the book, no fewer than *fourteen failures* make their appearance,—twice, in a single page, there are records of two disasters.

I am charitable enough to seek for some means of accounting for the singular discrepancy between the reports of M. Civiale and the statements of contemporaries. Men do not usually come openly before the world with an unmitigated falsehood in their mouths; they can generally explain their statements. In regard to lithotrity the explanation is this: All the cases in which the process is essayed, but unsuccessfully, in which one or two or even three attempts have been made to seize and perforate the stone, and even in which it has been seized and perforated once or twice, but in which it is found impossible to proceed in consequence of pain, of inflammation excited in the bladder, &c. &c.—all such cases are thrown out of the account; *in them lithotrity was not performed*; those that die under these circumstances, *die before the operation*, or from some other cause than the operation.—Where men are deeply interested, where they think their reputation is at stake, they deceive themselves, and then they try to deceive others. So respectable a surgeon as Mr. Martineau, who prided himself on his success as a lithotomist, thought that he did not select his patients. “In this number” (eighty-four cases in which he had performed lithotomy) he states that “no selection of patients was made, as I never rejected

any one who was brought for operation" (Med. Chir. Trans. vol. xi. p. 409.) But what is the language of his contemporaries? Let us consult Mr. Crosse: "During the many years that I witnessed Mr. Martineau's public practice, he carefully selected his patients;" (On Urinary Calculus, p. 155.) Unless he had a great chance of success, therefore, he never ran the risk of failure. In charity we must presume that it is the same with M. Civiale, although candour also compels us to admit that however emphatically warned he will not consent to be set right.

The following case which is given by M. Civiale (Parallele, &c. p. 377) to illustrate the ill effects of *simply sounding the bladder!* will serve me sufficiently well to corroborate the above views and statements:

M. Bizouard, aged 65, though he had long suffered from symptoms of stone, had such a dread of everything in the shape of a surgical operation, that it was only when fairly vanquished by his sufferings that he would consent to have his bladder searched. This being done at length by M. Hervez de Chegoin, a stone was struck. M. Civiale being called in a few days afterwards, ascertained without any difficulty that the bladder contained a foreign body,—of about the size of a large walnut. The urethra was sensibly contracted below the pubic arch, and the prostate was larger than natural. Some preliminary treatment, the necessity for which was indicated by the character of the patient and the irritability of the parts, was then had recourse to. "*An exploration of the bladder made by means of the instruments of litho-*

trity," says M. Civiale, "convinced me subsequently that it would be an extremely difficult matter to crush the stone, in consequence of its size, the enlargement of the prostate, the small capacity of the bladder, and the general irritability of the subject. *This perquisition was long and painful. It was followed by a little fever, difficulty in making water, &c.—These accidents never subsided.* Lithotomy was proposed to the patient as his only resource. A consultation was therefore called, and lithotomy was determined on. The day was fixed, the patient had the perinæum shaved, he was laid on his bed, and the sound was passed as the first step in the operation, but no stone could be discovered. It was searched for in vain by more than one experienced hand; the patient had to be put to bed again. Inflammation of the bladder now set in, and the patient died four days afterwards. *Nous trouvons là,*" continues M. Civiale (l. c. p. 378,) "*une preuve éclatante que les explorations pratiquées au moyen du cathéter ordinaire peuvent être plus dangereuses que celles pour lesquelles on emploie les instruments de lithotritie.*"

Now I hold this case to be extremely valuable; it gives us a key to M. Civiale's mode of interpreting his practice. This particular case would not be set down by him in connexion with lithotrity at all—there was "*a mere perquisition of the bladder.*" But when we look with unprejudiced eyes to the whole circumstances, we see that there was a very determined effort to seize and crush the stone in the first instance; this was found impossible; but the futile attempt was followed by local inflammation and

general symptomatic fever, "which never subsided," and the patient fell into such a state, that he must be relieved of his stone or die; the searching of the bladder by the simple sound, preparatory to the performance of lithotomy, rekindled or rather aggravated the inflammation which had been originally lighted up by the vain attempt to perform lithotrity, and the patient was the victim.

The nature of what the lithotritists entitle preliminary examinations—or, to adopt their own French word, *perquisitions*—which all the world save themselves regard as very determined efforts to drill or crush the stone, has been spiritedly sketched by M. Velpeau.* "Let us see," says M. Velpeau, "what these preliminaries are in fact. They introduce the litholabe, the lithonriptor or the percutator into the bladder, where its point is moved about to ascertain the existence and the position of the stone. They then open the instrument, its branches are separated to seize or embrace the foreign body, and to appreciate its size and its form. They then endeavour to perforate, to crush, or to fracture the stone by acting on the other and outer end of the instrument, which is thick and straight within the urethra. All this is done once, twice, or three times at intervals of a few days. And now, doubtless, some one will ask, in what the operation properly so called differs from these preliminaries? *Ma foi, je n'en sais rien!*"

Let us go further, and ask M. Civiale himself, in a couple of instances or so, what he understands by

* Lettre, &c. Gaz. Med. de Paris, 1835.

patients who had died "without having had any operation performed on them:" let us take the case of Lecomte, for instance, and see what is stated in certain private records of the Hôpital Necker, which M. Velpeau seems to have got a sight of, for he puts what follows within inverted commas, and adds in a note that he hopes M. Civiale will not dispute the accuracy of the statements, as he will have no difficulty in divining the source whence they were derived.

"This patient (Lecomte) had suffered from stone for two years, and had an ample urethra: the intention was to have begun the operation on the 5th of June, 1830. The instrument was passed into the bladder previously injected. Acute pain was experienced in the region of the prostate. Scarcely had the instrument been expanded when the pain became intolerable. The instrument had to be withdrawn before the stone could be attacked. From this time there were incessant calls to micturate, accompanied with tenesmus and excessive pain during the emission of the urine. *Death* on the fifth day afterwards."

There is room for farther selection. Here is another where matters were as bad, though the issue was complicated by lithotomy, which became necessary to give the man a chance for his life, which unfortunately he lost nevertheless. "Godailler, aged 57, had suffered from stone for three years. The instrument was introduced the 17th April, 1830, and the stone charged with the greatest ease; *the drill was worked*. After this operation the calls to urine became extremely frequent; in the evening the patient had

a rigor, and then he was attacked with fever. A second *sitting* took place on the 24th ; the febrile paroxysm returned with renewed violence ; the urine loaded with mucus acquired a sanguinolent tint. The state of the patient getting worse and worse, he was cut (and died).” Now the death of neither of these unhappy men is ascribed to lithotrity. Lecomte died without having had any operation performed ; Godailler died of lithotomy—according to M. Civiale ! !

Other excellent surgeons, with heads to plan and hands to execute every the most delicate operation in surgery, but who have not addicted themselves exclusively to lithotrity, have not met with even the very moderate success of M. Civiale from the resources of this operation. Some, however, have met with more ; among the number M. Velpeau, who has probably been as fortunate as any ; and as his experience and candour are greatly to be relied on, I shall give a summary of twelve cases of calculus that were under his own immediate care, and in which he essayed lithotrity.* In the 1st case, lithotrity had to be abandoned on account of the sufferings of the patient, who remained unrelieved ; in the 2nd case the patient was cured ; in the 3rd he died ; in the 4th lithotrity had to be relinquished, after which, lithotomy was performed ; in the 5th, the operation of lithotrity was also found impracticable, and lithotomy was had recourse to ; in the 6th the patient was cured ; in the 7th he was also cured ; in the 8th

* Med. Operat. tom. iv. p. 653.

he died ; in the 9th, he was cured ; in the 10th, he died ; in the 11th, he was cured ; in the 12th, lithotritry had to be given up, and lithotomy substituted. Of the 12 cases, consequently,

- 5 were cured by lithotritry, (not one in two) ;
 - in 1 the operation was abandoned, and the patient remained unrelieved ;
 - in 3 lithotritry was given up as impracticable, and the patients were cut and recovered ;
 - and 3 died of the operation.
- 5 in 12 is *one in two and a quarter*, nearly, in which success follows the operation of lithotritry.
- 4 in 12 is *one in three* in which lithotritry is unavailable,—the operation cannot be performed.
- 3 in 12 is *one in four* in which a fatal result ensues.

The effect of the operation gone on with in the four cases in which it was abandoned may easily be conceived ; it were not saying too much to maintain that in the hands of a man committed to the operation of grinding or crushing, four deaths more would have been added to the list of the mortality, when we should have had five recoveries counterbalanced by seven deaths.

Other practitioners have, as has been hinted, had still less to boast of than M. Civiale or M. Velpeau. M. Bancal, for instance, who is a warm advocate of the operation, and the author of "A Practical Manual of Lithotritry," (Paris, 1839). Let those who imagine that lithotritry is a pleasant pastime rather than a most serious business which often brings life into jeopardy, take the trouble to peruse M. Bancal's cases, and

then decide between those who would greatly restrict lithotrity and those who would apply it indiscriminately. Among the particulars of these cases he will find mention made of repeated and violent paroxysms of fever, the sequence of severe pain; of retentions of urine; of inflammations of the testes, and bladder, and knee; of treatments protracted through four months, and relief not obtained after all, &c. &c. Among the fourteen cases he will find that in *one* only (Case 2) could the cure be said to be satisfactory and complete; that in *one* (Case 1) after fourteen operations the patient seemed to be delivered of his stone, but was not cured; that in *four* (Cases 3, 8, 9, 10) lithotrity was essayed in vain, but the patients were cut and recovered; that in *four* (Cases 5, 7, 12, 13) lithotrity having been essayed, the patients remained unrelieved and would perish; and that in *four* (Cases 4, 6, 11, 14) death ensued immediately, or within about a year, from the effects of the operation.

“In a grand total of 1003 patients who have come under the hands of the lithotritists,” says M. Velpeau,* speaking in 1835, “616 only have been delivered of their calculi; and 387 have died or have not been relieved.” Entering into a few particulars, the same excellent writer informs us elsewhere, † that “the patient operated on by M. Civiale at Florence in 1835, was not cured. A merchant of Lyons, a patient from Anjou, another

* In Rapport et Discuss, sur la lithotritie et la lithotomie, p. 127.

† Med. Operat. tom. iv. p. 652.

patient from the country, two patients from the department of the Seine and Oise, the husband of a midwife of Paris, a printer, a patient of M. Roux, two patients of mine, a patient of M. Lenoir, Colonel Rankin an Englishman, another personage of the same country, a patient operated on by Mr. Attenbury, a patient of Mr. Oldknow, a patient of M. Colliex, the patient of Mr. Norris, and others still, all fell victims to lithotrity. It would therefore, I repeat it, be to abuse the public to hold out this operation as free from everything like danger."

"In the course of the year 1834," says M. Sanson,* "there were either five or six (certainly not more than six) operations by lithotrity at the Hôpital Necker. *Two of the subjects of these operations died.* Since the first of January of the present year (1835) three cases of stone have been received into the same establishment. One has died of the operation; the second has been alarmingly ill in consequence of it; the third is perfectly well,—but he has not yet been lithotritized."

"Of 200 cases of lithotrity," says M. Begin,† "of which M. Civiale has intelligence, performed at Paris, Bordeaux, Nismes, Avignon, London, Edinburgh, Vienna, Munich, Philadelphia, &c. hardly 100 cures are reckoned."

And here be it observed, that the deaths in all the preceding statements are the deaths that happen immediately upon the operation of lithotrity; there is no account of those that occur at the distance of

* Rapport et Discuss. p. 99.

† Art. *Lithotritie*, Dict. de Med. et Chir. pratiques, tom. xi.

a few months, hardly of a few weeks, from the date of its performance. Were these taken into the reckoning, the number of *cures* would be found wofully diminished, that of *deaths* frightfully increased. My own knowledge and the published statements of more than one unimpeachable authority would lead me to maintain that indiscriminate lithotrity was even less fatal immediately than it is in brief prospective. In great numbers of instances the unfortunate patient who has undergone lithotrity *successfully*, i. e. who has not fallen an immediate victim to the means that have been used to deliver him from his enemy, of course feels greatly relieved for a season,—the stone is gone, the thorn in the living flesh is plucked out, and the man rallies and again looks abroad upon the world with an eye of hope and gladness; but he is not quite well, irritability of bladder to a greater or less degree remains behind; this irritability increases; the constant services of the medical attendant again become necessary. The patient is next tormented with ceaseless pain in the region of the bladder, which by and by extends up the loins and settles in the small of the back. The urine has never been healthy in its character, or it has altered at an early period of these untoward symptoms; by and by it becomes like turbid whey; it has a faint, sickly smell; it coagulates on the addition of nitric acid and when exposed to heat; the patient loses flesh and strength; his stomach fails him; he becomes sick, and vomits; he begins to dose, and by and by he falls into a state of coma from which he never awakes, or he is seized with convul-

sions, in which he expires. This picture is from the life; such are the symptoms which I have myself seen in more than one instance, occurring *within two years after successful lithotrity*. Chronic disease has been excited in the bladder and urethra, and this by continuity of surface and of tissue creeps slowly upwards till the kidneys are attained, when death in the exhausted constitution in which such things take place is inevitable.

Mr. Fergusson (Edinb. Med. and Surg. Journal, Oct. 1838) and Mr. Key (Guy's Hospital Reports, vol. ii. p. 1,) have conferred a great boon upon true science by their observations upon lithotrity, and have effectually stripped the especial professors of this operation of the cloak of mingled pretension and mendacity with which they have robed themselves ever since they appeared upon the stage. Both Mr. Fergusson and Mr. Key have followed into their privacy many patients upon whom lithotrity had been performed, and have presented us with a sad picture of the life which many of these unfortunates lead, and of the miserable end which most of them meet at no long period after their deliverance from stone. Mr. Fergusson has recorded the particulars of seven cases in which lithotrity was performed, of which I here present my readers with an abridgment seriatim, for their edification and enlightenment in regard to the value of this operation.

CASE 1. A man about the middle period of life, stout and healthy, underwent repeated operations with the lithotrite, all of which were attended with

great pain ; at length he was held to be delivered. He never recovered completely, however, and now at the end of several years, though no stone can be felt, the patient declares himself to be in worse plight than before he came under the hands of the lithotritist. His present suffering is from chronic disease of the bladder apparently [certainly] induced by the treatment.

CASE 2. Mr. J. was operated on several times with the lithotrite, and suffered but little. After a fortnight's treatment, a fragment of the stone could still be touched ; but it could not be seized so as to be comminuted. The patient went to the country, but the symptoms of stone soon recurring, after an interval of eighteen months he came again under the hands of the lithotritist, and upon this occasion with better success, every tangible portion of the stone having been removed.

CASE 3. J. W. underwent lithotrity. The very first operation in this instance was attended with much pain ; each subsequent one was performed at the cost of agony to the patient. Nevertheless, the bladder at length seemed clear, and the patient appeared to get well.

CASE 4. R. B. had laboured under symptoms of stone for as many as forty years. An attempt was made to seize the stone with the lithotrite, but without success ; and " though the smallest degree of violence was used," still the patient suffered excruciating pain, which was followed by a feverish attack that did not subside for several months, when he was left in a very exhausted condition. The

strength being at length somewhat recruited, the patient was cut, and a mulberry calculus weighing five ounces was extracted. The patient did well.

CASE 5. The Rev. M. A. subjected himself to lithotrity; "but he suffered so much from and after the first attempt, that it was not considered advisable to proceed." Twelve months after this the patient was cut, and a "small stone" removed. He recovered slowly.

CASE 6. Mr. M., against the advice of Mr. Fergusson, insisted upon being lithotritised. "The operation, though done with the least possible violence, was followed by excessive irritation and pain in the bladder." These were subdued for a time, but they soon recurred, and carried off the patient four days after the operation. On a post-mortem examination of the body, the fragments of a large stone were found in the bladder, along with a second and smaller stone which was untouched. No trace of mechanical injury to the bladder could be discovered. Both kidneys were much diseased, and the left psoas muscle was converted into a substance like coagulated blood.

CASE 7. Mr. C., who had long suffered much from stone, was anxious to have lithotrity performed. From this his surgeon, Mr. Fergusson, dissuaded him. But a professor of lithotrity undertook the case. One operation was performed, and the stone was seized and broken; but the patient suffered so much, that he never could be brought to undergo a second operation. As a matter of course, he suffered most severely afterwards, and continued to

live in a state of great misery, being in a far more deplorable state than before the stone was broken into fragments.

In these seven cases, therefore, we see but two recoveries from stone through the means of lithotrity. One man is delivered of his stone indeed, but he is left with a diseased bladder, which is, if possible, a worse evil than the stone. One is dismissed with his stone in fragments still contained in his bladder, and one dies immediately from the effects of the operation. That is to say, we have as good as three deaths in seven cases; for he who escapes from lithotrity with a diseased bladder dies; and he who is unrelieved of stone by one process, and is left beyond the pale of relief by any other, perishes also. Two are cut, lithotrity having failed, and recover. Two recoveries in seven cases, and each of these achieved at the cost of vast suffering to the patient, and certainly with imminent peril to his life!

Besides these seven cases, Mr. Fergusson had cognizance of many others, in which lithotrity had been performed, but which were less immediately under his own eye than those the details of which he has given. He informs us, however, that out of eighteen cases in which he had known lithotrity to be performed, *six were cured; seven were not cured; and five died.* Even in the number of reputed cures, too, there is one case in which there are strong reasons for suspecting a *return* [quere, *a continuance*] *of the disease*; there is a second, in which, though no stone can be felt, “the patient has suffered almost as much since he was operated on as he did previous-

ly to coming under the surgeon's care. Indeed," continues Mr. Fergusson, "*in two only of these [eighteen] cases can the operation be said to have been attended with that happy success which has been generally claimed for lithotrity.*"

Mr. Key, in his excellent paper, also shows clearly that lithotrity is an operation which is neither so universally successful, nor so extensively applicable as might be inferred from the statements of its professors. In illustration of this position he gives the particulars of twelve cases, which I feel it my duty to lay in abstract before my readers for their satisfaction :

CASE 1. An Irish gentleman, aged 64, was operated upon by M. Civiale—successfully, of course, as the patient did not die immediately. But six weeks after his presumed deliverance he consulted Mr. Key, who found him labouring under symptoms of stone in the bladder, "which in severity he had only on one occasion seen exceeded." This poor gentleman lingered out a miserable existence for a few weeks, and then died with his sufferings unmitigated. Little or nothing could be done for his relief; but "a flexible catheter passed into the bladder, gave assurance of the presence there of a considerable fragment of stone."

CASE 2. Mr. E. aged between 50 and 60, was lithotritised by a well-known operator, I believe the Baron Heurteloup. Several sittings were required before the bladder could be cleared. Immediately after the last operation the patient became feverish and alarmingly ill, and he finally died

under typhoid symptoms. On a post-mortem examination, an abscess was discovered at the base of the prostate and neck of the bladder.

CASE 3. A gentleman from Stratford was operated on by Mr. Key with the drill lithotrite, but unsuccessfully. The patient was then placed under the lithotritist who operated in the last case, and he succeeded in breaking up a small phosphatic calculus. The patient left town with an irritable bladder, and still suffering a great deal. He did not survive the operation more than twelve months. On examining the body after death the bladder was found diseased, and occupied by several calculi.

CASE 4. Mr. N. aged 70. The calculus in this case was large. The same lithotritist was consulted, but as the stone was over the average size, and the bladder so irritable that only a very small quantity of water could be injected, the crushing operation was not persevered in. The patient was cut and recovered.

CASE 5. Admiral C[umberland] placed himself under the care of the same lithotritist. In this case the stone was said to have been successfully broken down, and the patient left London. But he soon had a return of his old symptoms. The operation was therefore had recourse to again, and several fragments were discovered and crushed. The patient was by this relieved for a time; still the relief was only temporary: all the symptoms of stone recurred, and the patient died, worn out with suffering, soon after he reached his home. In the bladder six calculi were discovered which had all

been formed upon fragments of the original concretion.

CASE 6. Mr. Saunders, of Tottenham, had been cut for stone about nine years ago. About six years afterwards he began to suffer as of yore, and having gone on for three years, the lithotritist of the former cases was consulted. A small stone was found and crushed, and the patient left London *cured*. Almost immediately after returning home, however, the pain which he had suffered in making water increased in intensity to such a degree, that the patient declared all the tortures he had endured from stone were as nothing to it. The bladder would not contain urine for an hour, though no calculus could be detected in its cavity with a catheter. The patient became feverish, and died without any mitigation of his sufferings.

CASE 7. Mr. L. was operated on by the same lithotritist. Several operations were required. At length the bladder was declared free, and the patient recovered.

CASE 8. An elderly gentleman at Greenwich was the subject of this case. He was examined by a lithotritist, but the bladder being found very irritable he declined to operate. The patient was then cut by Mr. Key. Many stones were removed at the time of the operation, and several came away at different periods afterwards by the wound; an abscess also formed in the prostate which made its way into the rectum, so that the convalescence was much retarded.

CASE 9. Mr. S. had his stone crushed and was

supposed to be permanently cured. By and by, however, he was taken with symptoms of stone as before. In addition, he became subject to hæmorrhage from the bladder, which, joined to the pain he suffered, destroyed him in a week or two. On opening the body "several calculi were discovered in the bladder, and each on being broken was found to be formed upon a fragment of the stone originally crushed as its nucleus." A fungus which had shot from the neck of the bladder had poured out the blood.

CASE 10. Mr. C. a surgeon, examined by Mr. Key and found to have a small calculus, was lithotritised by the same professor. Several operations were necessary, the lithotritist assuring the patient that he had crushed several entire calculi. A good deal of irritability of bladder followed, but in three weeks this subsided and the patient recovered.

CASE 11. Mr. C. from Yorkshire, aged 60, made the journey to London on purpose to have his stone crushed. The bladder, however, was extremely irritable; six weeks were spent in vain attempts to allay the irritability; the operator then declared the case unfit for lithotrity. The patient was therefore cut, and made a good recovery.

CASE 12. A surgeon underwent three operations by lithotrity, and obtained entire relief.

We have, therefore, 12 patients affected with stone, of whom

3 were cured by lithotrity, and

3 after vain attempts by this means, were cut and recovered.

6 died, of whom *one* with abscess in the prostate soon after the operation, *four* with protracted sufferings in consequence of fragments remaining in the bladder, and *one* with disease of the bladder brought on or aggravated by the operation, but whether with any fragments left in its cavity or not was not ascertained. We have consequently *one case in four* cured by lithotrity, and *one case in four* cured by lithotomy, lithotrity having failed; finally, we have *one death in two* of the entire number of patients who were subjected to this means, these patients having all or with a single exception been under the hands of one of the most skilful lithotritists of the day; a man who, to his literary and scientific knowledge, the result of a most liberal general and professional education, adds a rare mechanical genius, and a dexterity that was never surpassed. If these be the results in twelve cases where the Baron Heurteloup presided, and where Mr. C. A. Key lent his countenance and assistance, I own myself utterly at a loss to imagine what the amount of disaster must be where less of knowledge, less of skill, and less of conscientious feeling, have the sway.

Lithotrity is not only a dangerous operation in itself; it very generally puts the sufferer beyond the pale of relief by other immediate means, particularly lithotomy, immediate means being here the only admissible or competent ones. Of this we have ample assurance in the cases that have presented themselves in the practice of M. Souberbielle or that have fallen under his immediate cognizance.

M. Michali was brought to such a pass by attempts to crush the stone, that when immediate relief became the indispensable condition of present safety, and M. Souberbielle was brought in for the purpose of cutting him, this eminent lithotomist saw that the patient was lost, and had to decline interfering: the unfortunate Michali, in fact, died the day after that on which it had been proposed to operate.

M. Turgot, having submitted to lithotrity, had his urethra and rectum perforated; he however recovered from the double infirmity under which he laboured, by means of lithotomy, which Dupuytren performed.

M. Petiet, lithotritised by two different hands, had his urethra torn; five abscesses about the perinæum were the consequence; the patient, sunk in courage and weakened in body, would not submit to any other measure proposed for his relief, and died with his stone in his bladder.

M. Senecal had the urethra and left corpus cavernosum torn in vain attempts to perform lithotrity; whence infiltration of blood, inflammation, &c.

M. Gasselin, treated fruitlessly by lithotrity, had among other accidents an abscess formed between the upper and anterior wall of the bladder and the abdominal parietes.

M. Cornu died in great pain after nineteen operations of lithotrity; his bladder was violently inflamed.

M. P——, after an attempt to crush his calculus,

was seized with inflammation of the bladder, and died in the course of a fortnight.

A veterinary surgeon of Puy-de-Dome, at the inspection of whose body M. Breschet was present, was found to have had his bladder pierced as if by a pinking-iron, whence ensued infiltration of urine, gangrene, and death.

A retired officer of the Imperial Guard, the subject of calculus, but in other respects enjoying good health, was treated by lithotrity, from which he suffered dreadfully. He returned to the bosom of his family, where he died some short time afterwards. On a post-mortem examination, the bladder was found lacerated in several places, and in a state of suppuration.

A counsellor in the court of Besançon came to Paris in 1829, to place himself under the care of M. Souberbielle. He was dissuaded from this, and induced to submit to lithotrity. He died during the process; inflammation of the bladder and peritoneum carried him off in the short period of three days.

Baron Fouché submitted himself to the treatment by means of lithotrity; he died of inflammation of the bladder before it was achieved.

A man named Jean died after the operation of grinding the stone, of acute inflammation of the bladder with mucous discharge.

General Roguet, on the first introduction of the lithonriptor, had the urethra lacerated, and an abscess of the scrotum in consequence. He was cut and recovered.

Mr. H. Chaussier, who, in 1834, had been under treatment by lithotrity for nearly a year (!) had twice had the bladder pinched, and two pieces of the mucous membrane torn off by the instruments.

"I could greatly multiply instances," says M. Souberbielle, "but I do not pretend to write the martyr-ology of lithotrity. I have besides had occasion to perform lithotomy on upwards of thirty patients who had had lithotrity essayed upon them, more than twenty of these having been under the hands of M. Civiale. The whole of these patients assured me that they suffered more from a single sitting of the grinding process than from the operation of lithotomy.

"I was present at a lithotritic sitting in the house of M. Blanche, performed on a patient who after the *thirty-sixth operation and fifteen months of treatment*, was not yet delivered of his stone. I am cognizant of another fact which may seem incredible, and where one does not know which to admire most, the courage of the patient or the courage of the surgeon. *Eighty-four operations* were done in this instance in the course of one year and eight months, and the patient was still undelivered. Worn out by the inutility of his sufferings, the patient ended by desiring to have lithotomy performed; this was undertaken by the same attendant, and with the effect of delivering the sufferer effectually, for his shattered frame could endure no more; he died."*

The conclusions to be drawn from these and the

* Souberbielle, Lettre, &c. in Gaz. Med. de Paris, 1835, reprinted in Rap. et Discuss. sur la Lithotomie, &c. p. 151 et seq.

preceding cases are obviously melancholy enough in so far as lithotrity is concerned. And yet, when we reflect dispassionately, and as physiologists and practitioners, upon the nature of the entire process in this operation, we see it impossible that the results of its indiscriminate administration could have been very different from what they are. Let us only consider the immediate consequences of the successful performance of lithotrity,—the searching for and seizure of the stone, the necessary violence that accompanies the act of its comminution, and its condition with reference to the bladder after having been reduced to pieces,—and we perceive that in the nature of things it can be no trifling operation; that on the contrary it must needs be one fraught with much danger to the patient. We know that the mere act of searching the bladder with a polished sound is often accompanied by a great amount of pain, and followed by what appears to be a singular degree of sympathetic disturbance; we know that the attempt to seize and extract small stones from the bladder by the most delicate forceps has ended fatally; and how shall the necessarily large and complicated implements of lithotrity be introduced and moved about within the bladder without producing a hundred times the amount of excitement and of mischief? This cannot be, and is not. And then, what shall we say of the jarring and the violence that are inseparable from the process of working a drill, or of turning a screw, or of giving the whole apparatus a smart blow with a hammer? What of a stone which with a smooth surface was already such a

source of suffering as to make the owner weary of his life, and willing to take the chance of almost any odds against the solitary hope of finding relief, either roughened by repeated perforations, or reduced perchance into eight or ten angular and rugged fragments? All we can do is to admire the powers inherent in the delicate tissues that compose the excretory portion of the uropoetic system to withstand violence, and to repair themselves, bruised and maltreated as they necessarily must be in such an operation as lithotrity even when performed by the most gentle hand.

The singular increase of irritation that takes place in consequence even of the *spontaneous* breaking up of calculi in the bladder, a phenomenon which sometimes occurs, and the danger to life that ensues thereon, is strikingly illustrated by the circumstances and the issue of a case which is related by Mr. Liston.* A medical man, who had laboured under symptoms of stone for a great many years, and who by sounding himself had ascertained the existence of a stone in his bladder ten years previously, was one day met by Mr. Liston in consultation. In three days after this Mr. Liston was summoned to this unfortunate gentleman in a moribund state, from inflammation of the whole urinary system, his urethra being at the same time blocked up by large fragments of stone. "It appeared," says Mr. Liston, "that on parting with me he had been summoned to an urgent case of labour. He ran quickly

* Elements of Surgery, 2d ed. p. 632.

down a steep street, and at the bottom was seized with an urgent desire to make water, which he did in small quantity mixed with much blood, and passing some pieces of stone with sharp angles. He became alarmingly ill; went on from bad to worse; had retention of urine from obstruction of the urethra; suppression of urine followed, and death terminated his sufferings in a few days. Many portions of the calculus had been voided; but much of it with the nucleus still occupied the bladder and urinary passage. The kidneys were dark coloured, and one approached to a gangrenous state."

Now it is the business of lithotrity, by a certain amount of mechanical violence, less or more, to accomplish such a disruption of a calculus as took place here spontaneously; and our amazement finally comes to be, how the operation should ever succeed, not that it should so often be found either impracticable, or if persevered in fatal.—And this leads me immediately to consider the circumstances in which the operation is admissible, and those in which it is inadmissible. This point is soon discussed; the conclusion lies on the surface, and wants no farther fact or argument, after what has been said, to make it clear.—Lithotrity is admissible, and only admissible, in cases in which the bladder is perfectly healthy, and in which the stone is small,—of the size of a filbert, a shelled almond, or it may be a nutmeg at the utmost; under all other circumstances it ought to be held impracticable. In other words, lithotrity is admissible where it is estimated that the stone can at one sitting be seized and re-

duced to fragments of sufficient minuteness to be passed by the urethra. No second, certainly no third operation ought ever to be contemplated. *If the patient who has had lithotrity performed upon him is not relieved at once, he is in imminent danger of losing his life.*

Lithotrity, I do not hesitate to say it, has now been fairly tried and found wanting as a general means of relief for stone. Restricted to the circumstances just indicated, it is a great addition to our surgical therapeia; applied indiscriminately, and as a substitute for lithotomy and all other means of dealing with stone in the bladder, it is a most fatal present made to humanity.

This conclusion I know will present itself unexpectedly to many; the general belief is that lithotrity is a trifle; that the risk and the pain which accompany it are no more than attend the extraction of a tooth. Let no man deceive himself on these points; I have raised the veil sufficiently to show indiscriminate lithotrity, in the nature of things, a most formidable operation; I have shown it in its practice a most fatal one; and then as to the pain—the most violent fit of stone may be as nothing in comparison with the pain of lithotrity. The first operation is often at least as painful as lithotomy. Sometimes it is not so,—it never ought to be so,—but indiscriminately applied, it often is at least as painful as lithotomy. But if the sittings have to be repeated three, four, five, or six times,—and as many as a dozen and more are sometimes necessary,—each

becomes ever more painful than the last, till the business is literally one of torture. M. Souberbielle has performed lithotomy on more than 30 subjects, who had had lithotrity essayed, and every one averred that he suffered less from the former than from a single sitting of the latter operation.

Lithotrity, however, *ought* to be an operation without much or any pain; when it is not so, the operation is ill chosen; it ought not to be attempted if it prove painful. If a patient or his attendant have a doubt as to the fitness of the case for treatment by crushing, and the stone be not large, let the amount of pain in all the preliminary steps of the operation guide them both as to the propriety of proceeding with lithotrity or giving it up. Let the instrument be slowly introduced, and the power of the urethra and prostate to bear the presence of the stiff and straight iron rod be tested for a minute or two. If there be no complaint, the business may be proceeded with; if the sense of uneasy distension and forcing increase and by and by amount to pain, let the instrument be forthwith removed, and the hope of relief from lithotrity be at once abandoned. If no pain ensue the instrument will then be gently opened, and an effort made to seize the stone; even in doing this there ought to be little pain; no determined effort to seize the calculus should be permitted; the surgeon who makes such an effort under the circumstances contemplated, is false to the trust reposed in him: if the stone cannot be seized readily and at once without suffering to the patient, lithotrity is to be abandoned, the case is not adapted for treatment by its means.

In the preceding observations I have not paused to consider the comparative advantages of the two methods of procedure in lithotrity,—by drilling and by crushing. The general adoption of the crushing process has, in fact, settled this question, M. Civiale being almost the only professor, I believe, who still adheres to the plan by repeated perforation. I hold, therefore, that this point requires no discussion.

There is one direction, however, which I have not hinted at, but in which I conceive lithotrity, even in the case of a large calculus, might often be found of essential service, not as the prime means, but as secondary. A calculus having been ascertained to be of any but the oxalate of lime species, might sometimes be reduced to fragments by a single operation, and then attacked at a great advantage by medicines administered by the mouth, and by injections proper to dissolve and disintegrate it thrown into the bladder.

CHAPTER IV.

REMOVAL OF THE STONE THROUGH AN INCISION OF THE NECK OR FUNDUS OF THE BLADDER, THE INTERNAL PARTS WHICH OPPOSE ITS EXIT BEING DILATED WHEN IT IS SMALL, TORN WHEN IT IS OF LARGER DIMENSIONS.—LITHOTOMY, CYSTOTOMY.

UPON no single operation of surgery has half so much been written as upon lithotomy, and an almost infinite number of different methods of performing this operation have from time to time been proposed. Into the history of these I have no intention to enter. In this country all the methods may be said to be reduced to one—the *lateral operation*, as it is called;—that operation in which, a grooved staff having previously been passed into the bladder, an incision is made in the perinæum, from the side of the raphé, about an inch or more in front of the bulb of the urethra, downwards and outwards by the side of the anus, midway between that outlet and the tuberosity of the ischium. The external incision finished, the groove of the staff is felt for in the membranous part of the urethra; and this being opened with the point of a knife immediately in front of the prostate gland, the knife, or a substi-

tute for it, the cutting gorget, is pushed along the groove of the staff, until it has entered the bladder, more or less of the prostate gland only, or of this body and of the neck of the bladder being cut by different operators. The knife is then withdrawn, a finger is introduced, and upon this as a director a pair of forceps is passed, with which the stone is searched for, seized, and extracted. And all this is sometimes done in even less time than it has taken the reader to follow with his eye the preceding brief account of the various steps of the process. In other instances it is very different, and the operation is one of much greater length and difficulty.

The whole art of performing the lateral operation for stone well consists, I believe, in using the knife as little as possible after the first external incision is made. The edge of the knife in particular ought never to be directed upwards, for then there is great risk of wounding the artery of the bulb, from which hemorrhage, always alarming and frequently fatal, is apt to ensue; hemorrhage which is the more dangerous as the application of a ligature is generally impossible, and effectual pressure cannot be made. The external incision effected, the fingers suffice to separate the lax tissues that lie between the integuments and the urethra. No violence however ought to be used; resisting fibres are not to be rudely torn; put upon the stretch with the finger, they fly asunder on being merely touched with the edge of a blunt knife. The membranous part of the urethra attained, the same rule still holds good—the knife is to be used as little as possible. The urethra must be pierced

and the bladder must be entered, indeed ; but the knife is still to be held with its point, and some portion of its back edge, within the groove of the staff—parallel, therefore, in a great measure with the staff—and so passed into the bladder. The less that is cut in this stage of the operation the better ; the acme of excellence I believe to consist in cutting nothing.

The last and one of the highest authorities we have on all matters of operative surgery, Mr. Liston, says (in *Elements of Surgery*, 2nd Ed. p. 647) “ the prostate gland ought to be divided to the extent of no more than barely three quarters of an inch ;” and he continues, “ there is great danger in dividing the base of the prostate completely, and much more in cutting any portion of the coats of the bladder.” Of this fact there can be no doubt ; it is from not having been aware of it however that the best anatomists and most skilful operators generally, have not always been the most successful lithotomists. On the contrary, they have often been most unfortunate ; their success has been far below that of others every way inferior to them in science and dexterity. Trusting to their knowledge of anatomy, and that they might have a rapid and brilliant operation, they have made a free internal as well as a free external incision, cutting the bladder in some cases even up to the edge of the sacro-sciatic ligaments, and then woe to the unhappy patient ! it becomes a miracle if he escapes.

The bladder entered in the way that has been described, “ the opening is so much dilated, by steady

and gradual movements of the finger," continues Mr. Liston, as to admit the ready introduction of instruments for removing the stone. Indeed," he proceeds, "the neck of the bladder is capable of dilatation without any incision." Upon one occasion, where there was an abscess in the perinæum which communicated with the urethra, this excellent surgeon informs us that "he introduced his finger into the membranous part of the urethra and found that by the most gentle movement he could not only reach the bladder, but dilate the [natural] opening into it to a very considerable extent." And this is the point at which I am driving: If the bladder can be reached without cutting, where is the use of employing the knife? The prostate is to be incised to the extent at the utmost of three quarters of an inch. Such a gap will allow the finger to pass indeed, but it will not suffer the forceps and the finger to enter together; and still less will it suffer the forceps with a stone of an inch, an inch and a half, or two inches in diameter between its chaps to pass out again. The passage for the stone throughout the whole of the structures between the interior of the bladder and the external surface of the body is virtually made at last by *dilatation*, too frequently by *tearing*—it might always be effected by dilatation. And though surgeons speak of *gentleness* and *deliberation*, and so on, in extracting the stone, it is certain that these are meaningless terms here, or that they are merely relative,—as much force as is necessary to extract the stone must be used; and the very competent authority and

successful lithotomist I have quoted bids us "have the forceps tolerably long, so as to afford power in its use."

The motto of Le Cat in reference to lithotomy was: "Large incision extérieure, petite incision profonde!" Le Cat preferred tearing the neck of the bladder to incising it; and whether they have openly hoisted the same pennon or not, all the great lithotomists have acted under it. When we find a lithotomist reputed successful describing his operation otherwise, telling us that he enlarged the internal wound so long as there was resistance to the passage of the stone, we are forced upon one of two conclusions,—either that he did not do as he says he did, or that his success was vastly less than it is reported. *

* When I penned the above passage I was so bold as to have Mr. Martineau in my eye. He says, (Med. Chir. Trans. vol. xi. p. 411,) "Should the stone be large, or there be any difficulty in the extraction, rather than use much force, while the forceps have a firm hold of the stone, I give the handles to an assistant, who is to draw them outwards and upwards, while the part forming the stricture is cut, which is easily done, as the broad part of the blade becomes a director to the knife; and rather than lacerate, I have often repeated this enlargement of the inner wound two or three times."

But observe what Mr. Crosse says in regard to one of Mr. Martineau's operations, in which he held the staff for that distinguished surgeon. "I distinctly felt the knife touch the groove of the staff at the second cut; what was farther done with the scalpel was soon accomplished; but I felt convinced *that the prostate gland was only partially divided, and the neck of the bladder not incised*; still the blunt gorget being very conical entered readily; and, the staff withdrawn, the operator introduced his forefinger upon the concavity of the gorget into the bladder, *forcibly*

In his last work, the "Practical Surgery," Mr. Liston reiterates the principles I have already quoted

dilating its neck, and touching the stone. After the forceps had grasped the stone, the scalpel was twice employed to enlarge the wound downwards and outwards still the stone, weighing an ounce and three quarters, *was not extracted until great force had been applied.*"

This case proved unsuccessful. On inspecting the body of the patient, Mr. Crosse found the prostate divided to above two thirds of its depth, in a direction backwards and a little outwards. The neck of the bladder was not lacerated, so it must have yielded to allow the large calculus to be extracted, as neither the neck of the bladder nor the posterior portion,—nearly one third,—of the prostate gland, had been divided in the operation.

In connexion with the same case, Mr. Crosse informs us that after the blunt gorget was introduced and the staff was withdrawn, Mr. Martineau "was accustomed to introduce his left forefinger (which was particularly long and large) upon the concavity of the gorget into the bladder, *forcibly dilating the opening and using the finger as a powerful but safe instrument for rendering the neck of the bladder ample to admit the forceps.* The force and determination with which the finger was thus used, *dilating if not lacerating the remaining undivided portion of the prostate gland and neck of the bladder, I always regarded as a peculiar and intrinsic part of Mr. Martineau's method of operating.*" Mr. Martineau's own description of his operation gives us the idea that he cut every thing which opposed resistance to the issue of the stone. We see that he, in fact, *cut very little and took out the stone by main force*, as all successful lithotomists have done.

I have thought it of great importance to quote this explanation of Mr. Martineau's operation, because an erroneous impression of its nature is all but universal, and has I believe proved highly detrimental to the success of lithotomy in the generality of hands. Dr. Marcet, in his widely circulated work on Calculous Disorders, (1816,) first gave it publicity. He says, (Appendix, p. 193,) "Mr. Martineau determined to lay aside the cutting gorget and trust to making a large opening into the

from his "Elements," in reference to lithotomy ; here, indeed, we find the internal wound limited to still smaller dimensions. After stating that within certain bounds the external incision cannot be too free, he proceeds, " but the internal incision must be very limited indeed ; *it should certainly not extend beyond seven lines from the urethra outwards and downwards ; the less that is cut the greater will be the patient's safety.* The prostate and tissues around the neck of the bladder are very elastic and yielding, so that without much solution of their continuity,—by a very slight incision, and without the least laceration, the opening can be so dilated as to admit the forefinger readily ; still farther, the forceps can be introduced upon it as a guide, and removed along with a stone of considerable dimensions, say from

bladder with the knife." But whoever makes free internal incisions will very certainly not perform lithotomy with the success of Mr. Martineau. We are indebted to Mr. Crosse for telling us what this distinguished surgeon's operation was in fact.

Mr. Crosse himself, after describing the particulars of a case in which, the blunt gorget not having previously been got through the prostatic urethra, " the forceps were at last, by main force, made to enter the bladder," and in which " immense force was used in the extraction of the stone," states, that he had " repeatedly known instances of the scalpel not being carried deep enough, and of the prostate gland in consequence being pushed before the blunt gorget, the operator succeeding at length [in getting into the bladder] by *dilating* the prostatic urethra and neck of the bladder ; and the result of such cases has brought conviction to my mind that this error is less dangerous than cutting too freely the prostate gland and neck of the bladder. If the surgeon misuse a keen scalpel or cutting gorget, the effects are generally fatal to the patient."—Crosse, *op. cit.* p. 150.

three to nearly five inches in circumference in one direction, and from four to six in the largest." We have therefore a slit $\frac{7}{16}$ ths of an inch—little more than half an inch in length—that actually requires dilatation to admit the forefinger, and then the forefinger and the forceps, finally giving issue to a stone that may, and frequently does measure, with the blades of the forceps in which it is held, 2, $2\frac{1}{4}$, $2\frac{1}{2}$ inches in diameter, or nearly 6, $6\frac{3}{4}$, and $7\frac{1}{2}$ inches in circumference; and this, we are assured, without tearing! But the case is not so. The parts implicated are happily exceedingly dilatable; but they require time to yield; and economy of time is always held, nay is an indispensable element in the cutting operation for stone,—indeed with the rude means uniformly used to procure the necessary extent of outlet, economy of time is essential,—no human being, the most resolute and unimpressible, could long withstand the torture that is inflicted; he must either be speedily delivered or he must perish. When the stone is small, therefore, or of moderate dimensions—within the limits to which the prostate and neck of the bladder will yield in a given time, say a minute, a minute and half, or two minutes, without tearing—it may be laid down as an axiom that *the success in lithotomy is in the ratio of the force employed to extract the stone*—there has then been little cut; the outlet has been procured by dilatation. But the case is widely different when the affair is with a large stone; then the parts cannot yield within the time that we, as operators, dare to allow them; additional force with long forceps, "that afford a powerful lever,"

must be used; the parts give way, laceration takes the place of dilatation, and the patient's chance of recovery is vastly lessened. It is just as notorious, therefore, that the majority of the patients cut for stone whose calculi happen to be large are lost, as it is certain that they also in general do badly when the calculi, being small, are taken out without any resistance from the parts about the neck of the bladder,—too much has then been cut; infiltration of urine is almost certain to take place; gangrenous inflammation of the cellular and adipose tissues of the pelvis ensues, and the patient is irredeemably lost. Lithotomy with large stones is the disastrous operation it always proves, not from the size of the stone in itself, but from the extent of the incision or laceration at the neck of the bladder that is necessary to give it passage.

In looking over a paper by the late John Shaw,* a surgeon of great promise and a most amiable man, who died too young, I observe the report of a remarkable conversation stated to have been held between the late Sir Astley Cooper and Mr. Pattison, in which Sir Astley is made to say: “the longer I practise, the more I am convinced that the smaller the internal wound made in the operation of lithotomy the better. I may not live, but probably you will, to see the neglected and despised Marian method,” [the method by dilatation or laceration, according to the size of the stone, of the neck of the bladder], “under some slight modification, revived.”

* Quarterly Journ. of Foreign Med. and Surg. vol. iii. p. 44. Lond. 1821.

Genius is always prophetic : the fitness of things is present to its eye, which therefore seems to penetrate the future, and to foresee what will come to pass. The operation for stone in the best hands at the present day is the Marian method divested of its blunt gorgets, and having instead of these the finger and the forceps for dilators ; such was Martineau's, such is Liston's operation, and such has been the operation of every successful lithotomist since the days of Cheselden.

The great, the crowning improvement that has still to be made in lithotomy is the substitution of slow dilatation for the rapid stretching or tearing that is now universally practised. This modification would, I believe, be found of as much importance as was the invention of the grooved staff in the earlier period of the operation. I shall have occasion to speak more fully on the subject in my next Chapter.

In attempting to arrive at a true estimate of the worth of lithotomy as a means of entire relief from stone in the bladder, nearly the same difficulties are encountered which I have remarked on in regard to lithotrity. The Tables which we have of the operations for stone by cutting, and their results, are almost exclusively by the operators themselves, and in them the immediate consequences of the operation only are generally contemplated. The patient does not die at the time indeed ; but does he ultimately recover completely ? He may have a relapse of stone, it is true, and of this we have tidings,—it is

an accident independent of the operation ; but does he recover the functions of his bladder and kidneys like other men ? has he no stillicidium, no incontinence of urine ? does he not suffer more or less about the bladder and loins, and is not his life often cut short within a limited period, longer or shorter it may be, but still far within that which the average probability would accord to the age at which the operation is done ? These questions have hardly been asked ; they have never been answered. My own persuasion is, that in the adult lithotomy in a certain proportion of cases is no more than a means of present relief from the sufferings occasioned by stone in the bladder. It is not always a cure even in the sense in which the extraction of the spoiled tooth is a cure for toothache. Mischief to a greater or less amount too often remains in the bladder after the stone is removed, or is done to its neck during the operation, and interferes with the due retention or due discharge of the urine, which in either case is followed by irritability or inflammation, by induration and contraction of the bladder, and this in its turn by implication of the ureters, and then of the kidneys ; immediately upon which follow serious derangement of the general health, and at no very distant period, death. Lithotomy is not a very rare operation ; yet we seldom meet with any one beyond the middle age who was cut for stone some eight or ten years back.—The Tables of the successes and the failures then which we have from lithotomy are to be received with some abatement :—it is not

in human nature to put other than the best face upon affairs in which we have been personally and most materially engaged. And then, as I have said, the returns we possess generally refer to the immediate, very rarely to the more remote consequences of the operation.

I do not, indeed, take the extremely gloomy view of the results of the cutting operation for stone which some have done, but the final success is probably much less than it is generally believed to be. M. Richerand* goes so far as to say that "we cannot promise life with final recovery to above one half of all who are subjected to this operation." M. France† informs us that in the Hospitals of Montpellier as many patients die as recover from lithotomy; and M. Civiale,‡ whom however I would not be supposed to insist on as an authority here, speaking of the operations of M. Souberbielle, the most distinguished lithotomist of the French metropolis at the present time, says: "I knew of many operations for stone performed in Paris by this operator within a limited period of time. Two thirds of the patients operated on died!" This statement, disastrous as it appears, is however less startling than the facts we find adduced by so fair a witness as M. Velpeau§ in an account of the principal surgical diseases observed within a certain period at the

* Hist. des Progrès recens de la Chirurgie, Paris, 1825.

† Quoted by Velpeau, op. cit. p. 656.

‡ Arch. Gen. de Médecine, tom. x. p. 419.

§ Arch. Gen. de Médecine, tom. xi.

Hôtel Dieu. Here he gives the particulars of *six* cases of stone in the bladder, of which *five* proved fatal, *four* after lithotomy, one independently of the operation. M. Velpeau, it is greatly to be regretted, has not given any Table of his own experience in regard to lithotomy, as he has in regard to lithotrity. Had he done so, we should, I believe, have had a document that might have been greatly depended on, and that would therefore have been extremely valuable. "I have often performed lithotomy myself," says M. Lisfranc, "and I have often seen it done by others both in hospital and in private practice, and the mean mortality has appeared to me to be one in four of all who were operated on. The success may be greater elsewhere; I have not had occasion to satisfy myself personally that it is or is not so; but I insist on the accuracy of the proportion I have mentioned as regards Paris." *

One of the best and most trustworthy statistical summaries we possess is that which is given by Mr. Crosse of Norwich in the appendix to his work on urinary calculus. In this we have a bird's-eye view of the particular circumstances attending as many as 704 cases which were the subjects of operation in the hospital of Norwich or in the neighbourhood of that city from the date of the foundation of the hospital. Of the 704 cases, 387, considerably more than one half, were children and young persons under 20 years of age, and 35 were women.—But the infor-

* Lisfranc in Rapport et Discuss. sur la taille et la lithotritie, Paris, 1835.

mation conveyed by these Norwich documents is better appreciated in the Tabular form.

Ages.	Number of Cases.	Number Cured.	Number Dead.
YOUNG PERSONS			
From 1 to 10	281	262	19
— 11 to 20	106	97	9
ADULTS.			
— 21 to 40	96	88	8
— 41 to 60	147	112	35
— 60 to 80	78	56	22

In the first series the mortality is extremely small, and even in the second it still continues wonderfully low, amounting in the former to 1 in $14\frac{5}{8}$ ths nearly, and in the latter to about 1 in $11\frac{2}{3}$ rds. Up to the age of puberty, the operation for stone by cutting, therefore, appears to be attended with comparatively little danger. Even in the third series of cases—age from 20 to 40—the mortality is little increased; it amounts to 1 in 11 exactly. In the fourth series—age from 40 to 60,—the mortality rises rapidly; it amounts to 1 in $4\frac{1}{2}$ th very nearly, and in the fifth series, it is still higher, being about 1 in $3\frac{3}{4}$ ths. The mortality, according to the Norwich data, up to the age of puberty, is about 1 in 12; after 40 it is in the proportion of somewhat more than 1 in 4. The mortality from lithotomy at all ages is in the proportion of 1 to $7\frac{3}{4}$.

Another very comprehensive, and, according to M. Velpeau's statement, trust-worthy Table, is one which he has given as drawn up by M. Castara, of

Luneville, and which embraces the whole of the cases of calculus received into the hospital of that town for a long series of years. I have separated the females from the males in this Table, and find the numbers with reference to the males to stand as under :

Number of Cases.	Ages.	Number of Cases.	Cured.	Dead.	Reoperated.
1433	2 to 10	820	763	48	9
	11 to 20	439	384	51	4
	21 to 50	141	116	25	0
	50 to the end of life }	33	27	6	0

The mortality in the first series is very small, being but about 1 in 17. In the second the mortality is more than doubled at once ; it amounts to 1 in $8\frac{2}{3}$ ths nearly. In the third it is almost doubled again, being as high as 1 in $5\frac{2}{3}$ rds nearly. In the fourth it corresponds very closely with that in the third, being about 1 in $5\frac{1}{2}$.

In this summary we again see the operation of lithotomy in a very favourable light as regards youthful subjects, and becoming progressively more dangerous as years accumulate. Had we the bi-decennial period between 20 and 40 and that between 40 and 60 separated, we should certainly find the results more favourable up to 40 and less so after that age ; for calculus is not only more frequent between 40 and 60 than at any other interval after puberty in the life of man, but the operation for its relief has also seemed to me

more fatal ; I think I have generally seen old men of about 70 recover even better than men between 40 and 60.

On turning to the pages in Velpeau, where the statement of Castara is given, I find that very certainly every thing as there set down is not to be taken without abatement. Castara himself expresses his surprise at finding several series of 20, 30, and even 50 operations by the apparatus major without a single unfortunate issue ; and he asks : "Shall we then conclude that by the Marian method the loss will not be 1 in 20, 30, or 50 operations ? Very surely this is impossible." I apprehend that the proper conclusion to be drawn from the records of the operations done at the Hospital of Luneville is, that nothing certain is known of their results : the record of the operation is there, the death when it happened is not set down in every instance.

M. Salvatore de Renzi, of Naples, has on various occasions published an account of the operations for stone, performed in two great Neapolitan Hospitals,—the Ospedale dei Incurabili, and the Ospedale di Loretto. The general summary of the operations from 1821 to 1838, as stated in the Gazette Medicale de Paris for 1839, (p. 586,) is as follows :

Number of Cases.	Males.	Child- ren.	Adults.	Aged.	Results.	
					Cured.	Died.
596	579 Females 17	306	231	59	505	91

Considerably more than half of the entire number of patients, therefore, appear to have been children and women ; nevertheless, the mortality for all ages and sexes is about 1 in 6 ; and if it be considered how few the deaths generally are among women and subjects under puberty, it is easy to perceive that the casualties must have been extremely numerous among the adults and aged individuals. In his account of the single year 1838,* De Renzi mentions 36 operations, of which the subjects in 34 cases were males, and in 2, females. The particulars of these cases will be appreciated at once by a glance at the following Table :

Ages.	Number of Cases.	Cured.	Died.
Under 15	19	18	1
16 to 50	14	8	6
51 & upwards	3	2	1

In early life the result is here as elsewhere very favourable, the mortality is no more than 1 in 19. Among the adults, however, it is unusually high, being actually 1 in $2\frac{1}{3}$ rd nearly ; among aged subjects it is 1 in 3, which is common enough.

Now if we assume the mortality among the women and children comprised in the general statement to have been at the same rate as it is in the particular year 1838, we should have 17 deaths happening among them, and as many as 74 deaths among the remaining adults and aged individuals, 290 in

* Vide Gazette Med. de Paris, 1839, p. 539.

number, which is in the ratio of about 1 in 4, the still favourable interval between 15 and 30 being included.*

M. Civiale has taken great pains to procure returns of the operations for stone performed at the hospitals of the principal cities of Europe; I add a few of his statements and tables as calculated to afford a wider basis for estimating the risks of lithotomy.

In Austria, of 197 cases of calculus which presented themselves, 138 were selected as favourable for operation, and 59 were rejected as past relief by this means. Of the 138 who were operated on, 105 recovered and 25 died. This is a mortality of 1 in $5\frac{1}{2}$ for all ages and sexes even with the selection that was made. (Civiale, *Traité de l'Aff. Calc.* p. 552.)

In Bohemia, of 106 cases of calculus admitted into

* The accuracy of some of M. de Renzi's statements has been gravely called in question. In the *Gazette Medicale de Paris*, 1835, p. 695, we find it stated on his authority, that at the *Ospedale dei Incurabili*, ten operations for stone were performed, six of which were on subjects under 10 years of age, the rest on subjects not yet adult [under 15.] Nine were males, one was a female. *Only one patient died* (Un seul mourut.) But in a letter by M. Martinengo, addressed to the editor of the periodical just quoted, and published at page 735 of the volume for 1835, we find the following words: "With reference to the Hospital of Incurables, it is said: 'ten operations for stone were performed; only one patient died.' I can aver that this statement is not according to fact. I was at Naples at the time indicated; I was present at the ten operations, and I watched the patients afterwards. Five were operated on, upon the 9th of May, 1835, and five more on the 12th. Of the five cut on the 9th, one died the next day; of the five lithotomized on the 12th, three died some days afterwards. *Four of the ten patients operated on consequently perished.*"

the hospitals, 60, the majority, were rejected as unfit for operation; only 46 were cut, of whom 38 recovered and 5 died; which gives a mortality in the ratio of 1 in 9 nearly, a very favourable result, and undoubtedly connected with the youth of the great majority of the subjects chosen. Of the 60 who were rejected, 28 were known to have died when the report was made. (Civiale, *op. cit.* p. 561.)

In the Lombardo-Venetian states, of 1104 patients affected with calculus who entered the public hospitals, 1044 were selected as fit for the operation, and 60 were rejected as unfit. Of the number cut 819 recovered and 217 died, which is a mortality of about 1 in 4 $\frac{3}{4}$ ths for all ages and sexes. (Civiale, *op. cit.* p. 569.)

At the Hôtel Dieu of Paris from 1808 to 1830, 284 patients labouring under stone were admitted. Of this number only 100 were held fit to undergo the operation; and of them 56 recovered and 28 died; the mortality was therefore 1 in 3 $\frac{4}{7}$ ths for all ages and sexes, in spite of the selection made. Of the 184 who were left to their fate, 133 were known to have died. What makes the extent of the mortality the more remarkable here, is the fact that of the 100 selected for operation 46 were children, 43 adults and only 11 aged; 24 or 25 of the deaths must have occurred among the adults and aged, so that the mortality among them could not have fallen far short of 1 in 2, a result which justifies M. Richerand's estimate of the consequences of lithotomy. (Civiale, *op. cit.* p. 595.)

Dupuytren in the work on lithotomy which was

published after his death* has given what must be held as a very valuable and trustworthy document, in the shape of a Table, of the results of 356 operations for stone done in Paris and the neighbourhood by different surgeons during a period of ten years, of the whole of which he had kept a register himself. The results with reference to the males, 312 in number, are at once appreciated by the figures of the following Table :

Ages.	Number of Cases.	Cured.	Died.	Ratio of Mortality.
From 3 to 15	97	88	9	1 in 11 nearly
— 15 to 30	59	51	8	1 in $7\frac{3}{8}$
— 30 to 50	45	35	10	1 in $4\frac{1}{2}$
— 50 to 70	74	36	18	1 in $4\frac{1}{9}$
— 70 to 90	37	26	11	1 in $3\frac{4}{11}$
Total	312	236	56	1 in from 5 to 6

The mortality is not quite so favourable here as usual for subjects under the age of puberty ; under 30, however, it amounts to 1 in $9\frac{1}{2}$ very nearly ; but above 30 it is more than doubled, being as high as 1 in 4 exactly.—“ This mortality,” says M. Dupuytren in one place,† “ high as it is, is not less than was reasonably to have been expected considering the nature of the parts interested,” &c.; and in another‡ he says, “ after having united the whole of these

* Mem. sur une manière nouvelle de pratiquer l'opération de la Pierre. Publié par MM. Sanson et Begin, fol. Paris, 1836.

† Art. *Cystotomie*, in Dict. de Med. et Chir. pratiques.

‡ Mem. sur. l'oper. de la Pierre, sup. cit. p. 3.

cases, occurring among individuals of different ages and temperaments, operated on by divers methods, in seasons, places, and circumstances that were often opposite, I have satisfied myself that between a fifth and a sixth of all who undergo the operation are lost."

In the same work on lithotomy, Dupuytren has given a general Table of 89 operations for stone by the bilateral or transverse method, which he invented, and in 42 of which he himself operated. Omitting the females, 4 in number, the Table stands thus :

Ages.	Number operated on.	Recovered.	Died.	Ratio of Mortality.
1 to 10	37	35	2	1 in 18 $\frac{1}{3}$
10 — 20	17	16	1	1 — 17
20 — 30	7	5	2	2 — 7
30 — 40	7	5	2	2 — 7
40 — 50	4	3	1	1 — 4
50 — 60	5	1	4	4 — 5
60 — 70	6	0	6	6 — 6
70 — 80	2	1	1	1 — 2
Total	85	66	19	1 in 4 $\frac{2}{3}$

Dupuytren's own cases, 38 in number, deducting the females, are as under:

Ages.	No. operated on.	With Success.	Died.	Ratio of Mortality.
1 to 10	19	18	1	1 in 19
10 to 20	5	4	1	1 in 5
20 to 30	3	2	1	1 in 2
30 to 40	2	1	1	0 in 3
40 to 50	3	3	0	
50 to 60	2	1	1	1 in 2
60 to 70	4	0	4	4 in 4
	38	29	9	1 in 4 $\frac{1}{4}$

The mode of operation pursued in the above cases by the leading French surgeon of the day and those whom his position influenced, has not been imitated out of Paris. The operation cannot be a good one ; the lithotome caché, the implement with which the internal incision is made, is a most dangerous weapon, and in its principle, the substitution of cutting for dilatation, calculated to do away with what I cannot but regard as the first element towards successful lithotomy. Nevertheless, as if to satisfy us that all operations and all operators were nearly alike where youthful subjects are concerned, we have most favourable results up to 20,—a mortality of but 1 in $18\frac{1}{3}$ in the general Table, and of 1 in 19 in the particular portion of it. What a different aspect do the figures wear in reference to subjects of 20 and upwards, subjects among whom both the operation and the operator are undoubtedly of some moment ; from 1 death in 18 and 19 we have actually more than one victim in every two of all who are subjected to the process !

The operation which Dupuytren proposed as a substitute for the methods already in use has, therefore, nothing to recommend it. Divested of the lithotome caché, though it might be found as safe, I believe that it would still be more severe than the ordinary lateral operation.*

Dr. Roos of St. Petersburg† has given a very

* If French surgeons would consent to abandon the lithotome caché, I feel assured that the statistics of their operations for stone, would immediately wear another and a more favourable aspect.

† Medicinisches Correspond. Blatt. Quoted Gaz. Med. de Paris, 1838.

clear and satisfactory statement of the patients affected with stone who had presented themselves at St. Mary's Hospital, Moscow, in the course of 28 years, and of the operations for the disease and their results, which were done during an interval of eight years, from 1830 to 1837 both inclusive. In this interval 469 patients labouring under calculus were admitted, of whom 411 were subjected to lithotomy; of these 369 recovered and 42 died. 41 left the hospital and 17 died within its walls without having undergone any operation. But the particulars will be better understood by means of this Table.

Ages.	Number of Cases.	Recoveries.	Went out not operated on.	Died in course of first week.	Died at interval of a month and more.	Died without operation
2 to 15	392	323	30	18	13	8
16 to 40	73	43	10	5	6	9
41 to 61	4	3	1	0	0	0
Total	469	369	41	23	19	17

The singularly large proportion of youthful and small proportion of aged subjects, are here very remarkable,—392 out of 469 were actually children under the age of puberty, and no more than 4 exceeded the age of 40. Deducting those in the first series who left the Hospital and who died without having had any operation performed, (38,) we have 354 subjected to the operation, of whom 323 recovered and 31 died; this is a mortality in the ratio of 1 in $11\frac{1}{2}$ very nearly, which is favourable as usual, the subjects being young. If we deduct in like

manner from the number in the 2nd series those who left the Hospital and those who died there without having been cut, (19,) we find 54 who submitted to lithotomy, of whom 43 recovered and 11 died,—a mortality in the proportion of about 1 in 5,—very nearly double that of the first series. The number comprised in the 3rd series is so small that no inference of any interest or importance can be drawn from it.

How different is the issue of lithotomy where the subjects of the operation are principally adults and aged individuals! Take the following statement by M. Civiale (*op. cit.* p. 598) of the cases of calculus admitted into the Hôpital de la Charité of Paris, during a certain interval. The total number of cases that presented themselves was 138; but of these no more than 70 were held to afford any prospect of relief from the operation; 68 were consequently left to their fate. Of the 70 subjected to operation, 21 recovered; 35 died; 3 had fistulæ; 6 had relapses; and in 5 the result is not known.—To say nothing of consequent infirmities, relapses, and unknown results, we see that the actual mortality was just 1 in 2! But then of the 70 patients no more than 5 were youthful; whilst 42 were adults and 23 were aged.

The same diversity in the issues of lithotomy according to the age of those who are its subjects, is apparent in the accounts we have of the results of the operation in the practice of some Parisian surgeons given by M. Civiale (*op. cit.* p. 604.)

This series comprises 190 cases, 185 males, 5 females:

Ages.	Number of Cases.	Cured.	Died.
Young persons	21	71	106
Adults	59		
Aged	102		
Age unknown	8		
Total	190		

The conclusion from this statement is appalling; 71 complete recoveries to 106 deaths! But the result could not by possibility have been favourable, for 161 of the 190 were adult and aged individuals, 102 of the entire number being 40 years of age and upwards.*

In quitting general and public statements of the results of the cutting operation for stone, and approaching such as are individual, and often private, it is natural to feel some misgivings. Particular and private records have never the authenticity or value of those that are public, and that combine the issues

* These statements of the results of Parisian practice in lithotomy by Civiale have given rise to many *reclamations*, as our neighbours politely term flat denials. M. Civiale operated on *complete cases* only, i. e. cases in which all the main circumstances were known, such as the entry of the patient, the operation, and the result. Cases that are defective in the records in any of these essential particulars are left out by him. I see no reason to doubt the general accuracy of the facts as he has stated them.

In the preceding summaries the reader will understand that the data only are from M. Civiale's work; the remarks on mortality, &c., are added by the author of this little Treatise.

obtained by several men working to the same end ; they have therefore always been held as debatable in a greater or less degree. Some private and particular records of cases of lithotomy have indeed nothing to excite suspicion, their results being such as are vouched for by general experience. Others leave us no resource but doubt, their issues being extraordinary, and the causes of the unusual success being nowise apparent. To others, again, we assent at length, though disposed at first to question, because we see reason wherefore the results should have been fortunate in an unwonted degree.

The best general summary we possess in regard to the results of lithotomy is that of the Norwich Hospital. One of the best particular summaries extant, I believe to be that which we have from the pen of the distinguished Cheselden, the author of our present lateral operation. Reduced into the Tabular shape the particulars of the double series of operations, 213 in number, of which he has left us records, stand thus :

Ages.	Number of Cases.	Recovered.	Died.	Ratio of Mortality
Under 10	105	102	3	1 in 35
11 to 20	62	58	4	1 — $15\frac{1}{2}$
21 — 30	12	9	3	1 — 4
31 — 40	10	8	2	1 — 5
41 — 50	10	8	2	1 — 5
51 — 60	7	3	4	1 — $1\frac{3}{4}$
61 — 70	5	4	1	1 — 5
71 — 80	2	1	1	1 — 2
Total	213	193	20	1 in $10\frac{13}{20}$

This record I believe to be perfectly trustworthy. It exhibits the operation of lithotomy in the most

favourable light. Up to 20, the operation is not merely successful, as usual ; it is successful in an unwonted degree, and as it ought to prove, in the hands of a master—the mortality is no higher than 1 in $23\frac{6}{7}$ ths, say one in 24. Beyond puberty, however, even the master fails to render lithotomy other than it generally is,—a very deadly procedure ; from 40 to the end of life the mortality is 1 in $3\frac{1}{2}$ very nearly. The mortality among adults and aged persons would have been much less, Cheselden informs us, had not the fame of his great success by means of the new operation brought crowds of all kinds of exhausted sufferers from stone to the Hospital where he presided, who insisted on taking their chance, though informed that they were not likely to recover from its effects. Among the young subjects, again, the mortality is probably stated at something less than it ought to be. Small pox was always rife in the hospitals of London in Cheselden's days, and all the victims which this disease had among the subjects of lithotomy he tells us were thrown out of the list of fatal issues.

Cheselden's operation was I conceive all but perfect. *He must often have left the prostate altogether untouched ; he never at any time cut more than its thin urethral edge.**

* It was only after the whole of this little treatise, with the exception of the following note and the short paragraph to which it refers, was in type, that I thought of perusing the account which Cheselden has left us of his operation ; and I own it was not without feelings of exultation that I found the principles I have advocated in the conduct of lithotomy implied in every particular of the original description. After indicating the first

M. Belmas* gives an account of 100 operations by the high method, which I have here reduced into the Tabular form.

Ages.	No. operated on.	Recovered.	Died.	Ratio of Mortality.
3 to 15	35	33	2	1 in $17\frac{1}{2}$
16 to 40	22	17	5	1 in $5\frac{2}{3}$
40 to 60	16	10	6	1 in $2\frac{1}{3}$
61 & upwards	27	15	12	1 in $1\frac{4}{5}$
Total	100	75	25	1 in 4 for all ages

steps in the operation, which refer to the external incision, he proceeds: "*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 corpus cavernosum urethrae and in the prostate gland*, cutting from below upwards to avoid wounding the gut; then passing the gorget very carefully in the groove of the staff into the bladder, I," &c. &c.—He felt for the staff and cut upon it upwards; now it is certain that he could only have felt the staff inferiorly at the very edge of the prostate; at this point he entered his knife, and then he cut from the gland towards the bulb, simply slitting open the membranous part of the urethra. He could not have implicated one eighth of an inch of the prostate in this procedure; all that portion of the urethra which forms the internal infundibulum of the canal, and which is embraced by the prostate, was left untouched. Cheselden's internal incision, in fact, terminated, as regards the prostate, very nearly where that of the majority of the present race of operators begins, just as his external cut began nearly where that of the old lithotomists ended. There may possibly be no great mischief in cutting a certain portion—one half or two thirds—of the prostate; but to do so will not, I maintain, add to the success of lithotomy in any case; in many, I believe, that it will seriously interfere with the result; the smallest snip in the edge of the web we know suffices to begin the rent; the part unincised that would have yielded by stretching, incised gives way by tearing.

* *Traité de Cystotomie suspubienne*, Paris, 1827.

The operation by this method, so much decried by some surgeons and especially in England, appears however to be at least as favourable in early life as the lateral operation is generally; after 40 the one is probably not more unfortunate than the other. Many of Belmas's cases, from the size of the stone, &c. were held as unfavourable for the lateral operation. Had it been employed, the mortality under the circumstances would certainly have been at least as great.

M. Souberbielle is, like M. Belmas, an advocate for the high operation, and in a memoir presented to the Royal Academy of medicine in 1835 and since published, he gives the particulars of 50 operations which I have arranged in this Table.

Ages.		Number of Cases.	Cured.	Died.	Ratio of Mortality.
Under	10	9			
11	to 40	3			
40	to 50	1			
51	to 60	5	39	11	1 in $4\frac{1}{2}$ nearly
61	to 70	13			
71	to 80	17			
80	& upwards	2			

Up to the age of 22 no patient was lost. The mortality of 11 has therefore to be divided among about 40 subjects, which brings it to 1 in $3\frac{2}{3}$ ds. nearly. Many of M. Souberbielle's cases were unfavourable; in three the stone weighed 4 ounces, and in two it weighed 5 ounces; six of the patients moreover had already submitted to lithotomy, and twelve had had attempts made to grind or crush their stone. Lithotomy by any procedure, undertaken

under such circumstances, must needs be a very fatal operation.

Mr. Brett* has presented us with a catalogue of 108 cases in which he performed lithotomy. In the shape of a Table they stand as under :

Ages.	Number of Cases.	Recovered.	Died.	Ratio of Mortality.
Under 15	70	68	2	1 in 35
From 15 to 40	22	19	3	1 — $7\frac{1}{2}$
40 & upwards	15	13	2	1 — 7
Total	107	100	7	1 in $15\frac{3}{7}$

It is impossible to regard the results here as other than extraordinary, especially when the plan of operation pursued by Mr. Brett is taken into the account. He advocates a free internal as well as a free external incision : “ Unhesitatingly cutting all opposing textures,” he says, “ has, especially in my last 68 operations, been followed by the happiest results.” But it is quite certain that no man who has used the knife freely in the deeper incisions has ever been a successful lithotomist in this country, or in Europe ; so that we have but one of two conclusions here as elsewhere ; viz. that Mr. Brett either cuts less than he believes he does, or that his success is very very far from being so great as he imagines it. Cheselden’s patients, when he was in the habit of cutting freely, did very well for a time, but great numbers of them died in the end ; and as many of Mr. Brett’s operations seem to have been done, *che-*

* On some of the principal surgical diseases of India, 8vo. Calcutta, 1840.

min faisant, whilst in attendance on the Governor-General of India in a tour through the upper provinces, he probably did not know what the fate of his patients finally proved.

Mr. Liston has published summaries of his stone cases upon several occasions.* From these and the private record of the cases of the same distinguished operator up to the present time I have compiled this Table :

Ages.	Number of Cases.	Number Cured.	Number Dead.	Ratio of Mortality.
From 3 to 20	26	25	1	1 in 26
— 21 to 40	17	16	1	1 in 17
— 41 to 60	32	27	5	1 in $6\frac{2}{5}$
— 61 to 80	40	31	9	1 in $5\frac{5}{9}$
Total	115	99	16	1 in $7\frac{1}{3}$

Mr. Liston's success, I conceive, ought to be great, and we find it so in fact. Probably no man ever operated with more fortunate issues in adult and aged cases than this surgeon. To lose but 1 in 17 between the ages of 20 and 40 is indeed a triumph ; and though the mortality between 40 and 60 and between 60 and 80 be formidable enough, still the ratios of 1 in $6\frac{2}{5}$ and of 1 in $5\frac{5}{9}$ is greatly more favourable than we have been accustomed to see it in the tables of continental surgeons, where it is 1 in 3, 1 in 2, and sometimes even more than 1 in 2. The mean mortality of the whole of Mr. Liston's opera-

* Edinb. Med. and Surg. Journal, vol. xxviii.; Elements of Surgery, Pt. 3, 8vo. Edinb. 1832.

tions on the male is 1 in $7\frac{1}{2}$ very nearly, a result that accords very closely with that in the Norwich Tables; but it is a result obtained with this difference, that whilst at the Norwich Hospital considerably more than one half of all the subjects of operation were children and youthful subjects, in Mr. Liston's series of cases, 86, or about $\frac{3}{4}$ ths of the entire number, were adult and aged males. The issues in this Table are to be regarded as the immediate issues.

In estimating the risks from lithotomy, it is obvious, from the whole of the above statements, that AGE is an essential element in the reckoning. The operation, previous to puberty, is a very different affair from what it is after this great epoch in the life of man. Very little information is, in fact to be gained from statements of the results of the operation for all ages and sexes. It would seem generally to be of little moment who was the surgeon and what the operation: if the majority of subjects be youthful, the success will be considerable,—the mortality may be no more than 1 in 20 or 25; if, on the contrary, the majority of the patients be adult and aged, the mortality will certainly be from 1 in 5 to 1 in 2, according to the period of life.

It should ever be carefully borne in mind that the causes of death from lithotomy do not always inhere in the operation itself, though the mere cutting and the consequent shock to the nervous system will have their victims,—some never rally from the commotion produced by the use of the knife and the

necessary violence of extracting the stone ;*—hemorrhage has its victims also. But of far more consequence than either of these causes of failure, especially as regards adult and elderly subjects, the presence of a stone for a term of years in the bladder is followed in numerous instances by an amount of disturbance in the function, and then of alteration in the structure, of the kidneys that as certainly occasions death as a succession of softening and suppurating tubercles in the lungs. The operation here but fires the mine at once, that would have exploded of itself before long. In other cases, again, the operation is beyond all question the immediate cause of the train of morbid phenomena, having the same general character and tendency, that so frequently follow it. I find it impossible, therefore, to believe that the cases operated on by particular surgeons have ultimately done well in the proportions that are often specified. To have been as successful as rumour and their own statements proclaim them, their patients must have been abstracted from the influences that give stone its fatal tendency, which is an absurdity. Dupuytren, towards the close of his brilliant career, saw, as he informs us, that, “in spite of the variety of procedures which incumber the history of lithotomy, there was still great room left to desire a method of performing it which should be less murderous than any of those in use.” †

* Vide Appendix F, Influence of the size of calculi on the mortality from lithotomy.

† Mem. sur l'operat. de la Pierre, &c. p. 2.

CHAPTER V.

REMOVAL OF THE STONE THROUGH AN APERTURE
MADE INTO THE URETHRA IN PERINÆO, AND SLOW
DILATATION OF THE PROSTATE GLAND AND NECK
OF THE BLADDER.—LITHECTASY, CYSTECTASY.

THE ancient Marian method of performing lithotomy, was by incision of the external parts, and rapid dilatation or laceration of the internal, effected by a succession of blunt instruments called gorgets of different sizes. These instruments were introduced in pairs, through the membranous part of the urethra into the neck of the bladder, and being then separated from one another, they were made to distend and to tear. The first pair of gorgets having done their office, one of them was withdrawn, and upon the groove or tongue of that which still remained in the bladder, a second and larger sized instrument was passed, then a third, and so on, until the amount of opening necessary for the passage of the clumsy tongs in use at the time, and the removal of these with the stone between their chaps, was obtained.

The effects of this procedure are easily imagined :

the neck of the bladder as well as all the parts about the perinæum are very dilatable structures ; but they must have time to yield ; in the Marian method, no time was allowed for stretching, and as a consequence, the parts were torn. The very same thing frequently happens in the operation—the best operation—for stone as done at the present day ; the forceps with the stone between its blades, performs all that the *apparatus major* or succession of blunt gorgets used to accomplish ; we have truly an *apparatus minor* substituted for an *apparatus major* ; but the effects of either are the same.

The great dilatability of the female, and even of the male urethra under a gradually distending force, however, having been ascertained, (vide p. 51,) surgeons began to inquire whether this property might not be taken advantage of as a means of removing calculi from the male as well as from the female bladder, in a way other than that practised by the Egyptian physicians, as described by Prosper Alpinus. The first who turned his attention in this direction, so far as I know, was Mr. John Douglas.* He proposes that an opening should be made into the urethra from the perinæum, in those patients who were affected with a calculus which was apt to fall against the neck of the bladder and occasion a retention of urine or very severe pain. Through this opening, says he, the patient himself, or any one about him, might pass an oiled probe and push the stone back. “ By this fistula,” he continues, “ we can also very easily

* Phil. Trans. 1727, p. 318.

inject any liquid that may be thought proper, either to prevent or allay inflammation of the bladder, or to cleanse it from gravel," &c.

He then enters on the following question : " Whether it be not possible to dilate the artificial fistula in the perinæum of males and the urethra in females with sponge or gentian tents, gradually increased for some time, to such a width that we may easily pass a pair of forceps into the bladder with which the stone when small may be extracted ?" From the fact of small stones having so frequently passed or been extracted through the fistulous openings that were very apt to follow the Marian operation, and of large calculi having been slowly forced through the female urethra, Douglas, gaining courage apparently as he proceeded with his subject, concludes with the following general thesis : " Therefore, artificial fistulas in males and the urethra in females may be dilated so as to extract any stone without cutting the body of the bladder or lacerating any of the parts."

In this conclusion I unreservedly agree. It involves, in my apprehension, one of the most important of truths bearing upon the successful treatment of stone in the bladder by a surgical operation.

The excellent ideas contained in Douglas's paper, however, seem to have attracted little attention; at all events, we have no indications of their having influenced practice. Nothing of the kind he suggests appears to have been attempted for nearly a century after the date of his paper, and then the procedure was probably followed in ignorance of the existence of this ingenious document. The occasion in which the very plan which Douglas

suggested, but with other means of accomplishing the end than any he possessed, was first practised with intention and successfully, by the Drs. Neil and James Arnott and Sir Astley Cooper in the year 1819. The particulars of this case have already been given, (p. 71,) and we have seen the influence which their publication undoubtedly had in conjunction with other concurring circumstances in advancing the surgical therapeutics of calculous complaints.

The influence was collateral, however, not direct; no one, not even Sir Astley Cooper, who had taken a prominent part and was loud in praise of the procedure, was found to imitate it; all went on as before in the beaten path, and the world—or that portion of it which suffered from stone at all events,—was little the better for what had been done. In one of the very next cases he encountered, Cooper attempted to effect the dilatation of the urethra through its entire length by means of ordinary bougies,—instruments which are altogether incompetent to such an end; he induced inflammation in the canal, of course, and then he had to desist. The next step in his operation, the use of slender forceps for the extraction of the calculus, is objectionable generally, and is besides available in a very limited range of cases only. The operation at which Cooper assisted along with the Arnotts ought, I conceive, to have had other consequences in his hands than those that followed it immediately. Cooper's new procedure was a very questionable gain. The success in lithotomy, we have seen, is

not so great under any circumstances, certainly not in those where success is most truly desirable, as should induce men of humanity to rest satisfied with its results; a mortality of one in three, and one in four, is a frightful mortality; and after forty, when the life of man is most truly precious, when he is the husband and the father and the mainspring in the varied business of the world, the mortality is certainly not less; were the success nineteen in twenty, it would still be worth while in my opinion to strive to make it twenty in twenty-one.

M. Guerin,* Surgeon to the general Hospital of Bordeaux, a distinguished and successful lithotomist in his day, seems to have been prompted by some feeling of this kind when in the decline of his life he began inquiring whether there were no other means of getting into the bladder and removing calculi than by the ordinary lateral or high apparatus, and that might be attended with less imminent risk to life? Pursuing the subject, he invented a new operation, some of the parts of which are extremely objectionable, but others in their principle as highly commendable. This operation was as follows:

The patient having been placed as in the position for lithotomy and a grooved staff introduced into the bladder, an incision was made in the raphé from the point of the bulb downwards through the sphincter ani into the rectum. The groove of the staff was then felt for, and the urethra opened upon it. A slender blunt gorget or director was next passed in-

* Journal Medical de la Gironde, tom. v. Bordeaux, 1826.

to the bladder and the staff withdrawn. The forefinger of the right or left hand was now insinuated slowly along the director until it entered the bladder. The finger was retained for some little time in this situation to make sure of the dilatation already accomplished. The finger and director were then withdrawn and the means for accomplishing the final and sufficient dilatation of the neck of the bladder were brought into requisition.

These means consisted of a succession of tents prepared from the dried roots of vegetables, pierced in their centre with a canula through which the urine passed off whilst they were in position. Immediately before being introduced into the bladder through the perineal wound, the tents were dipped in water or some mucilaginous fluid; properly placed, they were left to swell, and acquired their greatest dimensions in from 12 to 24 hours, powerfully dilating the parts immediately around them. The first tent having done its office was removed, and a second and a third larger one substituted, until dilatation commensurate with the estimated size of the stone having been obtained, the last was withdrawn, the forceps introduced, and the stone extracted.

The sole objectionable element in this operation is the first step,—the division of the sphincter ani and orifice of the bowel, a step as unnecessary to the immediate end in view, as it is calculated to make the ulterior consequences of the operation distressing. Let the urethra be opened upon a grooved staff in the mesial line and behind the bulb to the extent of a few

lines, as used to be done in the old operation of *bouttonnière*, or as Cheselden did in his last operation, and every objection to the procedure is at once removed. To make such an opening, a lancet, in the absence of an implement with greater fixedness of parts, would perfectly suffice; and the urethra once open, we can dilate to the extent we please if we will but be patient. The vegetable tents of M. Guerin can always be procured, and nicely made would answer indifferently well to effect the needful opening. But an apparatus that is far preferable, that can be controlled to a nicety in its effects, and that is much more powerful than the tent, whilst its operation is still of the best kind, is the fluid-pressure dilator of Dr. Arnott. This is an instrument which consists of a cylindrical tube of silk lined with the thin gut of a small animal, to make it water tight, fixed upon a canula which traverses its axis, and having attached to its outer end a syringe guarded with a stop-cock, by which it may be forcibly distended with water or mucilage. This instrument when empty exceeds but little in size the bulk of the canula or catheter with which it is connected, and is therefore easily introduced along the groove of the staff into the bladder. When there it can be gradually distended to its utmost limits, and being made of so tough a material as silk, it expands evenly and is not liable to be burst by any degree of force that can be usefully employed. In Dr. Arnott's original case, 30 hours, during which the urine passed regularly guttatim by the canula, and the patient complained of no pain, but merely of a sense of distension, sufficed to ac-

comply dilatation to the extent necessary for the introduction of the forceps and the easy extraction of a stone having the dimensions of a walnut. And this without risk for one moment to the patient! The wound in the perinæum is a scratch; in itself and immediately it is hardly so dangerous as the puncture that is made in venesection; ulteriorly it can by no possibility be followed by any evil or unpleasant consequence; the urine never even comes into contact with the raw surface,—the dilator is introduced, and immediately this fluid, so poisonous to open wounds, finds no passage save through the canula; before the dilator is again withdrawn, the fresh surface has become covered with coagulable lymph through which nothing can penetrate; and the stone being removed, the gap might be closed with a couple of points of twisted suture and the urine made to come away at once by the whole length of the natural passage.

To me, I confess, that with this operation at command, stone in the bladder has already lost a great proportion of its terrors.—There is hardly a case to which it is not applicable, and its application is without danger immediate or prospective. The brief interval of from four and twenty to eight and forty hours, is all that is necessary to begin and end the operation;—and this with no doubtful prospect, it cannot end otherwise than well. Even if we found a stone of five or six ounces in weight, we should feel neither embarrassment nor alarm; we never should think of extracting such a mass entire, indeed, but we have an aperture of two

or if we choose of three inches in diameter, and a canal of little or no greater length, through which we can introduce an Earle's or any other commodious instrument for breaking up large stones in the bladder, and reduce it to fragments in a twinkling. We might even have a Professor of Lithotrity in waiting, and give him an opportunity of proving the strength of his instruments in circumstances where a break or a bend would prove of little consequence to the patient, and where no fragments,—not of the stone only but of the instrument,—need be left behind to form the kernels of other calculi, or to task his ingenuity to invent additional implements for their extraction. *

The mode of removing a stone from the bladder, recommended by Douglas and practised by the Arnotts and Cooper, was advocated some years back by Dr. M. S. Buchanan,† surgeon to the Royal

* Even at the present day the patients who subject themselves to lithotrity are not beyond the risk of having fragments of lithontriptors left in their bladder, if we may judge from the title of a paper addressed in the course of the last year (1841) to the Royal Academy of Sciences by M. Leroy, being a description of "An instrument invented by him for seizing and extracting from the bladder *certain foreign metallic bodies* engaged or retained in the viscus." With his Memoir and instruments, "*a kind of pincers*," say the Committee of the Academy, "M. Leroy also presented several of the foreign metallic bodies, *pieces of iron rods*, [pieces of a lithontriptor that had been broken in the bladder] which he informed us he had extracted from the bladder of one of his patients."—Comptes Rendus, 1841, 2me Semestre, p. 524.

† Glasgow Medical Journal, vol. iii. p. 379 and vol. iv. p. 425, Glasg. 1830 and 1831.

Infirmary of Glasgow ; under the impression that the plan was original on his part. But the means of accomplishing the dilatation which he imagined, was every way inferior to that devised by Guerin and particularly by Arnott. It was a three-branched instrument, very similar to the speculum vaginae of Weiss, but of course of dimensions suited to pass along the urethra. In its mode of action and effects it would have differed little from the gorgets of the apparatus major. Dr. Buchanan, however, has the merit of having seen the great advantage that would accrue from a gradual dilatation of the neck of the bladder, instead of the rapid distension and tearing that accompany the extraction of a stone of any size by the usual procedure, and that impress in an especial manner its fatal character upon ordinary lithotomy performed on adults.

APPENDIX.

APPENDICES (A.) and (B.) Pages 14, 15.

Action of the Vichy water on Calculi of the lithic acid and of the mixed and triple phosphates.

M. Chevallier* was the first who instituted direct experiments on the powers of the alkaline water of Vichy to dissolve and disintegrate urinary calculi. The following are the particulars of some of his trials:

1. A quantity of lithic acid gravel was subjected to the action of the Vichy water kept at a temperature of 97° F. The concretions were speedily destroyed; the lithic acid being entirely dissolved, and nothing remaining suspended in the fluid but a few loose flocculi of animal matter.

2. The half of a lithic acid calculus weighing 1 ounce, 1 dram, 36½ grains, was placed in a little bag of wire muslin, and subjected to the action of the Vichy water during 151 hours. Dried carefully and weighed after this, the calculus was found reduced to 2 drams, 52 grains; so that in less than a week it had actually lost 6 drams, 47 grains, or more than *two thirds* of its original weight.

3. In another experiment, five calculi, one of phosphate of lime weighing 1 dram, 18 grains; a second of lithic acid, weighing 1 dram, 8 grains; a third of lithic acid, weighing 25 grains; a fourth and fifth,—fragments of phosphatic calculi,—weighing, the one 29 grains, and the other 13 grains, were enclosed together in a bag of wire muslin, and exposed on the 5th September to a con-

* Essai sur la Dissolution de la Gravelle, &c. 1837.

stant stream of the Vichy water of the temperature of about 98° F. On the 11th September the bag being examined, was found completely empty; the calculi of lithic acid had been dissolved; those of the phosphates disintegrated, and their particles washed through the meshes of the muslin.

Many experiments on the solution and disintegration of calculi by the Vichy waters were performed by Dr. Ch. Petit, * a few of which are here selected.

1. Two pieces of a calculus, laminæ of a large lithic acid concretion, weighing 31.38 grammes,† after exposure to the action of the Vichy water during twenty-three days, were found to weigh only 8.65 grammes, so that they had lost 72.79 per cent.

2. A piece of an ammoniaco-magnesian phosphatic calculus, weighing 31.50 gram., immersed for eighteen days in the water, was found reduced to 17.25 gram., so that it had lost 45.23 per cent.

3. The half of a lithic acid calculus with traces of lithate of ammonia, weighing 40.80 gram., immersed for thirty days, was found reduced to 24.65 gram., and had therefore lost 39.58 per cent.

4. The half of a calculus of the triple phosphate of ammonia and magnesia, with traces of lithic acid, which weighed 16.25 gram. before immersion in the water, after exposure to its influence, weighed but 6.65 gram., and had consequently lost 59.07 per cent.

5. Half of a triple phosphatic calculus, of a greyish white colour, weighing 9.20 gram., after twenty days' immersion, weighed 2.60 gram., and thus lost 71.75 per cent.

6. A small calculus of lithic acid, weighing 2.75 gram. after forty-three days' immersion, weighed but 0.70 of a gramme, and had therefore lost 74.54 per cent.

7. Half of a calculus of lithate of ammonia, with traces of phosphate and oxalate of lime, weighing originally 3.05 gram.,

* *Nouv. Obs. sur la Dissolution des Calculs, &c.*

† A gramme is about 15 grains.

after eighteen days' exposure, weighed 1.20 gram. and had lost 60.65 per cent.

Contrary to the usually entertained opinion, M. Petit found that, on the whole, calculi of the triple phosphate of ammonia and magnesia lost more under the action of the Vichy water, *i. e.* of a solution of bicarbonate of soda in water supersaturated with carbonic acid, than those of the lithic acid. For example :

Five specimens of lithic acid calculi, weighing together a little more than 118 grammes, after remaining, on an average, twenty-seven days exposed to the action of the water, lost very nearly 64 grammes, or 53 per cent. of their original weight ; but five specimens of the ammoniaco-magnesian phosphatic calculus, which together weighed rather more than ninety-seven and a half grammes, and only remained under the action of the water, one with another, for the space of twenty-three days, lost fifty-eight grammes and three-fourths, or 60 per cent, of their original weight.

M. Petit, like M. Chevallier, found that the Vichy water had extremely little influence on calculi of the oxalate and phosphate of lime. This water, however, would dissolve calculi of cystine and lithic oxide with at least as much readiness as it disintegrates and dissolves those of lithic acid and the triple phosphate. Water surcharged with carbonic acid and holding a little bicarbonate of soda in solution is consequently a solvent for the calculi of every description that are of somewhat frequent occurrence, save those of the oxalate of lime. Such a water will therefore attack something like nineteen-twentieths of all the known varieties of urinary concretion.

The destruction of urinary calculi by an alkaline water is found to be not merely nor perhaps even principally by the way of solution ; it is accomplished in a very considerable degree, especially as regards those of the triple phosphate, by a kind of disintegration of their component par-

ticles. When calculi which consist principally of the oxalate or phosphate of lime, are mingled with a little lithic acid, lithate of ammonia, or triple phosphate, which they are very frequently, the alkaline water attacks and disintegrates them rapidly, so that the sphere of its activity is still farther extended.

APPENDIX (B.) Page 34.

Solubility of the alkaline urates.

These salts,—the urate of potash, of soda, and of ammonia,—are all of nearly similar solubility. Urate of soda, in particular, requires 480 times its weight of cold water to dissolve it. One grain of the salt already formed, would therefore require about one fluid ounce of water to take it up. But if to a solution of three grains of carbonate of potash in one ounce of distilled water uric acid in fine powder be added, so long as any is taken up, it will be found that rather more than three grains of the acid will have been dissolved. The ounce of menstruum has, therefore, not merely one grain of urate of potash in solution, as it ought to have according to the estimate of the solubility of the salt in water, but it has actually something like six grains of a saline matter, probably a double salt consisting of carbonate of potash and urate of potash. In like manner a solution of three grains of biborate of soda in one ounce of distilled water will take up and hold in perfect solution two grains of pure lithic acid; so that the menstruum has here something like five grains of the double salt of biborate and urate of soda dissolved in it. The explanation of these facts belongs to chemistry, and need not detain us as practitioners of medicine; it is sufficient that we are aware of them and incline to use them for the benefit of our patients. The solvent power of a solution of the carbonate of potash,—and it is nearly the same with regard to one of the carbonate or biborate of soda,

in the proportion of three grains to the ounce of menstruum—is obviously very considerable. It is so considerable, in fact, that supposing the quantity of urine to be sixty ounces per diem, and each ounce to contain three grains of carbonate of potash or soda, which it will readily hold in solution, were all the salt to combine with the uric acid of a calculus of the weight of one ounce contained in the bladder, the stone as such would be annihilated in the course of no more than about four days! But matters do not pass at this rate; a very small quantity only of the alkaline salt can enter into combination with the uric acid of the stone during the time the two are in contact, and the time required for the solution and disintegration of a calculus of lithic acid is much longer. But were the solubility of the urates of potash and soda no greater than they are stated to be in books of chemistry, a calculus of lithic acid weighing one ounce, kept constantly exposed to an aqueous or urinous menstruum holding in solution from two to three grains of carbonate of potash or soda per ounce, it would be entirely dissolved in about sixty-six days, or little more than two months; no long time, after all, for so great an achievement.

But the process that goes on between alkaline urine and urinary calculi of the more common kinds is not one of solution only; it is, in addition, very regularly one of disintegration also: the stone soon begins to scale, and quantities of detritus, often greater in amount than the matter that is actually dissolved, are discharged. I believe that under favourable circumstances a calculus of the lithic acid, lithate of ammonia, or triple phosphate, of the weight of one ounce, would be dissolved and disintegrated in the course of about forty days.

APPENDIX (C.) Page 35.

Experiments on Urinary Calculi.

It was my purpose to have given an account of the results of a connected series of experiments on the solubility

in different menstrua of the matters which enter into the constitution of urinary calculi. I have in my possession the *savings* collected during the division of the whole of a very extensive series of urinary calculi, which would answer perfectly for this purpose. But my own leisure has not permitted me to undertake the labour. The *savings*, however, are now in the hands of an able chemist, who, as opportunity permits, will make the needful researches, and publish the results.

APPENDIX (D.) Page 35.

Composition of the Vichy Waters.

There are seven principal springs which pour out these waters, the product of each differing but little from that of the rest. The composition is as follows:

Water	from 991,9 to 994,9
Carbonic acid gas	from 1,2 to 0,93
Carbonate of soda	from 5,5 to 4,7
Carbonate of lime	from 0,6 to 0,3
Carbonate of magnesia	from 0,09 to 0,06
Muriate of soda	from 0,57 to 0,52
Sulphate of soda	from 0,47 to 0,27
Silica	from 0,1 to 0,04
A vegetable matter, glairine, in indeterminate quantity.	

The formula in the Codex Gallicus for artificial Vichy water is this:

	OZ.	DR.	GR.
Crystallized carbonate of soda	0	1	54
Chloride of sodium	0	0	$\frac{1}{3}$
Chloride of calcium	0	0	11
Sulphate of soda	0	0	6
Sulphate of magnesia	0	0	3
Sulphate of iron	0	0	$\frac{1}{3}$
Water deprived of its air	20	0	0
Carbonic acid gas, three volumes and a half.			

The salts, with soda for a base, are to be dissolved together, and the sulphate of magnesia and chloride of calcium are to be dissolved separately; the different solutions are then to be mixed and charged with the carbonic acid gas; the gaseous saline water is finally to be received in bottles into which the sulphate of iron dissolved in a little water has been previously introduced.

APPENDIX (E.) Page 46.

Composition of injections for the solution of calculi, and means of using them.

When the great variety of urinary calculi came to be discovered, it was of course presumed that a corresponding diversity in the means of attacking them chemically would be found requisite; and this is the case; but it is so within much narrower limits than was until very lately imagined. One constituent principle or another of the great majority of urinary concretions is attacked by weak solutions of the fixed alkalis, pure or carbonated, by which, they are either dissolved or disintegrated. The injection made use of by Dr. Rutherford in the case of Macpherson (vide p. 39) was lime water, but as the patient was taking soap (a compound of soda) freely by the mouth, the alkaline urine which it produced became a weak solution of caustic soda under the influence of the injection; Dr. Ritter's injection in his successful case (vide p. 42) was a solution of caustic potash; Dr. C. Petit, in the case of Jacob (vide p. 29) made use of the natural Vichy water, or solution of bicarbonate of soda in tepid water. Magendie and Amussat* employed a very dilute solution of sulphuric acid. Sir B. Brodie† again had recourse to nitric acid,

* Quoted in my Work on Urinary Diseases, p. 336.

† Ibid. p. 337

in the proportion of two minims, and two minims and a half, to each ounce of water, with perfect success.

The most generally efficacious articles as injections are unquestionably the fixed alkalis. In every form of the lithic acid diathesis, we have but to take away the disposition of the urine to deposit this acid either pure or combined with ammonia, which we now know we can do at once by prescribing the benzoic acid by the mouth, to find ourselves at liberty to deal with the matters already deposited in the bladder at a great advantage. There is no objection to the caustic potash properly diluted as an injection; if this be but thrown directly into the bladder and withdrawn from it again through a catheter, it can be borne of the strength that is requisite to act even with rapidity on calculi of the lithic acid and the lithates. This solution also acts very powerfully upon all the looser phosphatic calculi, into the composition of which animal matter enters in considerable quantity.

Solutions of the carbonates or bicarbonates of the fixed alkalis are, however, to be more generally recommended. Their action, if less rapid than that of the caustic alkalis, is of the same kind, and equally certain. Had we a calculus of pure lithic acid to deal with, a solution of borate of soda or borate of potash would be the best solvent; and this, even in the state of saturation, is not felt as irritating in the slightest degree by the mucous membranes of the body. There is, however, no advantage in employing strong solutions of the carbonates or borates of the alkalis as injections; from three to five grains of the salt to the ounce of water is strong enough.

Among acid injections the best are those that are made with the lactic and nitric acids. The lactic acid, the natural acid of the urine, is probably the agent employed by Nature to hold in solution the phosphates contained in that fluid; at all events, the urine which deposits the phosphates is always either neutral or alkaline; and I know that a drop or two of a solution of

lactic or of acetic acid instantly render the most turbid phosphatic urine perfectly clear.

Acid solutions, even of considerable strength, are well borne by the mucous membrane of the bladder, though they are violently rebelled against by that of the urethra.

The best of all the methods of using injections into the bladder for the solution of stone is to have a reservoir for the fluid, raised a foot or two above the bed or sofa on which the patient is laid, and to connect this by means of a flexible tube guarded by a stop-cock, with a double-current catheter. In this way, a constant stream of the injection can be kept circulating through the bladder and acting on the stone to the very best advantage. The reservoir should be a double vessel of tinned iron, the outer one being filled with water at from 95° to 98° F. and kept at this temperature by means of a small spirit lamp. There is no necessity for any very rapid current through the bladder.

Calculi of the oxalate of lime are beyond the reach of solvents, and ought to be removed by mechanical means—by lithotrity if very small and not of such hardness as to induce risks of breaking or bending the lithontriptor, by lithectomy if they be hard or of a size exceeding a nutmeg. Had I a stone in my bladder myself, I should in the event of its being found of a nature to resist the action of solvents, have it taken out by lithectomy under all circumstances.

APPENDIX (F.)

*Influence of the size of Calculi on the Mortality after Lithotomy.
Supp. to page 135.*

The influence which the size of the calculus taken out in lithotomy has upon the mortality after the operation, is a point which has only been touched upon very generally. It is familiarly known, indeed, that a very large stone is almost certain destruction to the patient; but we have

scarcely any data from which we can deduce the relative influence on the event exerted by stones of different sizes. Mr. Crosse is almost the only writer who has seen this subject as one of interest and importance, or who has had materials at his disposal, from which other than either purely individual or extremely general inferences could be drawn. From the invaluable Norwich data, Mr. Crosse has presented us with the following Table of 704 calculi arranged according to their weight, with the results of the operations performed for their removal severally.

Weight.	Number of Cases.	Cured.	Died.	Ratio of Mortality.
1 oz. & under	529	482	47	1 in $11\frac{1}{3}$ nearly
1 to 2 oz.	119	101	18	1 in $6\frac{2}{3}$ —
2 to 3 oz.	35	19	16	1 in $2\frac{1}{5}$ —
3 to 4 oz.	11	4	7	1 in $1\frac{4}{7}$
4 to 5 oz.	5	2	3	1 in $1\frac{2}{5}$
5 to 6 } oz.	4	2	2	1 in 2
6 to 7 }				

This Table is valuable, and the information it conveys extremely important. With a stone one ounce in weight and under, it is obvious that the chances of a favourable issue are nearly twice as great as with a stone of between one and two ounces in weight, and nearly six times as great as when the stone weighs between two and three ounces. The mortality with stones of every weight over an ounce, is 1 in $3\frac{3}{4}$ ths nearly; and with those over two ounces it is something more than 1 in 2,—of the 55 instances in which the stone weighed two ounces and upwards, 27 recovered and 28 died. The chance which a patient has for recovery after lithotomy can therefore be calculated beforehand, and independently of every other consideration, from the ascertained dimensions or weight of his stone. Doubtless some considerable portion of the greater

comparative success that attends lithotomy in early life is due to the generally smaller size of the stones that are then extracted. So far as my observation goes, I should say that the majority of stones taken from the bladders of adults and aged individuals exceeded an ounce in weight.

A certain moderate size of stone, however, would seem rather to be advantageous than otherwise; the most favourable results are not associated with the very smallest stones, as is apparent from the particulars conveyed by this Table from Mr. Crosse, of the 529 calculi of the preceding Table that weighed 1oz. and under.

Weight.	Number of Cases.	Cured.	Died.	Ratio of Mortality.
1 dr. & under	134	122	12	1 in $11\frac{1}{8}$
1 to 2 drs.	111	101	10	1 in $11\frac{1}{10}$
2 to 3 drs.	95	90	5	1 in 19
3 to 4 drs.	68	60	8	1 in $8\frac{1}{2}$
4 to 5 drs.	29	28	1	1 in 29
5 to 6 drs.	38	35	3	1 in $12\frac{2}{3}$
6 to 7 drs.	24	21	3	1 in 8
7 to 8 drs.	30	25	5	1 in 6
Total	529	482	47	1 in $11\frac{1}{3}$ nearly

With stones under two drams in weight the mortality is therefore greater than with those that are between two and three drams, and particularly with those between four and five drams; the chances of recovery with this last weight of stone are actually about two and a half times greater than with a stone that weighs less than a dram. A certain moderate size in the calculus is therefore an advantage, I believe, because stretching is brought to the aid of cutting. Near and after the ounce weight, tearing is added to stretching, and immediately the mortality rises.

MEASUREMENTS of calculi would be far more important elements in forming estimates of this kind than weights;

it is the size of the stone that determines the extent of outlet necessary to give it passage, and this extent of outlet it is that influences the mortality; large stones often weigh very little; small ones, again, are frequently remarkably solid and heavy.

APPENDIX (G.)

Cheselden's Operation. Supp. to Note, p. 153.

Much discrepancy has prevailed in the accounts that have been given of Cheselden's lateral operation. This has arisen, first from the confused and inaccurate description of the procedure which was published by Dr. Douglas in the lifetime of Cheselden, and which seems to have been principally referred to by surgical writers for information; and then from the material differences that exist between the first and second description of his method, which Cheselden himself gave to the world, having been overlooked.

The first account we have from the pen of the celebrated surgeon of St. Thomas's Hospital, is in "An Appendix to the fourth Edition of the Anatomy of the Human Body," which appeared in the year 1730. In this appendix, after describing the first stage of the operation, he goes on to say: "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," &c. &c. In the appendix to the fifth Edition of the Anatomy, which issued ten years later, viz. in 1740, the description is the same till we pass the words: "I then feel for the staff," when he proceeds: "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." Dr. Yelloly, in a learned and very able paper published in the 15th volume of the Medico-Chirurgical Transactions (Lond. 1829) speaks of these two operations as identical. If the words in which they are described be

taken in their most simple signification, however, it seems to me that the two operations are totally different. In the one—the first,—*the prostate is cut in its length, and the knife in the groove of the staff is passed into the bladder*; in the other—the second and improved operation,—*the knife is entered through the distal edge of the prostate only, and the membranous part of the urethra slit open*. The first method is the lateral method of English surgeons of the present day; the second method has scarcely if it has ever been intentionally performed since Cheselden himself ceased to operate; nevertheless that it was the one which he approved there can be no doubt; for it is that along with which his most brilliant successes were achieved, and it is that which is found in the next and only other Edition of the Anatomy which appeared during his lifetime, the sixth, which issued in 1750.

Dr. Yelloly conceives that the important part of Cheselden's operation "consisted in cutting upon the staff in the membranous part of the urethra, and in continuing the incision from such membranous part, through the prostate gland, into the bladder." I am, with the greatest respect for Dr. Yelloly, of a different opinion; the operation, as spoken of by him, done guardedly, is a good one; but there is a better, that, namely, which Cheselden described after the reiterated experience of ten years, and the important part of which I maintain consists *in not cutting through the prostate gland into the bladder*.

THE 'END.

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