mental group, which lie beneath the floor of the mouth behind the lower jaw; (2) the submaxillary, some of which actually lie in the substance of the salivary gland; (3) the parotid, and (4) the carotid, which lie over the course of the carotid artery and particularly over the bifurcation of the common carotid.

Speaking generally, it may be said that, although the lymph from the anterior portion of the tongue does occasionally pass, directly or indirectly, through the parotid group of glands, it does so only rarely, and the rule is that all the lymphatics from the anterior half of the tongue, whether from the dorsum, the border, or the under aspect, pass through one or more of the three anterior groups of glands. This is the more fortunate because the anterior half or two-thirds of the tongue is much more subject to cancer than the posterior part; also because there is much greater uncertainty respecting the relation of the parotid group of glands than there is respecting the relation of the three other groups. For example, I have not been able to discover whether lymphatic glands are embedded in the substance of the parotid salivary gland, as they frequently are in the substance of the submaxillary salivary gland. So far as the majority of cancers of the tongue are concerned, especially of the cancers which can be removed so that they are not likely to recur within the mouth, it may be foretold that they will inoculate one or more of the three anterior groups of glands, particularly the submaxillary and carotid groups. The removal of these three groups, then, would offer a reasonable prospect of preserving the patient, in any given case, from glandular affection. And if, in addition, the parotid glands, or those of them most likely to be affected, could be removed during the same operation, an increased prospect of success would be afforded. With this in mind I have devised and carried out on many occasions during the last eighteen months or two years, an operation which removes all the contents of the great anterior triangle of the neck, including the submaxillary salivary gland. And, although I have not yet operated on a sufficient number of cases, and time enough has not yet elapsed to allow the routine to be judged, the results have already been so good as to encourage an extended trial of the method of operating.

The time has not yet arrived to give an account of the operation, further than to say that the anterior triangle is thoroughly exposed by an incision about 7 inches long on the anterior border of the sterno-mastoid muscle from the mastoid process to below the thyroid cartilage, and a second incision from the symphysis of the lower jaw to the first incision about the upper level of the thyroid cartilage, and raising up the two triangular flaps which are thus mapped out. The dissection is commenced from the apex of the triangle, below, and carried upwards. The large vessels are exposed for a considerable distance. The vessels which are cut are clamped before, or as, they are divided; and, finally, the submaxillary salivary gland is taken out. A very careful dissection is made of the triangle, so that the connective tissue and glands are all taken out in one continuous mass. Search is made between the muscles in front for one or two deeper-seated lymphatic glands, and the glands in front of the parotid gland and about the angle of the jaw are removed with the other contents of the triangle. The submental and parotid glands are not so easily and certainly removed *en masse* in this operation as the submaxillary and carotid groups. Both the latter groups are very readily removed, and require no special search to be made for them. This is fortunate, because they contain the lymphatic glands, which are by far the most likely to be affected. The dissection occupies from an hour to an hour and a quarter, but the wound heals very rapidly, so that patients have been able to go out of doors eight or ten days after the operation. At first I performed it at the same time that I removed the affected portion of the tongue. But, experience has taught me that this is too hazardous. The disease of the tongue should be first removed. And, when the patient has had time (three or four weeks) to recover from this operation, and can take food well, the removal of the contents of the anterior triangle may be undertaken without fear. Both within the hospital and out of it I do my best to persuade nearly every patient who comes to me with cancer of the tongue to submit, after the removal of the cancer, to the operation on the glands of the neck. In

the course of the next two or three years I hope to be able to judge of the results of this preventive method. Thus far, I can only say that the glands have been found to be enlarged, but not cancerous, in several cases in which no enlargement was suspected. And, in one instance, to which reference has already been made, a cancerous gland, as large as a filbert, was removed with the submaxillary salivary gland, by which it had been shadowed and concealed. I shall at some future time publish a more detailed account of the steps of the operation, and a note of the patients on whom it has been performed, and of the fortune, good or bad, which has attended it.

In the meantime, I trust that the results which have been recorded in this paper will serve to encourage medical men and their patients to take a more hopeful view of the operative treatment of cancer of the tongue, particularly when the disease is situated in the anterior two-thirds of the tongue, and, above all, when the operation is performed at an early period of the disease.

NOTE AND REFERENCES.

¹ These 66 patients are made up of the 18 patients who actually suffered from recurrence *in situ*, 28 who died of affection of the glands without recurrence in the mouth, and 20 patients who remained well more than three years after operation. ² Holmes, *A System of Surgery*, 3rd edition, 1883; *Diseases of the Tongue*, E. A. Barker, vol. ii, p. 604. ³ *Sarcoma and Carcinoma*, 1882, p. 156. ⁴ *Beiträge zur Statistik der Carcinome*, p. 214, Stuttgart, 1878. ⁵ *Anatomie, Physiologie et Pathologie des Vaisseaux Lymphatiques considérés chez l'Homme et les Vertébrés*, Paris, 1874-85.

THE LETTSOMIAN LECTURES

ON THE

AFFECTIONS OF THE URINARY APPARATUS IN CHILDREN.

Delivered before the Medical Society of London.

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LECTURE II.

TUMOURS OF THE KIDNEY.

THE tumours of the kidney in childhood are almost without exception malignant, and the great majority are of the nature of sarcomata, though a few bear affinities to the adenomata, and in rare instances show pigmentation. They are by far the most frequent of all malignant tumours occurring in the abdomen in childhood, and originate either from the cortex, and invade the gland, or in the perirenal tissue. Very rarely they commence in the adrenals, sometimes surrounding, sometimes infiltrating, the whole of the kidney. By pressure the tumour may cause hydronephrosis, and adhesions may be found to other structures. The pressure effects may cause ascites or œdema of the lower extremities. They are frequently bilateral. Neither traumatism nor antecedent disease has much to do with their origin.

Occurring for the most part in very early life, and confined at first to one side of the abdomen, they present a smooth rounded outline, as distinguished from the sharp edge of an enlarged liver, or the notched surface of a hypertrophied spleen. On bimanual examination they are found to be movable, but attached to the neighbourhood of the lumbar spine. They grow forwards, and do not bulge in the lumbar region. Though dull on percussion, except where crossed by intestine, they are often so soft as to give an obscure sense of fluctuation, and have thus been mistaken for ovarian cysts. They are invariably crossed by a portion of the colon, and in an early stage are influenced by the movements of respiration. There is generally a space into which the fingers can be pressed between the upper margin of the renal growth and the ribs.

So rapid is usually the advance of these neoplasms that they present only two symptoms in their earliest onset, namely, that of a large rounded tumour commencing in the loin, which most often is the first indication, and hæmaturia. In 12 per cent. this latter is said to be the primary symptom. Both might well, in the earliest onset, be mistaken as due to

hydronephrosis, or the presence of calculi in the pelvis of the kidney. But the nature of the swelling is soon evidenced by the rapidity of its increase, and the hæmaturia differs from that resulting from calculus or scrofulous pyelitis in its abundance and its intermittence, the urine in the intervals being clear. It may be so abundant as to form clots in the bladder or ureter, when pain will occur as an additional symptom. If hæmaturia occur without an assignable cause, the patient should be strictly watched for several weeks. By this means Israel found a growth very early, and removed it successfully. Cachexia does not appear until late, and then the wasting is rapid, and the effects of pressure become evident in dyspnoea, vomiting, and indigestion.

The conditions are few which give rise to any difficulty of distinction between these rapidly-growing tumours of the kidney and those of other parts. Malignant disease of the suprarenals is rare, and its results are similar to those in the case of the kidney, which is generally encompassed. The origin of such growths may be indicated by pigmentation of the skin and an abnormal growth of hair about the pubes and other parts of the body. Enlarged lymphatic glands form a movable swelling which may closely resemble a renal tumour.

Clearly the treatment of these cases resolves itself into the question of whether operation is justifiable or no. This has been examined by many able critics. Gross in an admirable paper forbids the operation altogether. He states that of 16 patients operated on for sarcoma between the ages of 16 months and 7 years 7 survived and 9 died, a mortality of 56.25 per cent.; 5 died of recurrence in a few months, and of 2 others there is no further history. In the *Archives of Pediatrics*, February, 1896, Dr. Emily Lewi has tabulated 60 cases of nephrectomy for renal sarcoma in children. The operation mortality was 28½ per cent. But recurrence took place in nearly all the cases, and at the time of writing only 3 cases had passed the three years' limit. Newman gives 19 cases in patients under 6 years of age; 13 died and 6 recovered from the operation, but the after-history is not given. Aldibert collected the results of 45 cases; 20 deaths occurred soon after operation, two-thirds of them from shock. In 11 cases death was caused by recurrence within nine months. Sutton has tabulated 21 cases of operation in children under 6 years. Most of these are identical with those of Newman. There were 9 recoveries and 12 deaths; of those which survived the operation all were dead within a year. From 74 cases collected by Dr. Walker he calculates that the ultimate mortality lies between 74.32 per cent. and 93.22 per cent.

Thornton points out that the progress of renal sarcoma in children is rapid, quickly involves surrounding tissues, speedily recurs extensively, and leads to an amount of suffering altogether beyond what is seen when the disease is allowed to run its natural course in the kidney. Butlin altogether opposes the operation in the case of children. Quoting the last three of the successful cases just mentioned, Mr. Jacobson considers the opinions expressed by Butlin and Thornton as too pessimistic, and suggests that as some growths are less malignant than others, the operation may occasionally be justifiable. The older the patient and the smaller the tumour the greater is the probability of success.

In the cases which have come before me I have only once felt justified in attempting to remove such a tumour, though I have more than once opened the abdomen in order to see the conditions and surroundings, and this I consider a justifiable proceeding, since it does nothing to hasten the patient's inevitable end, and may give some hope of being able to proceed to the removal of the tumour.

As to the choice of proceeding in the event of nephrectomy being decided upon, the lumbar operation gives a smaller mortality than the abdominal, but with no great difference. On the other hand, the latter gives more room for the removal of a large tumour and for dealing with bleeding vessels. Abbé in both his cases used a long transverse incision, placing the patient in Trendelenburg's position. Malcolm opened the abdomen in the course of the linea semilunaris, and this has been more favoured by other operators.

CALCULUS.

The origin, development, and progress of calculi in early life have been investigated and described by so many excellent observers that I should be guilty of needless repetition were I to say much upon this subject. That a calculus may actually be formed during intrauterine life is shown by the fact that one was found by Langenbeck in the kidney of a fetus of six months, and Jacobi found 6 cases of congenital renal calculus in 40 necropsies; but it is a matter of very frequent observation to find deposits of crystals in the cortical portions of the gland in newborn infants, which in the ordinary process are washed away by the fluid components of the mother's milk. These so-called infarcts consist of amorphous urate of ammonium mixed with crystals of uric acid, and are found occupying the straight tubes of the pyramids.

But it is to the later manifestations of lithuria, or the uric acid diathesis, that attention is more seriously called, and which are a direct result of the injudicious feeding of the infant. Independent of the actual development of calculus, all the symptoms which indicate its presence in some part of the tract may be caused by an excessive amount of uric acid salts, and this excessive elimination, when continuous, is always evidence of a serious disturbance of nutrition. The urine is frequently of low specific gravity, often 1006, pale as water, and containing very little urea. The explanation of the deposit lies in the small proportion in which the alkaline phosphates, the presumed solvent of uric acid, exist in the urine of infants. "In children," says Sir B. Brodie, "the deposition of lithic acid sand by the urine will not infrequently produce not only pains in the glans, but bloody urine and all the other symptoms of stone in the bladder." Besides uric acid, oxalate of lime concretions are not infrequent, as well as small calculi of the urates of ammonia and soda.

The symptoms produced by these conditions are to be observed in children at a very early age, and have been pointed out by Dr. Gibbons in his excellent paper on Renal Colic in Infants. No calculus is formed, but blood, mucus, and crystals are found in the urine, and pain, tenderness, and colic occur in the lumbar region. The patients are children of well-to-do parents, who are almost invariably themselves gouty. Dr. Dickinson gives several instances of a similar condition occurring at about the period of teething and giving rise to hæmaturia. These cases he describes as scorbutic, and in all the diet had been conspicuously wanting in fresh milk. That these symptoms are not always ascribed to their proper cause, and are attributed to intestinal colic, is due to the small amount of blood which passes with the urine, so that attention is not directed to the kidneys and ureters as the site of pain. On the other hand, this may sometimes be excessive.

Besides hæmaturia, pain is the most constant symptom, generally occurring suddenly and without warning, and referred to the lumbar or hypochondriac region, and running down the course of the ureter towards the groin, the bladder, and the penis, and frequently causing retention of urine; and this may exist to the extent of producing reflex irritation of an extreme character, as in the case of a child described by Henoch, who passed round fragments of the size of a pin's head, which were recognised as uric acid concretions. She cried always before passing water, and developed first convulsions and subsequently contractures of the toes of both feet and of the fingers and knee-joints. The attacks will intermit with greater or shorter intervals, and there is extreme tenderness to touch of all parts in the region of the kidney affected.

It is, however, between the ages of 2 and 6 years, according to the tables of Sir Henry Thompson, that stone in the bladder is met with more frequently than at any age before 50; that is to say, that the deposits from the tubules are more excessive soon after the first dentition, when the organism is most in need of appropriate nourishment and most liable to reject those constituents which it cannot assimilate.

As to the frequency of stone in the children of the poor, Mr. Cadge agrees in the main with Sir Thomas Smith in attributing it to insufficient and almost arrested cutaneous excretion from imperfect clothing and uncleanness, tending to disturb the due proportions of the normal constituents of the urine,

and lead to a relative or absolute excess of some one constituent, while the digestive organs are constantly liable to disarrangement from unsuitable food or from irregularities in the mother's diet, and he lays much stress on the impossibility of these children obtaining a proper and sufficient supply of sound milk. Dr. Cunningham accounts for the prevalence of stone in India as being due to the mountain ranges of limestone bounding the districts in which it is of most frequent occurrence, the rivers depositing lime in the soil from which the drinking water is drawn. Hot, dry summers inducing much perspiration, the urine consequently becomes concentrated, and the salts crystallise out on any provocation, such as a diseased state of the urinary organs. Hot days and chilly nights are another predisposing influence, especially where clothing is insufficient.

It is remarkable how frequently a stone may be latent in the kidney of a child and afford no evidence of its presence beyond the pyuria. In the 2,594 necropsies at the Hospital for Sick Children to which I have previously referred, I find that there were 26 cases in which calculi were lying in the pelvis or in the ureter. Seeing the much greater frequency of stone in the bladder of boys than of girls, it is very remarkable that the majority of 14 occurred in females; 11 were on the right side, 9 on the left, 5 were on both, and in 1 case the side is not stated. The ages of the patients varied from 9 months to 9 years. Most of them died of affections not directly referred to the urinary apparatus, and it may be presumed that in a large majority there were no symptoms pointing to the probable existence of calculus, unless it were suspected from the existence of pyuria. In this list one case at least is not included—that of a boy, aged $8\frac{1}{2}$ years, upon whom I operated in 1892 for a calculus which was found blocking the commencement of the ureter. Nephrolithotomy is, however, but rarely called for in children. Calculi are not infrequently impacted at the upper portion of the ureter, but seldom in any other part of its course. There are, however, one or two specimens in London museums, and notably one at the Hospital for Sick Children, showing calculi impacted at the vesical end of the ureter, and others I shall refer to later.

There is one symptom of calculus vesicæ in children to which full weight is hardly given in the textbooks; that is, the rough and almost gritty condition which the surface of the bladder presents to the sound when the symptoms of stone seem to warrant an exploration. This is constantly found to exist when no stone is present, and when not even phosphatic concretion can be extracted. It is caused, I believe, by the extreme acidity of the urine exciting a spasmodic contraction of the muscular fasciculi of the bladder and throwing them into ridges and folds, against which the point of the sound impinges. The condition is so frequent that it is one to remember as leading to a possibly mistaken diagnosis of stone, but it passes away as soon as the child has been kept warm in bed and the urine has been rendered less acid by means of drugs.

OPERATIONS FOR STONE IN THE BLADDER.

Time and the improvement of modern instruments have greatly altered the views of surgeons of the present day with regard to the treatment of stone in the bladder of children. This change of front is due in great measure to the advocacy by Indian army surgeons, with their unrivalled experience, of litholapaxy in preference to any cutting operation. Successful as lateral lithotomy has proved in the hands of many former surgeons, there are still objections to its general adoption.

According to Sir Henry Thompson, the mortality varies during the period of from 1 to 12 or 14 years from 1 in 11, or 1 in 28 cases, or about 1 in 16. On the other hand, Mr. Bryant states there was no death in 100 consecutive operations on boys at Guy's Hospital; and the results of the operation natives at the hands of such surgeons as Keegan, Freyer, Cunningham, and many others, have given a very small mortality. Yet it is from these very surgeons that the strongest advocacy of litholapaxy comes. Besides the troubles incidental to a cutting operation, particularly hæmorrhage, which is often severe and difficult to check, there are many difficulties in lateral lithotomy which have proved formidable to the most skilful and practised surgeons. But the

more serious objections are found in the later consequence such as stricture, fistula, and sexual impotence. Greig Smith, in the latest edition of his work, says: "I have seen in the last nine years five operations for perineal fistula following perineal lithotomy, and I have been concerned in the treatment of one case of stricture and one of fistula from the same cause" these occurring in a district where stone is far from frequent. Recto-vesical fistula is one of the most troublesome accidents which a surgeon can be called upon to rectify, and is certainly not an infrequent consequence of the operation. Although Sir Henry Thompson questions the possibility of injury to the vesicula by the knife, yet, difficult as it must necessarily be to obtain evidence on the point, there is much to warrant the belief that impotence in the adult not infrequently follows this operation in the child. Teevan reported 4 cases of sterile husbands among lithotomised patients. Langenbeck has called attention to the same danger, and Keegan believes the operation to be frequently followed by emasculation. It must be remembered that the statistics of lithotomy are largely derived from the results obtained by Cheselden, Thompson, Cadge, and others, who had special opportunities of practising that operation, just as Indian army surgeons have lately had of studying litholapaxy; but for those to whom the opportunity comes but seldom, the lateral operation presents as many, if not more, dangers and difficulties as litholapaxy, which, on the other hand, has far fewer after-consequences.

LITHOLAPAXY.

On the other hand, it has been shown by Keegan that the objections urged against litholapaxy in children are really invalid, that the bladder of a boy gives ample room for the working of a small lithotrite and a medium sized aspirator tube, while the sensitiveness of the urethra is overcome by means of an anæsthetic. The liability to laceration of the mucous membrane of the bladder and urethra is theoretical, and need not be feared if care and gentleness be exercised; and with regard to the smallness of the urethra he shows that if the meatus be divided the urethra of a boy from 3 to 6 years of age will admit a No. 7 or No. 8 lithotrite, and of a boy of 8 to 10 years a No. 10, 11, or even 14. The size of the urethra does not depend upon age. He advocates litholapaxy in male children principally for two reasons—rapidity of cure, and the absence of a cutting operation.

With regard to the size of stones that have been dealt with by this method Freyer has removed a calculus weighing 808 grains from a boy of 9 years, and Keegan one of 700 grains (uric acid) from a boy of $9\frac{1}{2}$ years. The largest stones in the collection at the Hospital for Sick Children are a uric acid calculus encrusted with phosphatic material, and weighing 229 grains from a boy, aged 2 years and 6 months, a uric acid stone of 178 grains from a boy 5 years and 5 months, and one with a uric acid nucleus of 450 grains from a boy of 11 years. All these were successfully removed by the lateral operation.

Most recent writers are inclined to be converted to these views. "The operation of election for stone in the bladder," says Greig Smith, "is undoubtedly Bigelow's. Lithotrity is an operation at least as good as, possibly better than, lateral lithotomy, while as regards remote results there can be no comparison." Southam, in describing two cases of lithotrity in boys of $3\frac{1}{2}$ and 10 years, mentions that of all the 11 stones previously removed by him by lithotomy each might have been successfully dealt with by lithotrity.

The objection raised by Jacobson as to recurrence after lithotrity is met by Keegan's conclusion from an experience of 110 cases of his own, "that recurrence of stone does not follow lithotrity in male children any oftener than it does lateral lithotomy, provided the former operation is skilfully performed."

The fenestrated lithotrites that are now employed render it possible completely to pulverise any stone which they are capable of grasping, supposing that its components are not so hard as to risk injury to the instrument, and thus none but the smallest fragments are left in the bladder. These by the aid of the large sized evacuating tubes, which can easily be passed into the bladder, can be removed by repeated injections from the evacuator, so that nothing but the finest particles is likely to remain. The bladder of a child, being much more sensitive than that of an adult, would be much more ready to

resent and to expel any fragment left, and from the undeveloped condition of the prostate, and the absence of any depression or pouch behind it in which fragments could lie, as well as the healthy state of the mucous membrane as compared to that of an elderly person; there would be far less liability to formation of stone in the bladder. Any fresh calculus is much more likely to have descended from the kidney, seeing how frequently when found in that organ they are multiple. Again, as I have formerly pointed out, it is easy by a second washing out of the bladder, after a few days' interval, to minimise the possibility of any fragments remaining.

THE SUPRAPUBIC OPERATION.

The suprapubic operation has, owing to recent improvements in the method of its performance, been rendered much less difficult than formerly, and its dangers have been very greatly diminished. The higher position of the bladder in children and the small amount of tissue which intervenes between it and the transversalis fascia render it more accessible than in adults, while from the small size of the veins and the thinness of the fatty layer which overlies the bladder the amount of hæmorrhage is seldom great and can easily be controlled. The peritoneum is not often seen, and can easily be avoided. With care in the extraction of the stone the wound of the bladder need not be large, nor should it in ordinary circumstances be lacerated.

One question which time only can answer with regard to this operation is the condition of the bladder in an old patient who has had suprapubic lithotomy performed during youth. A line of cicatrix in the anterior wall must necessarily interfere to some extent with the normal power of contraction of the viscus; and if in addition the cicatrix be adherent to the anterior abdominal wall, as in many cases it must be, not only is the shape of the bladder greatly altered, but its power of expulsion must be considerably curtailed.

RECURRENCE.

As regards the recurrence of stone, I published a case¹ in which I crushed a calculus weighing 130 grains which had formed in the bladder of a young man who exactly twelve months previously had undergone the suprapubic operation at the Seamen's Hospital when a calculus of 338 grains had been removed.

RESULTS OF OPERATION.

The subject of the treatment of stone in children has an extensive literature, which teems with statistics. These, however, are drawn either from the writings of surgeons who practised before the days of antiseptics or the introduction of litholapaxy, or from the experience of Indian army surgeons upon native children, and are therefore open to objection on these grounds. For the sake of comparison, therefore, I have had collected, thanks to Mr. Templeton, the results of operations in children under 12 years of age from six hospitals in various parts of the kingdom during the last ten years.² These are as follows:

	No.	Recovered.	Died.	Percentage of Death	Percentage of recoveries.
Litholapaxy ...	49	45	4	8.1	91.8
Lateral lithotomy ...	17	16	1	5.8	94.1
Suprapubic ...	65	59	6	9.2	90.7
Total ...	131	120	11	8.3	91.5

The percentage of recoveries after the lateral operation is nearly the same as in a collection of 75 cases operated on at the Hospital for Sick Children before 1890, and a little below that in the tables of Sir Henry Thompson (95.41), but above that of Mr. Charles Williams at the Norfolk and Norwich Hospital (93.73). The percentage of recoveries of the total number is, however, smaller than that in any of the three tables of the results of lateral lithotomy. Mr. Barling in the BRITISH MEDICAL JOURNAL, 1895, has collected the results of the three operations in children under 10:

	No.	Recovered.	Died.	Percentage of Recoveries.
Litholapaxy ...	44	43	1	97.7
Lateral lithotomy ...	50	48	2	96.0
Suprapubic ...	56	46	10	82.6
Totals ...	150	137	13	91.3

This puts the suprapubic operation in a much less favourable light, and gives to litholapaxy the highest percentage of recoveries of any of the three operations. These figures are of course too small from which to draw any definite conclusions. It may be presumed that in a certain number at least the suprapubic operation was selected in preference to either of the other alternatives on account of the size of the stone, the smallness of the pelvis, or for some other reason, and this would account for its showing a heavier mortality than the others. In a paper which I read before the Royal Medical and Chirurgical Society in 1890, I detailed the results of 114 consecutive operations for stone at the Hospital for Sick Children. Out of 75 cases of lateral lithotomy there were 71 recoveries, a percentage of 94.6. Hæmorrhage, abscess, erysipelas, and orchitis were among the immediate casualties that followed the operation. To supplement the table in this paper there have been since its publication 16 patients operated on for calculus vesicæ at the Hospital for Sick Children:

	No.	Recovered.	Died.
Lateral lithotomy ...	3	3	—
Litholapaxy ...	7	6	1
Suprapubic ...	6	4	2

These are included in the first of the above tables; the death after lithotripsy was due to pyonephritis and morbus cordis. One case which came under my own care was instructive. A boy, aged 6, was found to have a moderate-sized stone, which was easily seized with the lithotrite, and a small amount of material was crushed, but the remainder was so hard that no impression could be made upon it, and I desisted from further attempts from fear of breaking the lithotrite, and at once removed the stone by the lateral operation. It weighed 2½ drachms, was composed of oxalate of lime with a slight covering of phosphatic material, which had been partly detached by the lithotrite.

Dr. White, in an excellent article in Starr's *Textbook of Diseases of Children* urges "that in every case of calculus in male children litholapaxy, on account of ease of performance, low mortality, speedy recovery, and absence of danger of emaculation should be the operation of predilection." He quotes as the most recent statistics of the three operations those of Cabot. As all the cases were operated upon after 1878, and as they are classified according to age, they are especially valuable for the purpose of this paper. They may be compared as follows for children under 14:—

	No.	Deaths.	Mortality.
Suprapubic ...	591	74	12.52 per cent.
Perineal lithotomy ...	539	16	2.96 "
Litholapaxy ...	241	4	1.66 "

I am therefore inclined to emphasise rather than to retract from the propositions offered in my former paper:—

1. That in the cases of boys and girls, stones of moderate size should be dealt with by litholapaxy.
2. That stones composed of oxalate of lime, or of such size as not to be readily grasped between the blades of a lithotrite, should be removed by the lateral operation in the case of boys.

3. That the suprapubic operation should be reserved for stones of very large size or inconvenient shape in boys or girls, or cases of calculus embedded in a sacculi of the bladder or impacted in the mouth of a ureter.

That these propositions are not absolute must be evident. Cases have occurred to myself and others where the lithotrite cannot be introduced owing to some puckering of the mucous membrane of the urethra, and the lateral operation may be forbidden on account of a narrowed and rickety pelvis, but I think it is proved by the above tables that the tendency of surgeons is, when possible, to use the lithotrite instead of the knife, and that with proper care such a course is followed by the best results, and is free from the after-consequences of a cutting operation. At the same time, it is not every surgeon who has had experience of the use of a lithotrite, and to such must be left the choice of one of the other operations. In girls, unless the stone be very large, when it should be removed by the suprapubic operation, lithotrity is always easily available, and it avoids the troublesome after-consequences of over dilatation of the urethra or the danger of a vesico-vaginal fistula.

The advice here given is entirely from the point of view of the patient, but to the practitioner who is called upon to deal with a stone, and who has not had personal experiences of lithotrity, it is difficult to offer suggestions. To see lithotrity performed by Sir Henry Thompson, or some of those who have had large experiences in India, is like witnessing the feats of Roberts with a billiard cue. But the manipulative dexterity which is certainly essential is only acquired by a long apprenticeship and considerable experience. On the other hand the pitfalls of the lateral operation are many and often alarming to those who are not in the habit of witnessing or performing it. The suprapubic operation is in itself simple and easy of performance, and is probably that which under such circumstances should be adopted. At the same time, though I do not place much reliance upon statistics, it is the one that in the above tables presents the most unfavourable results, and in my own, and in the opinion of many other surgeons, the results would appear still worse if it were possible to collect all the cases in which this operation has been performed in recent years.

It must not be forgotten that where there is a stone in the bladder there is or has probably been some amount of pyelitis, and Southam, in his relation of the two cases mentioned above, gives some very good advice with regard to the previous treatment of the patient: Rest in bed, milk diet, and sterilisation of the urine by boric acid or salol given internally, and, if the urine contain much pus, the bladder should be washed out thoroughly more than once with an antiseptic solution. Shock should be avoided by thorough protection of the patient against surface chilling.

There must always be met with some rare cases for which the suprapubic operation is alone available, such as are indicated in the third of the above propositions. In connection with the impaction of calculi at the vesical orifice of the ureter, my colleague, Mr. Pitts, has favoured me with two most interesting cases of this condition:

A boy of 9 years was admitted to Great Ormond Street with symptoms of stone in the bladder, which was verified by the sound. On bimanual examination two stones were felt, one on each upper lateral portion of the bladder, that on the right side about the size of an almond and fixed, that on the left movable and of the size of a cherrystone. The suprapubic operation was performed and a stone removed of the size and shape of a plumstone. No other could be felt by the finger in the bladder, but, on repeating bimanual examination, a stone could be plainly felt in the position of entrance of the right ureter. Careful examination of this spot within the bladder revealed a protrusion of the mucous membrane, and, by probing the apex of this protrusion, a stone could be felt encysted in that part of the ureter which passes through the bladder wall. The mucous membrane was incised with scissors, and the stone, which was pyramidal in shape, made to project into the bladder by the finger of an assistant in the rectum. After very prolonged and careful manipulation it was finally loosened and extracted by aid of a bent director. It was about half an inch in its longest diameter, somewhat pyramidal in shape, with the apex projecting at the orifice of the ureter and the base firmly grasped by the surrounding structures. The wound united and the boy was discharged well in less than six weeks.

A second case which was under Mr. Pitts's care at St. Thomas's Hospital is of still greater interest and rarity. A thin cachectic child, aged 4 years, who had had symptoms of calculus vesicæ for two months, had been admitted to another hospital, where he was sounded under an anæsthetic, but nothing abnormal found. The child became much worse, and three months later came under Mr. Pitts's care. There was then retention

of urine, the bladder was distended to the umbilicus, the penis swollen, great pain complained of when catheter was passed, and the urine found to be very offensive, thick, and looking like pure pus, escaping very slowly through the catheter, in the eye of which a small stone was found. On April 6th a suprapubic incision was made. No stone was found, the wall of the bladder was much inflamed, the surface of the mucous membrane red and granular, with same indications of sacculation. A large drainage tube was inserted, and the patient placed in a boracic bath. This was changed for boracic irrigation on the sixth day, owing to signs of bronchitis. Six weeks later an attack of jaundice supervened, which was followed by inflammation of the right testicle and cord. On June 30th the tube was still in the bladder, and no urine coming through the penis, on July 18th an examination was made under chloroform. The bladder was found empty, but on rectal examination a hard nodular mass was felt on the left side between the rectum and the bladder. The cystotomy wound was enlarged, and an ulcerated opening was found in the trigone of the bladder near the neck, which led to a cavity outside the bladder, which contained four oval stones that were with difficulty dislodged and manipulated from the pouch into the bladder, and so removed. The largest of these calculi was of the size of a small plumstone. The boracic bath was repeated, and the child made a good recovery. Mr. Pitts adds as a note to this exceedingly instructive case, that in the absence of any stone on first opening the bladder, and from the suppurative condition found, together with the subsequent inflammation of the epididymis and cord, the condition was for a long time believed to be tuberculous. Hence the delay in the second operation, which resulted in finding the stones and curing the patient, a result which redounds to the credit of the surgeon.

Such cases as these admit of no other treatment than by the suprapubic operation, which was clearly indicated beforehand in all of them.

NOTE AND REFERENCE.

¹ *Clinical Journal*, 1896. ² The hospitals from which these statistics were kindly supplied were the Hospital for Sick Children (London), Children's Hospital (Pendlebury), the General Infirmary (Leeds), St. Peter's Hospital (London), Royal Hospital for Sick Children (Aberdeen), Royal Hospital for Sick Children (Edinburgh).

RECENT EVIDENCE AS REGARDS THE PRODUCTION OF SUGAR IN THE LIVER AND ITS UTILISATION IN THE TISSUES.

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THE busy practitioner frequently finds it no easy matter to weigh the value of the theories put before him, simply because he has not the time to study the evidence bearing upon the views advanced. For this reason it is the duty of anyone who presents his views to his professional brethren to state as clearly as possible all the evidence forthcoming, not merely the evidence derived from his own work, but of that derived from the work of others. It may be that in the opinion of the author the work is of no value, but he must at least give it consideration, and indicate where it is erroneous.

The universally-accepted views in regard to the action of the liver upon carbohydrates have recently been assailed, and my object in giving the following very brief account of some of the more important recent work upon the subject is to enable the practitioner to form an intelligent judgment upon a matter which bears so directly upon so important a question as the treatment of diabetes.

Briefly stated, the usually accepted glycogenic theory is:

1. That when there is an excess of carbohydrates in the food, the liver stores it as glycogen.

2. That in the absence of carbohydrates in the food, the liver converts its stored glycogen into sugar, and, when this is exhausted, forms sugar from other substances and passes it to the tissues.

3. That the sugar in the blood is used by the tissues.

Serious objections to these conclusions have been offered by only two investigators:

1. Seegen maintains that the liver does form sugar, but that the sugar is not formed from glycogen.

2. Dr. Pavy maintains that the liver stores carbohydrates as glycogen, but that it does not reconver this to sugar. He considers that the great function of the liver is to prevent sugar passing into the circulation, and that, if sugar does pass into the circulation, it is not used by the tissues but is simply excreted by the kidneys.

The evidence in favour of the production of sugar in the