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THE LETTSOMIAN LECTURES

THE AFFECTIONS OF THE URINARY
APPARATUS IN CHILDREN.

JOHN H. MORGAN, M.A. OXON., F.R.C.S. ENG.,

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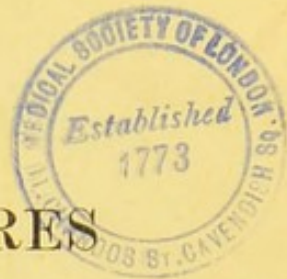
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with the best regards of the author

Oct. 1898



THE LETTSOMIAN LECTURES

ON

THE AFFECTIONS OF THE URINARY APPARATUS IN CHILDREN.

DELIVERED BEFORE THE MEDICAL SOCIETY OF LONDON

BY

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THE AFFECTIONS OF THE URINARY APPARATUS IN CHILDREN.

LECTURE I.

Delivered on February 7th, 1898.

INTRODUCTION.

MR. PRESIDENT AND GENTLEMEN,—It is no small honour to be chosen by the Council of this Society to follow in the steps of such distinguished men as are numbered in the roll of former Lettsomian lecturers, and in thanking the Society for the distinction so kindly proffered, I trust that the selection of my subject may not prove unworthy of the traditions handed down by my predecessors. I was guided by the fact that whilst many have chosen the diseases of childhood as the subject of these lectures, many also have given valuable researches into the treatment of diseases of the urinary organs. I was confirmed in my choice by finding to how small an extent was any special reference made to the diseases of the urinary tract in children, and yet how much scattered observation and record there existed on the subject. It will be my earnest effort in these lectures to collect and review much of this wayside literature, and to present it to you with such observations of my own as an experience of more than 20 years may seem to warrant.

ABNORMALITIES OF KIDNEYS.

Like other organs of the body, the kidneys are not exempt from certain eccentricities of development, but as the majority of instances have been found in the bodies of adult persons who have died from causes unconnected with such conditions, it is seldom that these abnormalities have to be reckoned with in early life. A writer (Dr. Englisch) in the 'Wiener Medicinische Zeitung' states that a foetus may attain the age of from seven to eight months with the kidneys wanting or rudimentary, the

ureters obliterated, and the bladder undeveloped. In some 40 cases he had found atresia of the urethra, or absence or defects of the ureters, the foetus reaching from eight to nine months; and Rayer and others have recorded the absence of kidneys in the foetus. But notwithstanding some cases which have been published, it may at once be said that the subjects of such deficiencies are not viable.

A recognised variation from the normal is found when the two organs are united, either by renal tissue or by a fibrous band, constituting the horse-shoe kidney, the convexity of which always faces downwards, and which lies transversely over the lumbar spine, generally rather lower than the level of the normally placed gland. There are usually two ureters, which pass in front, but sometimes behind, the organ, and the vascular supply is also double. Of this condition there are occasional variations, but so far as regards our present subject the horse-shoe kidney is of interest only as an abnormality, since I have not met with an instance where, in the case of a child, it has been in itself the source of disease or of difficulty in the diagnosis of other affections. The rarity of its occurrence may be judged by the figures of Mr. Morris, who found only nine instances in 14,318 *post-mortem* examinations, or about 1 in every 1,600. From the records of the *post-mortem* books of the Hospital for Sick Children, Great Ormond Street, extending over 20 years (1878-1897), which have been searched by Mr. Templeton, the surgical registrar, for this purpose, out of 2,594 necropsies only three instances of horse-shoe kidney are noted. In one the left ureter was dilated, and one was complicated by imperforate anus.

The kidney may retain more or less its lobulated foetal form into adult life without any impairment of efficiency.

ABSENCE OF KIDNEY.

The absence of one kidney and a corresponding hypertrophy of the other is a possibility that may have to be reckoned with. The left is by far the most frequently found to be defective. Mr. Morris has been at much pains to estimate the proportion of individuals in which this congenital atrophy of one gland occurs, and from a large number of figures he reckons it as happening in one out of rather more than 3,500. Quoting again from the

hospital statistics there are five instances of aborted kidney in the *post-mortem* books of the Hospital for Sick Children, Great Ormond Street. Two were on the left side, two on the right, and in one the side is not noted. Two were complicated with imperforate anus and one had the foramen ovale patent; in another the suprarenal capsule was absent and there was also hypospadias. In a girl, aged 10 years, who died after operation for cleft palate, the left kidney was atrophied and the left ureter dilated. One instance occurred in which the right kidney was small and consisted of three lobes, and the left kidney was a bag of pus, the child dying from uræmia. When the kidney is absent the corresponding suprarenal capsule is also wanting in one out of every 10. In Virchow's 'Archiv,' 1838, Breunner collected records of 48 cases of congenital absence of one kidney, but in all these, except five, the suprarenals were present. He found also that in one-third of his series there was some malformation or arrest of development in one or other of the genital organs. Out of 46 cases of single kidney quoted by Rayer and analysed by Mr. Morris four were in young persons between 4 and 15 years old, two were in foetuses, and one in a foetal monster. In a boy, aged 5 years and 4 months, who died in the Hospital for Sick Children, Great Ormond Street, the left kidney alone was present. It weighed $4\frac{3}{4}$ ounces, which is about the weight of the two normal kidneys of a child of the age of $5\frac{1}{2}$ years. The pelvis and ureters were proportionately large. The organ appeared to be quite healthy. There was no trace of a right kidney or ureter, and no indication whatever of a ureteral orifice on the right side of the bladder. A case of extreme congenital atrophy of one kidney occurred in a new-born male with imperforate rectum who lived only five days. The right kidney measured 1 inch and its pelvis was much dilated; the left kidney measured only one-third of an inch and was smaller than a haricot bean.

ABNORMAL POSITION.

In Mr. Morris's work and in the volumes of the 'Transactions of the Pathological Society' will be found many instances of abnormal position of a single kidney, but although the possibility of such an occurrence may be borne in mind in the diagnosis of obscure tumours they are exceedingly rarely met with and need

only be suspected when there also exists some one or other congenital malformation such as was found to occur in the two cases mentioned.

Roberts states that in 21 cases of congenital malposition of the kidney which he had been able to collect and to compare the abnormality was in every instance confined to one kidney, and the left was much more commonly affected than the right (the left in 15 cases and the right in six).

The most frequent of these deviations was to find the kidney lying obliquely on the sacro-iliac synchondrosis. In some of the cases the organ was fixed beside the uterus or transversely between the rectum and bladder or across the prominence of the sacrum. Such abnormalities have led to mistakes in diagnosis, and even of treatment in the case of adults and in women to trouble in parturition. Only two instances are to be found in our tables. In a boy, aged 4 years, who died from diphtheria, the right kidney lay on the brim of the pelvis, and in a girl of the same age the kidneys were fused and lay over the sacral prominence. There were two ureters and the vascular supply was abnormal, but in children it is so easily possible when the muscles are relaxed by an anæsthetic to examine the abdomen, that the absence of a kidney from its normal position or its presence in an unusual one would hardly fail of detection if once suggested. It is of the greatest importance, in considering this question, that the condition of the organs of generation should be carefully examined, since they frequently exhibit concomitant variations where the kidneys are abnormal. Dr. Guttman * quotes the case of a boy, aged 15 years, with right kidney and ureter wanting as well as the right vesicula seminalis and vas deferens; and in a female, aged 20 years, in whom the right kidney and ureter were absent, the external and internal organs of generation were very defectively developed.

Although instances of complication from this condition are very rare it is one that it is important to bear in mind when dealing with cases of sudden and complete suppression of urine, since in such cases it is possible that one kidney is congenitally absent and the remaining ureter obstructed. Of this Mr. Jonathan Hutchinson has related two instances,† and another is described by Mr. Pick. Especially is it important, both in adults and in children

* 'The Lancet,' May 19th, 1883, p. 875, quoted from Virchow's 'Archiv.'

† *Ibid.*, July 4th, 1874, p. 1.

when the question of nephrectomy has to be entertained, that all indications of the absence or atrophy of one kidney should be carefully regarded. Although some cases of movable kidney have been reported as occurring in children where the gland is suspended in a peritoneal fold of its own, the mesonephron, and where the vessels are of undue length the condition so rarely gives rise to symptoms as to require no discussion.

ABNORMALITIES OF URETERS.

The ureters show frequent aberrations from the normal type. Dr. Ewart has described a case where each organ had two separate ureters which began in distinct pelves and terminated independently in the bladder. All four were pervious. Sometimes two ureters leaving the pelvis of the kidney unite before entering the bladder at the usual situation. This may be seen in a specimen from a child in Charing-Cross Hospital Museum. The left kidney has a second ureter, which arises from the pelvis a good deal higher than the other, which commences at the usual situation. This second ureter runs almost a straight course downwards and joins the proper duct at a right angle about half an inch before its entrance to the bladder. In five instances of double ureter noted in the books of the Hospital for Sick Children, Great Ormond Street, four were on the right side and one on the left. In no case were they the source of disease. Mr. Shattock* regards doubling or trebling of the ureter as a reversion to a lower type. In amphibia there are as many ureters as there are segments of the mesonephric kidney. It may be assumed that the portion of the kidney in connection with the superior of the ureters represents a persistent segment of the mesonephros with its appertaining duct, which has remained functional and supplementary of the metanephros or permanent kidney with which it retains its primitive continuity.

But it is with regard to their causative relations to congenital hydronephrosis that the abnormalities of the ureters are of special interest. In the case of cystic kidney removed by abdominal section and presented by Dr. Day to the Hunterian Museum the ureter was represented by a fibrous cord which was traced down to the bladder, and it seemed probable that the impervious ureter

* 'Transactions of the Pathological Society,' vol. xxxvii, p. 289.

was a congenital defect and the cause of the dilated condition of the kidney. Another case in which cystic degeneration of the left kidney took place during intra-uterine life is found in the 'Transactions of the Pathological Society of London,' vol. xxxi, p. 187, where the condition is ascribed to a valvular fold of mucous membrane of the ureter. On the right side the ureter was doubled to within half an inch of its lower end. The anus was imperforate and the bowel transposed. In another instance the left kidney was converted into a cyst in which a few small patches of secreting structure were left and lay in the angle between the diverging common iliac arteries, the ureter was short, narrow, and patent, but its orifice was no larger than a pin's hole and placed inferiorly. In 20 out of 52 cases of hydronephrosis Sir W. Roberts found a congenital malformation; in four the ureter was imperforate; in three it entered too obliquely into the pelvis of the kidney; and in two a supernumerary renal artery crossed and compressed the ureter near its origin. Four of these cases lived for periods varying from $5\frac{1}{2}$ years to 20 years, and Dr. Hare's patient, where both ureters were coiled on themselves near their origins and adherent to the lower part of the dilated pelvis, thus forming a valve-like obstruction, survived to the age of 38 years. The remainder died at a very early age.

HYDRONEPHROSIS.

Among the necropsies at the Hospital for Sick Children, Great Ormond Street, there were 12 cases of dilated pelvises or hydronephrosis. Two of these were complicated by imperforate anus, one by harelip, and another by cleft palate. To account for the gradual occurrence of hydronephrosis, Roberts assumes that the impediment was at first incomplete though the malformation was congenital, and that its effects were not fully developed until a subsequent period, and then probably with extreme slowness. As put by Mr. Greig Smith, "complete obstruction to the urinary flow leads to atrophy rather than dilatation; stricture varying in narrowness predisposes to dilatation." It is probably due to this that in many cases, especially when unilateral, the tumour is small and gives rise to no symptoms, whilst in intermitting cases the swelling will often attain enormous proportions.

In several of the London hospital museums are specimens of

hydronephrosis in young persons due to phimosis, and Mr. Morris and Dr. Alexander James have both pointed out that dilatation of the ureters and pelves may be the result of increased frequency of micturition, which, by exciting frequent contraction of the walls of the bladder and frequent closure of the vesical orifices of the ureters owing to the anatomical arrangement whereby the ureters traverse the parietes of the bladder, thus occasion frequent resistance to the outflow of urine from the ureters. The same explanation may account for the dilated and tortuous condition of the ureters which is generally found to exist in cases of ectopia vesicæ, when, as can be seen, the discharge from the orifices of the ducts is constant.

Newman describes a specimen from the body of a stillborn child in which a cyst of about the size of a walnut completely occluded the right ureter, and caused enormous distension of the renal pelves, and a similar case occurred at the Hospital for Sick Children, Great Ormond Street, where both kidneys and ureters, which were double on the right side, were dilated in consequence of a small cyst which was found in the bladder, and a few specimens are recorded as resulting from an imperforate urethra. Sutton has recently described four cases of congenital hydronephrosis, in two of which the dilatation of the pelvis was due to the minuteness of the opening of an inadequate ureter; in a third, which was obtained from an infant, the right kidney only was present, the infundibula, pelvis, and ureter were widely dilated, and at a point where the ureter opened into the bladder there was a small circular diaphragm-like valve, which, though offering no obstruction to the flow of fluid from the ureter into the bladder after death, probably acted as a mechanical obstacle during life. He further suggests that compression of the penis between the thighs, or between the thigh and pelvis when the legs are flexed on the trunk during foetal life, might explain the retention which gives rise to prenatal hydronephrosis.

These being the main congenital causes of hydronephrosis, it is important to notice the frequency with which both kidneys are affected. Out of 20 cases collected by Sir William Roberts, in 13 the condition was bilateral—a statement which must be borne in mind in considering the question of nephrectomy. Two of these perished stillborn, one lived six hours, one 30, and one 46 hours, while one died 20 days, and another between three and four months

after birth. In other cases where life was prolonged "we must assume," says Sir William Roberts, "that the impediment to the urinary flow was at first incomplete, though the malformation was congenital, and that its effects were not fully developed until a subsequent period, and then probably with extreme slowness."

It is unnecessary to describe here the well-known appearance of kidneys affected by this condition. Generally they present a mere fibrous skeleton of the gland with the pelvis and calyces enormously dilated, and the secreting structure to a great extent and sometimes entirely absorbed. The surface shows numerous rounded elevations bounded by fibrous septa, and corresponding to the lobules of which the foetal kidney is composed. The fluid which is contained in such a sac is of a low specific gravity, and contains little urea or uric acid.

As already indicated in the foregoing enumeration of causes, the effects may be immediate or remote. If the condition affects both kidneys, death usually occurs at a very early period. If, on the other hand, it be unilateral and due to permanent obstruction of the ureter there may be no symptoms, and life may be prolonged to its natural term. When, however, the cause is intermittent, as in many instances that have been given, a tumour is produced which requires to be differentiated from other similar swellings. In the absence of any history of severe crush or blow, it will not be confused with a perirenal hæmatoma or perinephritic abscess. Notably, it may need to be distinguished from ascites, especially if both kidneys are involved, which can, however, hardly ever be the case; and where the one kidney only is affected the permanent dulness on the affected side in all positions, and the uneven surface of the tumour as contrasted with the even surface of the abdomen, with the shifting of the fluid and the accompanying anasarca, will probably make the distinction an easy matter. From the rare cases of ovarian cysts in children the tumour would be distinguishable by the presence of the colon in front, and by the dulness in the lumbar region of the side affected. Hydatids of the kidney are very rare in children, and their presence could only be surmised by the detection of the hydatid fremitus and by the passage of cysts with the urine. One is described by Mr. Bruce Clarke as having been found in the kidney of a boy who died from rupture of the stomach, and one

was found *post-mortem* in a child who died at the Hospital for Sick Children, Great Ormond Street. The presence of pus in the urine and the accompanying pyrexia would indicate the condition of pyonephrosis, whether engrafted upon the cystic condition or arising in consequence of a calculus in any part of the tract or due to tuberculous disease. The region of the kidney is occasionally the site of tumours of the character of cystic hygroma, and such a one is described by Sir T. Smith, and was exhibited by him at the Pathological Society of London. The tumour weighed 14 lbs., and was removed from a child 17 months old, whose weight was more than half made up by the disease. It was first noticed at the age of 3 months, when it appeared to be of the size of an orange. Although from the first the disease made very rapid progress, it was not accompanied by any special cachexia, and until by its size and weight the tumour interrupted the functions of the abdominal viscera, the child's health was unaffected. When this, however, took place the child rapidly emaciated, and died from inanition. After death the tumour was found to be behind the parietal layer of the peritoneum, which was tightly stretched over its anterior surface. It was covered by a distinct capsule, and had formed no connection either by adhesion or infiltration with surrounding parts. It originated in the substance of the left kidney, the remains of which, unaltered in structure, were found spread out in a thin layer over its posterior surface. The ureter was healthy, there was no affection of the lymphatic glands, and the remaining viscera were unaffected. On dissection, the tumour was found to contain numerous cysts embedded in a coarse fibrous or reticulated structure. The cysts were of various sizes; the larger ones contained others of smaller dimensions springing from their inner surface. On microscopic examination, the solid parts were found to be of a fibro-cellular structure, the cellular elements predominating over the fibrous. The cysts contained a clear serous fluid.

In the eighteenth volume of the 'Transactions of the Royal Medical and Chirurgical Society,' Mr. Caesar Hawkins described a cyst which filled the entire right side of the abdomen in a boy, aged 6 years. In the walls of the cyst was a small third kidney which had no excretory duct. The cyst was punctured during life, and five pints of aqueous fluid, free from albumin and urinary salts, were found in it after death.

Although not arising in or directly connected with the kidney, other congenital cysts are found to occur in the neighbourhood which might be confused with those with which we are now concerned. Such are the various forms of mesenteric cysts described by Mr. Treves in his work on surgery, and others related by Mr. Moynihan,* one of which occurred in a girl, aged 6 years, and was multilocular; and two others are described in the 'Annals of Surgery,' June, 1897, one of which occurred in a child, aged 4 years, and another in a boy, aged 8 years, which attained enormous size. It was twice tapped, and finally removed, when it was found to be multilocular, and attached to the great omentum by its entire width below the margin of the transverse colon, within the folds of which the cyst had developed. Two interesting cases in which the cysts were removed have recently been related by Mr. Eve in a paper read before the Royal Medical and Chirurgical Society.

In a congenital hydronephrosis there is one sign which only occasionally is given, but which is definitely reliable as indicating the nature of these tumours, viz., the sudden subsidence of the swelling followed by an increase in the flow of urine. If the dilatation becomes sufficient to form a tumour, which it may do at any time between the third and eleventh year, or even later, the necessity for surgical interference will arise, partly as a means of diagnosing the exact nature of the swelling and partly to relieve the patient of the inconvenience and sometimes even of the pain and the effects of pressure upon the intestines which occasionally result. A trial may first be made of systematic rubbing, which was successful in the case of a girl, aged 8 years, under the care of Sir William Roberts, who suddenly passed a large quantity of urine, when the swelling subsided and did not return. The same treatment was temporarily successful in a child, aged 3 months, under the care of Sir William Broadbent, and in a third case, under the care of Mr. Thurnam, in a boy, aged 4 months. But where this treatment is not available, either on account of the pain caused or the risk of rupturing the cyst, the fluid must be withdrawn by the aspirator or trocar. In the absence of any very distinctly fluctuating area, Mr. Morris directs that in the case of the left kidney the puncture should be made just anterior to the last intercostal space, whilst on the right

* 'Annals of Surgery,' July, 1897.

side, to avoid all risk of injuring the liver, it should be halfway between the last rib and the crest of the ilium, between 2 inches and $2\frac{1}{2}$ inches behind the anterior superior spine of the ilium.

The fluid thus released often amounts to a very large quantity, and is of a brownish colour and contains urates and urea. As a rule it reaccumulates very rapidly, and fresh tapplings are required. The most notable instance of recovery by this means is in the case related by Dr. Hillier, of a boy, aged 4 years, who was repeatedly tapped, and after one of the tapplings a quantity of fluid was passed from the bladder exactly similar to that from the cyst, a temporary communication thus obviously being established between the cyst and the bladder. This continued to occur. It was presumed that a congenital malformation of the right ureter existed, which rendered it liable to occlusion, but admitted, under some circumstances, of the passage of fluid. The boy died four years later from cerebral symptoms, and the right kidney was found to be converted into an enormous cyst. The right ureter was abnormally constricted, especially at its vesical end, so that fluid did not escape into the bladder until a fine probe had been passed.

Although this proceeding is occasionally successful, and the insertion and retention of a drainage tube has been followed by temporary relief, the operation that is most satisfactory is nephrotomy, followed by tapping of the cyst, and attachment of the margins of the incision in the tumour to the edges of the wound in the loin. Through the indiarubber drainage tube which is inserted all discharges can readily pass, and be caught in a suitable appliance. Mr. Newman quotes four cases in children under 12 years of age, all of which were successful. In three the lumbar incision was used, and in one the cyst was reached from the abdominal surface. Mr. Symonds and Dr. Tuckwell relate* the case of a boy, aged 11 years, with a large hydro-nephrosis. Nothing had been noticed until fifteen months before admission. The swelling was aspirated, and from three to four pints of turbid dark-brown fluid, containing altered blood, albumin, and urea, were withdrawn. The cyst rapidly refilled, and was incised, and similar fluid evacuated. The opening became obstructed, and the sac became larger than ever. A fresh tube was inserted, and drainage continued for six months,

* 'The Lancet,' July 29th, 1882, p. 141.

when all healed. In this case normal urine showed a healthy state of the opposite kidney.

Should the sac suppurate and the discharge become a source of exhaustion, and should there be evidence that the renal tissue is incapable of performing its function, lumbar nephrectomy may be called for. Mr. Newman's tables give eight cases in children under 12 years of age where the kidney was removed for hydronephrosis; six recovered and two died. In four of the cases the abdominal incision was resorted to, in the other four the lumbar incision, one death occurring in the case of each. To those may be added a case of a girl, aged 13 years, from whom a large hydronephrotic kidney was successfully removed by my colleague, Mr. Owen.* The abdomen was opened in the middle line, and the tumour consisted of one large cyst about the size of a foetal head, occupying the position of the pelvis; the kidney tissue was stretched, and involving the upper infundibula was another dilatation which opened freely into the larger cavity. A considerable amount of healthy renal tissue remained at the lower part and presented congenital lobulation. The patient made an excellent recovery.

The possibility of involvement of the opposite kidney must always be borne in mind in operating upon these cases. Only recently a child, who had for some months been in the medical wards of the Hospital for Sick Children at Great Ormond Street, suffering from symptoms of intestinal obstruction, was transferred to the surgeons on account of a tumour which developed on the right side of the abdomen. The urine had for some time been purulent. The child was aged 4 years, and was otherwise well formed. Mr. Pitts opened the abdomen by Langenbuch's incision, and felt what he took to be a healthy kidney on the left side. The tumour, which proved to be an intensely dilated kidney with most of the secreting structure destroyed, was then removed. No urine was subsequently passed, and the child died at the end of three days. At the necropsy it was found that the left kidney was almost non-existent and quite incapable of function. A ureter of the natural size and patent opened into the bladder at the normal site, and the suprarenal capsule was normal in size and position. The right ureter was greatly dilated and its orifice was exceedingly small.

* 'The Lancet,' December 4th, 1897, p. 1453.

CONGENITAL CYSTIC KIDNEY.

In the Hunterian and a few other London museums are to be found specimens of kidneys taken from fœtuses or newly-born children where the whole gland is converted into a congeries of cysts. Quite recently Dr. Still has described a specimen which was removed from the body of a girl, aged 3 weeks. The child was born prematurely at the eighth month. Both kidneys were affected, and together weighed 15 ounces. The capsule stripped easily, and the surface presented a translucent appearance, which was seen to be due to innumerable closely packed cysts, none of which projected on the surface. On section the whole kidney had a honeycomb appearance due to numerous small, more or less tubular, cavities separated from one another only by fine septa; these cavities seem to be more developed in the cortex than in the pyramids. The pelves and ureters were normal. The liver in this case, as in many others that have been described, also showed on section numerous small cavities. This condition is bilateral, and is ascribed by Virchow to intra-uterine nephritis, or to impaction of the straight tubules with uric acid, both of which lead to atrophy of the papillæ and obliteration of the pelvis of the kidney. Koster considers it to be due to a malformation of the lower urinary tract. Mr. Shattock, regarding this condition from the developmental point of view, argues that it results from a want of differentiation of the metanephric blastema, out of which the permanent kidney is developed, from that of the mesonephron or Wolffian body. The proper tissue of the kidney grows into that of the Wolffian body, while the remnants of the latter become the seats of the cysts scattered through the proper renal tissue. The enlargement of the cysts may, by irritative tension upon the intertubular tissue, produce an excess of this tissue and cause the origin of the urinary retention cysts, and the presence of these cysts would certainly produce secondary pressure on the proper renal tubules, and thus lead to the formation of true renal retention cysts. Dr. Still, whose interesting paper will be found in the next volume of the 'Transactions of the Pathological Society of London,' adopts this view, and putting aside the theory of intra-uterine inflammation, believes that the same cystic condition which is found in adults from 50 to

70 years of age, is due to the presence of glomeruli and tubules, which for a long period retain a healthy condition. These states are rare, and are of more interest to the pathologist than the surgeon.

INJURY.

Children, and particularly boys, are liable to injuries from crushes, or from the passage of wheels over the abdomen which produce lesions of the kidney or ureter or the tissues which envelop them. In the latter case there may be nothing but a circumscribed collection of effused blood, which may be absorbed or may become surrounded by lymph in which it is encapsuled, and from changes of the constituents a cyst is formed, which is variously styled perirenal or paranephric. Or, again, the effusion may break down and, forming an abscess, give rise to all the constitutional effects of suppuration, and ultimately point in the ilio-costal region. But this perirenal extravasation is often followed, at a period of from two weeks to two months, by a swelling containing more or less clear fluid with some of the constituents of the urine. These have been shown by Mr. Barker to vary inversely to the amount of pressure within the sac which forms around the extravasation. These effusions are liable to suppurate or to rupture into the peritoneum. The most notable instance of the last occurrence is related by Mr. Taylor, where, as a result of injury in a girl, aged 15 years, an accumulation formed which burst into the peritoneum, giving rise to symptoms of profound shock. An opening was made in the median line, the peritoneum was sponged out, and the wall of the cyst stitched to the edges of the incision. This opening closed, and a second had to be made on the outer side of the rectus. The patient recovered, and a glass tube was worn in the fistula, through which the urine passed.

Previously to this, Mr. Stanley had described the case of a boy, aged 9 years, in whom a circumscribed swelling appeared six weeks after injury. This was punctured on six different occasions, and the boy was discharged, though a swelling remained. Several other cases are recorded. One where a boy, aged 7 years, who had been knocked down by a van 11 months previously, came a second time under the care of Mr. Godlee, who had attended him soon after the accident, but had discharged him as convalescent.

There existed a large tumour occupying the whole of the epigastric region. This was cut down upon, and 43 ounces of turbid, whitish-yellow fluid were drawn off; the margins of the opening into the cyst were stitched to the edges of the abdominal wound, and a drainage tube inserted. In a case related by Mr. J. Marshall, a girl, aged 13 years, was run over across the loins, and apparently recovered, but nine months later was found to have a fluctuating tumour over the left side of the abdomen. This was first aspirated, but afterwards drained antiseptically with a successful result.

In Mr. Barker's case, again, the child, aged 3 years and 8 months, was run over in August, and passed some urine containing blood-clots. She did well at first, but was readmitted three weeks after the accident with a fluctuating swelling of the character of a hydronephrosis, and there was no evidence that any urine from the affected side was entering the bladder. As the constitutional symptoms became serious, the tumour was first aspirated, then drained, and finally removed on November 19th, the patient making a good recovery.

Mr. Owen ('Lancet,' December, 1897) relates the case of a boy, aged 7 years, who was kicked on the left side of the abdomen by a horse. There was at first pain, sickness, and hæmaturia, but at the end of nine days he was able to get about. Shortly afterwards a tumour developed, which was aspirated at the end of the third week after the accident. This reappeared after three days. It was then cut down upon, and it was found that the capsule had been completely torn across, and the upper four-fifths of the kidney separated from the lower fifth. A drainage tube was inserted, and complete recovery followed.

Lastly, in Mr. Croft's case, a boy, aged 12 years, met with a fall which injured his left side and loin. There followed pain and hæmaturia. He was admitted to hospital, but discharged as convalescent. On the forty-ninth day after the accident he was readmitted with a swelling in the left lumbar and hypochondriac regions, but without any blood in the urine. Seventy-nine ounces of urine-coloured fluid were withdrawn by the aspirator; altogether the tapping was performed eight times, and after the last occasion no swelling recurred.

From this brief relation of the more important of several recorded cases the course and symptoms of this accident can be gathered. After the first symptoms of shock, followed generally

by vomiting, there is more or less hæmaturia, lasting for two or three days. If the ureter becomes blocked with clots, there is considerable pain, which is referred to the loins and runs down to the testes. These symptoms may be induced by a simple bruise of the kidney, but if there be rupture of the ureter or pelvis, or laceration of the gland structure, in the course of time a tumour will appear which may attain a very large size, and form what has been termed a spurious hydronephrosis. In a case under the care of Mr. Pitts, of a girl, aged 9 years, who had been run over by a hansom cab six weeks previously, 41 ounces of clear fluid were removed by tapping, and the swelling was reduced by massage.

Unless it becomes necessary to cut down upon the kidney or to remove it, the actual lesion can only be guessed. The ureter may be blocked with clots, which when passed will allow the passage of urine, and the patient shows no further sign of the injury. Or the amount of blood may be such as to excite an acute cystitis, as in the case that is described by Dr. Rawdon of a boy, aged 12 years, who injured the right kidney by a fall. The hæmaturia was followed by cystitis, and to avoid further hæmorrhage the kidney was removed by a lumbar incision, and was found to be torn completely across. Four days later lateral cystotomy was performed, and a free drain established. The patient died on the fortieth day from pyelitis and circumscribed suppuration of the left kidney.

The treatment of these injuries, therefore, is in the first instance to check further hæmorrhage and to subdue pain, then to watch carefully for any changes indicating suppuration in the effusion or the formation of swelling by the secretion of the kidney. Aspiration may be tried and supplemented by gentle massage, but if the swelling increase or if there be any signs of suppuration a lumbar incision must be made and the state of the kidney investigated. If this be ruptured it must be removed, but if not, a drainage tube must be inserted and the cavity washed out with antiseptic solution until it closes. In removal of the kidney under these circumstances the surgeon may count upon the healthy state of the opposite organ, unless there is reason to fear that it also has been damaged by the accident, although one case is recorded where rupture took place of a single hypertrophied kidney.

Apart from traumatic causes perinephritis and perirenal abscess are very rare in children. The *post-mortem* books of the Hospital for Sick Children, Great Ormond Street, record but very few instances, and the majority of these are due to pyæmia. Calculus in the kidney, though producing pyelitis, seldom gives rise to inflammation in the surrounding tissue. Dr. Gibney reports 28 cases of primary perinephritis in children, the majority occurring between the ages of 3 and 6 years. Most of the cases had been diagnosed as disease of the hip-joint or of the spine. Resolution followed in 12, and 16 ended in suppuration. Personally I have met with few, but one case that was sent to me was that of a boy, aged 8 years, who presented many of the features of hip-joint disease. A large abscess soon presented itself in the iliac region, which was not due to spinal caries and was not apparently perityphlitic. There was a history of a kick upon the loin some time previously. A large abscess was opened and drained through the lumbar region. All the hip symptoms passed away and he is now strong and healthy. Exploration showed the abscess to surround the kidney.

SYMPTOMATOLOGY OF HÆMATURIA.

Before passing to other diseases of the kidney it may be well to review the causes of the presence of blood in the urine. Hæmaturia may indicate a local or a general disease and the detection of its origin must always be of primary importance. It may arise from any part of the tract and may be so minute as to escape all but the most careful search by the microscope or by tests. It may be constant and slight or profuse and intermittent. Apart from poisoning by such drugs as chlorate of potash, cantharides, turpentine, carbolic acid, and rhubarb, small quantities of blood are found in the urine of young infants, as the result of irritation of the tissue of the kidney by uric acid and other crystals; when more abundant it occurs in connection with the other evidences of scurvy rickets, of which it is sometimes the earliest symptom. In purpura the hæmorrhage from the kidney is often profuse, with intervals of intermittence and in hæmophilia it is also common. Dr. J. Abercrombie has recorded a case of Raynaud's disease in which a little boy passed bloody urine day after day for six weeks together in the colder seasons, which ceased when the child was

kept warm before the fire. In vol. xv of the 'Transactions' of this Society will be found a very interesting account of a case of Raynaud's disease with paroxysmal hæmoglobinuria, by Dr. Haig, in which he says that his previous researches led him to believe that both the Raynaud's disease and the hæmoglobinuria in this case (that of a girl, aged 6 years) were due to an excess of uric acid in the blood (uricacidæmia), and this theory affords a most simple explanation of their evident connection. Blood in smaller quantities occurs in Bright's disease, in hæmorrhagic measles, in scarlet fever, diphtheria, and small-pox. What has been named Winckel's disease, in which cyanosis, jaundice, and hæmoglobinuria attack new-born children on or about the fourth day and cause death in 48 hours, has not been observed in this country; but paroxysmal hæmaturia or hæmoglobinuria, where no blood corpuscles can be detected, but the urine is nevertheless stained with blood pigment, has been fairly often detected. Dr. Herringham has described the cases of two sisters, aged $3\frac{1}{2}$ years and $4\frac{1}{2}$ years, who were hereditarily syphilitic, and Dr. Voelcker, who has noted several others, finds a syphilitic taint in all of them. I have, however, seen a typical case in private where no such suspicion could have existed. But it is as a symptom of local affections that hæmaturia is of diagnostic value to the surgeon, and of these I shall have to speak later. As a general rule hæmorrhage from the kidney is more profuse than from the bladder, and is seldom accompanied by pain, unless it gives rise to the formation of clots in the ureter, when the pain may be referred to the loin, the testes, or the thigh, but ceases as soon as the clot is washed onwards to the bladder. The origin of the hæmorrhage from the kidney is generally confirmed by the presence of casts and epithelium. In examining cases of supposed hæmaturia it is well to keep one's eyes open to the possibility of deception, as instanced by the case narrated in the 'Transactions of the Clinical Society of London,' vol. xxiv, by my late colleague, Mr. Leopold Hudson, of a boy, aged 11 years, who gave a history of suffering from the usual symptoms of stone, and brought a specimen of his urine with a red stain which was afterwards found to have been produced by steeping in his urine a piece of rag stained with Turkey red dye.

TUBERCULOSIS OF THE KIDNEY.

The acute miliary form of tuberculosis which affects the kidney is only a local manifestation of a general disease, and is very commonly in children associated with tuberculous phthisis or meningitis. Dr. Dickinson found that in nearly a sixth of all children dying thus affected tubercle was present in the kidneys, and states that renal tubercle is nearly three times more frequent under than over the age of 12 years. Of 28 children under 12 years of age both kidneys were affected in 19, one only in nine, and the sexes were attacked impartially. Out of 24 children dying under the age of 12 years with the kidneys involved, 13 died under 5 years of age and 11 between the ages of 5 and 12 years. This corresponds with the estimate of Rilliet and Barthez, who found that in 315 tuberculous children tubercle of the kidney was present in 49, or 15 per cent., and that therefore the kidney was three times more liable to tuberculous deposits in children than in adults. The invasion of this organ is seldom marked by any distinct symptoms, and the affection of the kidney is disguised by the more evident signs of disease which are manifested in the lungs or the brain. Such conditions, therefore, admit of no surgical treatment. When the disease originates in the urinary organs the infection may be conveyed by three sources. The principal and commonest is by the blood; secondly, it may ascend by the ureters or lymphatics from the bladder; or, thirdly, it may extend from the surroundings of the gland. I shall have to speak of the second of these sources when dealing with tuberculosis of the bladder.

Chronic localised tuberculosis or strumous disease of the kidney is by no means frequent in children. Out of 15 cases collected by Mr. Morris there was not one instance in a child younger than 11 years. The pathological history of the affection is the same as that of the disease in other organs. The bacilli conveyed in the blood-stream to the glomeruli for elimination must of necessity cause great risk of infection, and consequently the principal seats of the early deposits are the apices of the papillæ, the calyces, or the pelvis of the gland. First are deposited the miliary nodules and these coalesce to form caseous masses. As these break down fresh nodules are deposited in other parts, and the caseous

necrosis that ensues lays bare an ulcerating surface in the pelvis, whilst in the periphery they form irregular cavities. As more and more renal substance becomes involved these cavities coalesce and the secreting structure may be entirely destroyed. Generally the pelvis of the kidney and the ureter become thickened, the mucous membrane ulcerates, and its lumen is occluded. If the ureter remains pervious the *débris* may be washed away and in its course will almost surely involve the parts below, and thence the disease may ascend to the opposite organ. If, however, the ureter becomes blocked the whole organ may be converted into a large abscess cavity or series of cavities with caseous *débris*—tuberculous pyonephrosis. Sometimes the obliteration of the ureter causes the whole organ to be converted into a shrunken, putty-like mass, or large abscesses may result by reason of the access of pyogenic organisms.

In view of the rarity of this affection in childhood it might seem hardly worth while to linger over its symptoms or its diagnostic difficulties, yet there has been a sufficient number of cases in which operation has been satisfactory to encourage the hope that a larger number of successes might follow an earlier recognition of the affection. This is, however, a matter of peculiar difficulty at all ages, and especially in young patients, since the symptoms in the earlier stages are little marked and local signs are absent, whilst, on the other hand, when evidence is more pronounced, when the urine becomes constantly purulent, and vesical irritation is a marked characteristic, the disease has so far involved other portions of the tract that only palliative treatment can relieve.

It becomes, then, of the utmost importance to examine closely all signs which may indicate an early invasion of the gland. The symptom so common to many other affections, *thamuria*, or frequency of micturition, is here also that which directs attention to the possibility of some morbid condition in the kidney, and when all other causes can be eliminated, the region of the kidneys should be carefully palpated and the question of tenderness investigated, and any history of pain in the loin or in the testes examined. Any increase of size in either gland can best be appreciated with the aid of an anæsthetic. The urine offers few indications in the earlier stages except that its quantity is often increased and the specific gravity is frequently low. At a later period it becomes

purulent, and, as distinguished from calculous pyelitis, where the amount of pus is intermittent, in scrofulous disease it is always continuous unless the ureter becomes blocked. Even with large quantities of pus the urine in the early stages is generally acid. Examination for the tubercle bacillus should never be omitted and must be most carefully carried out, but no reliance can be placed upon its absence. I have frequently been disappointed in searching for it, even in marked cases of tuberculosis of the bladder and other parts of the tract. Blood is only to be found at intervals and seldom in large amount. It is, especially in the earlier periods, a matter of the utmost difficulty to differentiate between the pyelitis of tubercle and that of calculus, but in the latter the inflammation of the pelvis does not spread to the ureter or bladder, and there is, therefore, no dysuria such as forms a very distressing symptom in the later stages of the former. Whenever, then, these early stages have been observed the constitutional symptoms must be carefully watched for, the evening pyrexia, the night sweats, pallor, and emaciation which ordinarily accompany the invasion of tubercle in other parts. Even if catheterisation of the ureters were possible in the case of children the plan is not advisable for fear of spreading disease in the healthy ureter, and the use of the endoscope is prohibited except in a few cases, so that there is no aid from such sources for detecting whether pus comes from one or both ureters.

If, then, from such evidences there arises a strong suspicion that one kidney is affected by scrofulous disease, the question has to be decided whether surgical interference is justified. Speaking of the disease generally, Dr. Dickinson states that both kidneys are affected as often as one alone, and only one case in seven occurs in which the disease does not affect other organs. Aldibert has collected 13 cases of children in which nephrectomy was performed. Of these nine recovered and four died, two of the deaths not being traceable to the operation or to the original disease. No recurrence had taken place in one at the end of eight years, and none in another after three. Professor Gross's tables give 20 instances of removal of the kidney at all ages for scrofulous disease, 12 recovered and eight, or 40 per cent., died. Tubercle was limited to one kidney in only 65 per cent. In eight cases of preliminary nephrotomy relief was not afforded, so that this proceeding is not recommended.

Mr. Morris, on the contrary, recommends that nephrotomy should first be tried in cases that are not advanced, in the hope that it may check progress by opening and draining the abscess cavity. Nephrectomy may be performed later if strength improves or if lardaceous disease threatens. He adds: "It is in the scrofulous kidney especially that we so much need the means of ascertaining the working capacity of the other kidney, and it is in these cases also that the difficulty of doing so is almost insuperable." Professor Gross, from this point of view, recommends the operation in an early stage by means of a ventral incision by which both kidneys can be examined, and of which he states the mortality to be 14.28 per cent., against 53.84 per cent. by the lumbar method. Mr. Newman's tables, published in 1888, record two cases of nephrotomy for this condition in childhood, both of which ultimately recovered, though one (that of Mr. Morratt Baker) subsequently had the kidney successfully removed, and five cases of nephrectomy, four of which recovered. To these may be added a case by Mr. Wright, in which at intervals nephrotomy, cystotomy, and nephrectomy were performed, the child dying with much ulceration of the bladder, and a case by Mr. Eve, where in a child, aged 3 years and 9 months, nephrotomy was first performed, and 17 days later the kidney was removed through a prolonged incision. The child recovered, and was in perfect health seven months later.

In the light of these results it would seem that where the abscess is large, nephrotomy and drainage should first be tried, and later nephrectomy, but where suspicion of an early state of disease is tolerably certain, the two kidneys should be examined by means of a ventral incision, and if one be found healthy and the other extensively diseased, the one affected should be at once removed.

LECTURE II.

Delivered on February 21st, 1898.

TUMOURS OF THE KIDNEY.

MR. PRESIDENT AND GENTLEMEN,—Amongst the *post-mortem* records of the Hospital for Sick Children, Great Ormond Street, already quoted, there occur eight cases of primary sarcoma of the kidney. Three cases affected both glands, invading them from without, and have been described by Dr. Abercrombie.* Five other cases are mentioned as being retro-peritoneal in origin but directly or indirectly involving the kidney. In two instances the gland was secondarily affected with sarcoma which originated in other parts and in one by lymphadenoma. All the cases of primary sarcoma occurred in children under 4 years of age. One instance is recorded in which sarcoma commenced in the suprarenal and invaded the kidney. This happened in a boy, aged 8 years and 4 months. These observations concur with those of other writers. Dr. Windle† states that 33 out of 40 occurred before the tenth year, and of these 33, 26 were before the fifth year. Dr. Dickinson's tables show six cases under 5 years of age, none between 6 and 20 years. Sir William Roberts mentions 25 cases under the age of 10 years; indeed, all except three under 5 years. Dr. Senator's statistics of 96 cases show 58 males and 38 females. In children under 10 years, 50 per cent. occurred during the first two years and 85 per cent. during the first five years. In Mr. Newman's tables 48 per cent. were under 10 years of age. But by far the most complete analysis of this affection has been recently published by Dr. George Walker, of Baltimore, who has collected 142 cases. He finds that as regards sex they are fairly equally distributed, and that the greater number occurred in children under 4 years of age. Dr. Starr out of 54 cases found nine under 1 year, 17 between the ages of 1 and 3 years, 18 between 3 and 5 years, six between 5 and 8 years, and four between 8 and 12 years, the sexes again being fairly equally affected. In a valuable statistical paper by Leibert, quoted by

* 'Transactions of the Pathological Society,' vol. xxxi.

† 'Journal of Anatomy and Physiology,' vol. xviii.

Dr. Money,* 60 cases were collated. Forty of the number died under the age of 5 years, and 20 under that of 2 years. The sexes again were equally affected. Similar evidence is given by Mr. Taylor and other writers, and it would seem established that these tumours are most frequent during the first five years of life, and are fairly equally distributed between the sexes, and perhaps occur rather more often on the left side than on the right. The size to which they may attain is enormous. In the Middlesex Hospital Museum is a specimen which was removed from the body of a boy, aged 8 years, which weighed 31 lbs., and one was reported by Sir Spencer Wells as having weighed from 16 lbs. to 17 lbs. The mean duration of the disease, according to Sir William Roberts, is, in children, nearly seven months, the minimum 10 weeks, and the maximum over a year. The course of the disease appears to be longer the older the child.

Although some of the earlier cases are described as encephaloid it may be taken that the greater majority are sarcomata, though Birch-Hirschfeld and Mr. Sutton found adenomatous tissue in a large number, and the conclusions concerning them, which are summarised by Mr. Paul in an admirable paper,† may be accepted in full:—(1) That these tumours show themselves generally during the first few years of life, and are probably invariably of congenital origin; (2) they are primarily extrarenal, though usually extracapsular, and distend and surround the kidney in preference to invading it; (3) they rarely cause marked urinary symptoms or much pain, death ensues from exhaustion or from pressure effects; (4) occasionally they give rise to metastatic growths, some infiltrate the kidney, all recur after removal; and (5) they frequently contain striped muscular fibre and embryonic renal tissue. Such growths he classes under one general title as congenital renal tumours closely allied to dermoids in origin. Considering the almost invariable malignancy of these tumours, probably such a clinical title is as good as any that can be found, and no great advantage is to be gained by naming them according to the prevailing cell elements, whether they be round or spindle shaped. The last variety, in which striated muscle appears, deserves, however, some special identification. Muscle fibres are found in connection with tumours of other organs, such

* 'Transactions of the Medical Society,' vol x.

† 'Liverpool Medical and Chirurgical Journal,' January, 1894.

as the testis, but these rhabdomyomata of the kidney are of particular interest and probably find a true explanation of their origin in the views of Cohnheim, who, recalling the close relation of the first rudiments of the urogenital organs to the proto-vertebræ, suggests that by a faulty segmentation of these parts some of the germinal muscle cells may be mixed from the commencement with the cells constituting the rudiment of the kidneys, and that these cells afterwards develop into a pathological new growth. All the cases described have occurred in children under 18 months of age, and in most of them both organs were affected. Mr. Eve's description of the specimen shown by him before the Pathological Society will serve for all. A large nodulated tumour with distinct capsule, the kidney tissue normal, the consistence uniform, yellowish white resembling myo-fibroma of the uterus. Microscopically, striped muscle arranged in fasciculi, generally parallel, round and spindle cells in nodules among the muscular tissue. In a specimen shown by Dr. Dawson Williams from a child, aged 13 months, the right kidney was involved, and the tumour weighed 1 lb. 13½ ounces, or one-sixth of the weight of the body.

The tumours of the kidney in childhood are, therefore, 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 an 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, viz., 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 calculous 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 dyspnœa, 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 surrounded. 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. A specimen of such a tumour is preserved in the museum of St. George's Hospital, and described in the 'Transactions of the Pathological Society,' vol. xvi, and also by Dr. Dickinson:—
"A girl, 3 years of age, presented in the left hypochondriac region a hard, round, slightly movable mass, of which the whole circumference could be traced. The skin was generally hyperæmic; it was gipsy coloured, though not bronzed, and was covered with a remarkable growth of dark hair. The tumour proved to be

* Langenbeck's 'Archiv,' Band xlvii, 1894.

a globular mass of encephaloid 6 inches in diameter, which had replaced the left suprarenal capsule. This lay immediately beneath the abdominal wall uncovered by bowel of any kind. It had pushed itself out of its proper place in regard to the kidney, and lay along its inner edge close to the hilum, which, with the tumour upon it, was turned forward, the growth extending without interruption between the concave margin of the kidney and the abdominal front; thus the tumour had assumed the position, but not the relations, of a renal enlargement." The only distinction in this case was that no bowel lay in front of the swelling. Enlarged lymphatic glands form a movable swelling which may closely resemble a renal tumour. At a meeting of this Society in 1885 I exhibited a patient, aged 10 years, with a hard, firm mass lying in the abdomen to the left and a little below the umbilicus. It had apparently some pedunculated attachment posteriorly, but it could be moved, especially towards the left flank. There was no pain, and no abnormal conditions could be detected in the urine. Many opinions were offered as to its nature, but all doubts were solved when nine years later the youth, who had declined all suggestions of operative interference when first seen, came and requested me to remove the tumour, which had altered little in the interval. This was done, and the young man afterwards entered the army. The swelling proved to be a mass of calcareous mesenteric glands.

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. Professor 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, seven survived and nine died, a mortality of 56.25 per cent.; five died from recurrence in a few months, and of two 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 $28\frac{1}{2}$ per cent. But recurrence took place in nearly all the cases and at the time of writing only three cases had passed the three years' limit. Mr. 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. Dr. 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. Mr. Sutton has tabulated 21 cases of operation in children under 6 years. Most of these are identical with those of Mr. 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. George Walker he calculates that the ultimate mortality lies between 74·32 per cent. and 93·22 per cent. He mentions in his list of successful operations two remarkable cases. The first is by Israel, who removed an alveolar sarcoma from a boy, aged 14 years. The patient was well and strong five years later. Schmidt operated for sarcoma on a girl, aged 6 months, who was living and well four years later. Besides these are two cases by Dr. Abbé and one by Mr. Malcolm. The first of Dr. Abbé's patients was a child, aged 13 months, where the tumour weighed 7 lbs. and the patient, after operation, only 15 lbs. The recovery was uninterrupted, and three years after the operation the child was in perfect health. The second case was in a child, aged 2 years, and the tumour weighed $2\frac{1}{4}$ lbs. This patient was in perfect health three years and nine months subsequently. The first case is the more remarkable in that the tumour is described as a rhabdomyo-sarcoma, and that the kidney was ligated and a healthy portion of the gland was left. Mr. Malcolm's patient was a girl just under 2 years of age, and the right kidney was removed through an incision in the right linea semilunaris. The tumour, which is preserved in the Museum of the Royal College of Surgeons of England, was examined by Mr. Targett, who pronounced it as being composed of tubules lined by columnar epithelium and collections of shorter epithelial cells arranged as if to form the lining membrane of a tube, but showing no lumen, a malignant adenoma. Here was found nothing resembling striped muscle cells nor any sarcomatous tissue. These cases are therefore not identical, nor do they differ greatly from those tumours which had rapidly recurred after removal. Mr. Malcolm suggests that the success of his case may have been due to a free excision of the parts. The glands removed with the surrounding fat showed, however, no secondary deposit.

Mr. Thornton points out that renal sarcoma in children is more rapid, and more quickly involves the 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. Mr. Butlin altogether opposes the operation in the case of children. Quoting the last three of the successful cases just mentioned, Mr. Jacobson considers the opinion expressed by Mr. Butlin and Mr. 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. Dr. Abbé in both his cases used a long transverse incision, placing the patient in Trendelenburg's position. Mr. Malcolm opened the abdomen in the course of the linea semilunaris, and this has been more favoured by other operators.

RENAL AND VESICAL CALCULI.

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 intra-uterine life is shown by the fact that one was found by Langenbeck in the kidney of a foetus of 6 months, and Jacobi found six 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 new-born 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. In young infants they are due to the increased metamorphoses of

tissue elements which must take place after birth in consequence of the newly inaugurated processes of digestion, respiration, and generation of heat (Dr. E. Smith). Ebstein believes that these uric acid infarcts of newly born children form the first stage of calculous production, and that the large quantity of uric acid present in foetal and early life explains the frequency of calculi of this substance. The abnormal elimination of uric acid leads to degeneration of epithelium which forms the animal basis of the calculus, which may remain in the tubules, or pass into the pelvis and become enlarged by successive additions. The amount of uric acid in the urine of the new-born child has been proved to be greater than at any subsequent period of life. The proportion of uric acid to urea is said to be as much as 1 in 14, and consequently the crystals of uric acid and amorphous and crystalline urates are frequently found in abundance, and it is a matter of constant observation that these by their irritation may cause an excessive amount of disturbance even in very young infants, as evidenced by pain, anuria, and occasionally even by the presence of blood. But it is to the later manifestations of lithuria, or the uric acid diathesis, that attention is more seriously called, and these are a direct result of the injudicious feeding of the infant. Independently 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 1,006, 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," said 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 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. Dr. Abercrombie has given me the notes of the case of a boy, aged 3 years, who was admitted under his care for hæmaturia, said to have commenced three weeks previously with pains in the legs, back, and abdomen. The urine was deeply blood-stained, but not smoky or porter-coloured, as it is in acute nephritis or hæmoglobinuria. Under the microscope nothing but blood corpuscles could be seen. The urine was always acid, there was no pain in micturition or at other times, and the blood was equally diffused through the urine when passed. The symptoms completely disappeared after 10 days, during which uric acid crystals were found in fair abundance in the urine as well as on subsequent occasions. These cases in fact bear a close analogy to what Sir Henry Thompson describes as uric acid storms in the adult. 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 the 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 urine, 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. The main sources of formation of salts in the urine of children were stated by the late Dr. Ralfe to be "indirectly from food by incomplete oxidation of the saccharine, amylaceous, and oleaginous principles, and from increased tissue metabolism, and the blending of crystals to form a calculus is aided by the concentration of urine from deficiency in the amount of water secreted by the kidneys and further by the irritation excited by their presence in the pelvis, which sets up pyelitis, and the resulting secretion, aided by small hæmorrhages, agglutinate them into a calculus which receives constant augmentation in the kidney, the ureter, and the bladder.

As to the frequency of stone in the children of the poor, Mr. Cadge agrees in the main with Sir T. 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. J. A. 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. This was pointed out by Dr. Gee in a paper read before the British Medical Association in 1883:—"In other cases of stone in the kidney the diagnosis becomes possible when there are symptoms more or less like those of renal colic, when there are symptoms like stone in the bladder and yet no stone can be discovered, or where the kidneys can be felt by

deep pressure." In the 2,594 necropsies at the Hospital for Sick Children, Great Ormond Street, 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 bladders of boys than of girls, it is very remarkable that the majority of 14 occurred in females; 11 were on the right side, nine on the left, five were on both sides, and in one case the side is not stated. The ages of the patients varied from 9 months to 9 years. Most of them died from 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 $8\frac{1}{4}$ years—upon whom I operated in 1892 for a calculus which was found blocking the commencement of the ureter. Nephro-lithotomy is, however, but rarely called for in children. One case is mentioned by Mr. Thornton where pain was referred to the left kidney, which was found by means of an abdominal incision to be quite normal, and calculi were removed by a loin incision from the enlarged right gland. Two cases in which stones were successfully removed from a girl, aged 11 years, and a boy, aged 3 years and 8 months, have been reported to me from the Pendlebury Hospital, and these are all the cases of operation that I have met with. It would thus appear that 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 hospital museums, and notably one at the Hospital for Sick Children, Great Ormond Street, showing calculi impacted at the vesical end of the ureter, and others I shall refer to later. Dr. Eustace Smith observes that "where the concretion passes from the kidney into the ureter and downwards into the bladder there is always pain, but the child suffers far less than an adult would do under similar circumstances." This is certainly not beyond the truth, for in the investigation of a large number of cases of calculus vesicæ it is rarely possible to obtain any story of the passage of the stone from the site of its origin to that of its resting place. I have elsewhere described the case of a boy, aged 10 years, who was handed over to my care by Dr. Barlow, and who, after a blow upon the loin, suffered frequently from attacks of violent pain in the lumbar

region with occasional hæmaturia. Repeated examinations failed to detect any calculus, and the symptoms subsiding, he was discharged. Two years afterwards a small stone was found and crushed. It was probable that an effusion of blood into the pelvis of the kidney followed the blow upon the back and that some remaining portion of the clot became the nucleus of a calculus which remained for some time in the ureter, but ultimately passed into the bladder, giving no symptoms of its later progress.

There is one symptom of calculus vesicæ in children to which full weight is barely given in the text-books, 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. 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 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 that there were no deaths in 100 consecutive operations on boys at Guy's Hospital and the results of the operation upon natives at the hands of such surgeons as Surgeon Lieutenant-Colonels 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 consequences, such as stricture, fistula, and sexual impotence. The late Mr. Greig Smith, in the latest edition of his work, said:—"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 of 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. Mr. Teevan reported four cases of sterile husbands among lithotomised patients. Langenbeck has called attention to the same danger, and Dr. 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, Sir Henry Thompson, Mr. 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. On the other hand, it has been shown by Dr. 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 aspiration 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 8 lithotrite, and of a boy from 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, Mr. Freyer has removed a calculus weighing 808 grains from a boy, aged 9 years, and Dr. Keegan one of 700 grains (uric acid) from a boy, aged $9\frac{1}{2}$ 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, aged 5 years and 5 months, and one with a uric acid nucleus of 450 grains from a boy, aged 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," said Mr. 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." Mr. 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 Mr. Jacobson as to recurrence after lithotrity is met by Surgeon Lieut.-Colonel Keegan's conclusions from an experience of 110 cases of his own, "that recurrence of stone does not follow litholapaxy 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 to completely 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 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. As regards the recurrence of stone I published a case* in which I crushed a calculus weighing 130 grains, which had formed in the bladder of a young man, who exactly 12 months previously had undergone the suprapubic operation at the Seamen's Hospital, when a calculus of 338 grains had been removed.

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

* 'Clinical Journal,' April, 1896.

age from six hospitals in various parts of the kingdom during the last 10 years.* These are as follows :—

—	No.	Recovered.	Died.	Percentage of deaths.	Percentage of recovery.
Litholapaxy	49	45	4	8·1	91·8
Lateral lithotomy ..	17	16	1	5·8	94·1
Suprapubic operation ..	65	59	6	9·2	90·7
Totals	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, Great Ormond Street, 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 has collected† the results of the three operations in children under 10 years of age :—

—	No.	Recovered.	Died.	Percentage of recoveries.
Litholapaxy	44	43	1	97·7
Lateral lithotomy	50	48	2	96·0
Suprapubic operation	56	46	10	82·6
Totals	150	137	13	91·3

* The hospitals from which these statistics were kindly supplied were the Hospital for Sick Children, Great Ormond Street; Manchester General Hospital for Sick Children; Leeds General Infirmary; St. Peter's Hospital for Stone, Henrietta Street, W.C.; Royal Hospital for Sick Children, Aberdeen; and Royal Hospital for Sick Children, Edinburgh.

† 'British Medical Journal,' March 9th, 1895.

This puts the suprapubic operations 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, Great Ormond Street. 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, Great Ormond Street, three by lateral lithotomy, all of whom recovered; seven by litholapaxy, of whom six recovered and one died; and six by suprapubic operation, of whom four recovered and two died. 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 years, was found to have a stone of moderate size 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 $2\frac{1}{2}$ drachms, and 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 'Text-book 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 emasculation, should be the operation of predilection." He quotes as the most recent statistics of the three operations those of Dr. A. T. 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	Per cent. 12·52
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; and (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 sacculæ 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 experience 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 of 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 opinion, 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 Mr. 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 contains 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. Such a case I related in 'The Lancet' of October 22nd, 1887, in a boy, aged 1 year and 4 months, weakly, rachitic; symptoms of calculus had existed for three months, and a stone was found on sounding which did not readily move in the bladder. The very narrow orifice of the pelvis, which was deformed by rickets, did not promise success to the lateral operation if performed. A suprapubic opening was made and a stone was felt lying in a sacculus in the region of the trigone below and between the orifices of the ureters, and overlapped by the mucous membrane of the bladder to such an extent that it became necessary to raise the calculus from below by the assistance of the forefinger in the rectum. The stone was of uric acid, weighing 53 grains, and was of the shape of a blunted cone, the apex of which was buried in the walls of the bladder. The

wound healed on the sixth day and the boy was discharged at the end of a fortnight.

URETERAL CALCULI.

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, aged 9 years, was admitted to the Hospital for Sick Children, Great Ormond Street, with symptoms of stone in the bladder which were 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 of about the size of an almond and fixed, and that on the left movable and of the size of a cherry-stone. The suprapubic operation was performed and a stone was removed of the size and shape of a plum-stone. 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 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, was 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 the care of Mr. Pitts 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 was found. The child became much worse, and three months later came under the care of Mr. Pitts. There was then retention of urine, the bladder was distended to the umbilicus, the penis was swollen, great pain was complained of when the catheter was passed, and the urine was 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, and the surface of the mucous membrane was red and granular, with some indications of sacculation. A large drainage tube was inserted and the patient was 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 plum-stone. 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.

LECTURE III.

Delivered on March 7th, 1898.

PATENT URACHUS.

MR. PRESIDENT AND GENTLEMEN,—A patent condition of the urachus after birth is not exceedingly rare, and is one of the causes of those masses of granulations which are found springing from the umbilicus, out of the centre of which, and issuing from a minute aperture, a fluid with all the characteristics of urine often exudes in small quantities. A ligature applied to the base of this fleshy tumour at once destroys it and obliterates the canal leading to the apex of the bladder. This condition is usually noticed in very young infants soon after the separation of the cord, but Sir T. Smith relates a case in which it occurred in a boy, aged 2 years, and Mr. Bryant one in a boy, aged 8 years, and the patency will occasionally persist into adult life, as in the case described by the late Mr. Paget, of Leicester, of a man, aged 55 years, from whom he removed a ring-shaped calculus by a finger passed down through the umbilicus and into the urachus. This and another patent urachus in an infant he succeeded in closing by paring the edges and uniting them with harelip pins. Should ligature of the granulation growth fail to close the canal, this may be effected by means of the electric cautery or by a plastic operation.

Two very interesting cases are recorded, in which the urachus was reopened by pressure of the urine from below: the first by Mr. Savory, of a boy aged 13 months, who had difficulty and pain in micturition, and presented the symptoms of calculus vesicæ. Gradually an abscess formed at the umbilicus, which on being opened gave exit to urine. The boy gradually sank, and at the *post-mortem* examination there was found a polypus in the bladder obstructing the ureters and the orifice of the urethra. The urine thus obstructed forced an opening through the recently-closed urachus, and thus gave rise to the abscess.* A similar case is related by Mr. Ball as occurring in a boy aged 10 years. Mr. Sutton states† that the urachus may sometimes grow equally

* The specimen is to be seen in St. Bartholomew's Hospital Museum.

† 'The Lancet,' February 5th, 1887, p. 256.

with the bladder, retain a communication with it, and give rise to a so-called bifid bladder. It may dilate unequally and form a chaplet of small cysts, and in some rare instances may serve as a starting-point of a cystic tumour outside the peritoneum of enormous dimensions. One examined and reported by Mr. Sutton and Dr. Aveling weighed nearly 5 lbs., and Mr. Lawson Tait has recorded a number of instances of similar tumours under the name of extra-peritoneal cysts.

HIATUS OF THE BLADDER.

To account for the existence of that distressing deformity, hiatus of the bladder, several theories have been suggested. Dr. Ahlfeld opines that these persistent fissures in the middle line of the body are due to excessive traction of an abnormally distended umbilical vesicle and allantois, which pulls the viscera forwards. This distension is due to a general dropsical tendency in the foetal membranes and appendages, and in support of this Dr. Magnussen recites three cases of ectopion (*sic*) in which spina bifida and meningocele—that is to say, dropsical processes in the vertebral region—were present. Against this I may state that of the many cases of this defect that I have seen I remember none in which it was associated with these deformities, and they may well have been instances of concomitant defects of development in the median line. Dr. Paul Reichel, of Würzburg, maintains that the theory of Dr. Duncan that congenital defects of the bladder and penis are caused by atresia of the urethra and the bursting of these organs from pressure of the urine is not tenable. Ectopion (*sic*) of the bladder is simply a persistence of the primitive cleft throughout the greater part of its extent, preventing the formation of the anterior wall of the bladder, the anterior abdominal wall, and the symphysis pubis, besides interfering with the formation of the external genitals. The cleft may be partly closed, forming various modifications of the deformity. In other words, it is an arrest of development which gives rise to this condition as well as to epispadias. M. Tourneux and M. Durand explain it as the result of the undue extension forwards of what the former has named the “urethral lame,” a prolongation of the “bouchon cloacal,” which intervenes between the lower end of the urogenital sinus and the exterior, and thus

shuts in the sinus. This leads to an increase in the size of the anterior part of the aperture by which the urogenital sinus is put into communication with the exterior.* The extent may vary from a complete exposure of the posterior wall of the bladder, with separation of the recti and imperfect union of the symphysis pubis, to the slightest condition of epispadias, where only a portion of the wall of the urethra is exposed, and where some sphincter power remains, so that the most distressing feature of the deformity, the uncontrolled dribbling away of urine, is not met with, and every variation between these two extremes. Sometimes the bladder, though in itself perfectly formed, may prolapse through the urethra or even the urachus. The appearances of this deformity are so familiar as to need no further description, but there are certain conditions associated with it which are not easy of explanation. The tortuous and dilated state of the ureters, which is a frequent accompaniment, may be due to the irritation of the surface from exposure, which induces a constant discharge from the ureters and produces the same conditions as ensue from enuresis due to other causes. Although this complication has been frequently observed, it can hardly be constant, or the well-known healthiness of some individuals who are afflicted with this deformity, and who pass into adult life, could not be maintained. The tendency, however, of these patients is to die from secondary inflammatory conditions and kidney complications. Dr. Ultzmann,† confirming this, quotes M. Berger,‡ who found that of 71 cases collected by him only 23 reached the age of 20 years, the causes of death being skin inflammations, erysipelas, secondary inflammatory affections, and frequently kidney diseases. The state of hyperæmia and congestion of the mucous membrane are most favourable to the existence of micro-organisms and to their extension in the urinary tract. It is due to the establishment of these micro-organisms that there is maintained a chronic inflammation of the mucous surface, from which an alkaline or feebly acid urine is discharged, which deposits phosphates in such abundance as to be the greatest cause of distress to the patient, and the most troublesome obstacle to successful treatment by the surgeon.

* See Ballantyne, 'Edinburgh Hospital Reports,' vol. iv.

† 'Krankheiten der Harnblase,' 1890.

‡ 'Semaine Médicale,' 1883.

The operative measures for the alleviation of this defect I have only space to enumerate. First, there are the methods of Dr. Daniel Ayres, Dr. Pancoast, Professor John Wood, and Mr. Holmes, which aim at forming a covering for the exposed mucous membrane by turning over flaps of skin from the surface of the abdomen, and so covering the exposed surface that the urine is directed on to the urethra and guided into the orifice of an apparatus as it falls uncontrolled from the ureters. By this proceeding the urine is made to issue from a single aperture, and further attempts to improve the shape of this opening can be made by raising a flap of scrotal tissue and lifting it over the penis to attach it to one turned down from the surface of the abdomen. Many modifications of this plan have been followed by myself and others, and it is impossible to give outlines for the direction of the incisions, as they must be adapted to the requirements of each individual case, and tissue must be drawn from the parts where it can best be spared, and where resulting cicatrization will be least harmful. I have found that the skin of the prepuce, which is usually redundant, can generally be made available to cover some part of the aperture.

It is remarkable how tolerant of operations are the subjects of this deformity. I have on several occasions removed the testes or ovaries on both sides, with large hernial sacs, as a preliminary to the plastic operation which has been performed at a later date. But, notwithstanding these facts, the proceedings are very disappointing as regards ultimate results. Complete covering is rarely obtained by one operation, and small apertures require to be dealt with by subsequent manœuvres. Trendelenburg in one case operated ten times, and one of my cases has been at least six times under my hands. The disappointments met with are due to the persistence of small openings caused by the permeation of urine through the edges of the united flaps, which it is very difficult to close. But the greatest drawback to success is due to the septic condition of the urine, and the large quantities of phosphatic material which it secretes. Sometimes this will accumulate to such an extent as to form considerable calcareous masses. A child for whom I succeeded in making a very fair covering for the bladder requires every few months to have one or more of these masses removed. The hairs, too, which grow from the overturned flaps of skin become hypertrophied and form

nuclei upon which these concretions collect. Professor John Wood, who had an experience of 40 cases, could only say that they were rendered much more comfortable, but does not mention the casualties or troubles subsequent to operation. Distressing as this condition appears to observers, it must be borne in mind that many subjects of this deformity are in other respects strong and healthy and live to a good age, and personally it is only in the most urgent cases that I am inclined to propose an operation which is not without risk, entailing long confinement and many subsequent procedures, and which at best may afford but little alleviation. Other methods have been tried, such as that recommended by Mr. Simon, of establishing a fistulous communication between the ureters and the rectum, or removal of the mucous membrane of the bladder and planting the ureters in the gutter of the penis or in the rectum, but the mortality after these proceedings is very heavy, mainly in consequence of inflammation spreading up the ureters and causing an acute septic interstitial nephritis. Trendelenburg and others have sought by dividing the sacro-iliac synchondrosis, which should be done before the fifth year, to narrow the interval between the pubic bones and to approximate the margins of the exposed bladder, and then suture them together. Mr. Makins has published* an account of this operation which he performed upon a boy, aged 5 years, and which was fairly successful. He found a great improvement in the condition of the urine to result from the application to the mucous surface of pinewool bags impregnated with perchloride of mercury. By thus subduing the septic condition, the character of the urine improves and the phosphatic deposits diminish, and this indicates a course which should certainly be adopted before proceeding further. In the same way, when the ureters are healthy, I believe that much assistance might be gained by temporarily maintaining a catheter in each, and so preventing the urine from coming in contact with the mucous membrane or with the edges of the united surfaces. A mode of operating which seems to promise greater success is that which is suggested by Mr. Milton, of Cairo, and which is described by Mr. Anderson.† This consists in dissecting up flaps of the mucous membrane of the bladder and urethra for about half an inch from without

* 'Transactions of the Royal Medical and Chirurgical Society.'

† 'Transactions of the Clinical Society,' 1892.

inwards and uniting them by a double set of sutures over a large catheter. Two marginal skin flaps are then dissected up from without inwards, and tension being relieved by two lateral incisions, their edges are brought together over the closed bladder by means of wire sutures and harelip pins. Lastly, I must not omit to mention the ingenious suggestion offered by Mr. Reginald Harrison, who, from a boy, aged 15 years, removed the left kidney, and 11 months later attached the upper end of the right ureter to a wound in the loin. The urine that issued was neutral and free from the tendency to form phosphatic deposits which existed when flowing over the surface of the bladder.

EPISPADIAS.

Epispadias is not a frequent deformity, and may exist independently of any defect of the abdominal walls and be confined only to that portion of the urethra which passes through the glans, or may extend backwards into the spongy portion of the canal. But since behind these parts there exists more or less sphincter power the results are not so distressing as in the more pronounced form where the opening extends backwards to the prostatic region, although the bladder and the symphysis pubis may be normally formed. This latter form imperatively calls for some attempt on the part of the surgeon to remedy the condition, but again, as in *hiatus vesicæ*, the great obstacle to success is the constant and uncontrolled discharge of urine, although in these cases there is not the same tendency to phosphatic deposit owing to the normal and protected condition of the bladder. I have once attempted to remove this difficulty by draining the bladder through a perineal incision, though in this instance the result was disappointing. Time does not permit me to describe the various plans which are recommended for the remedy of this defect, but by far the most practical suggestion is that recently described by Dr. Cantwell.* The patient should be at least 10 years of age. The bladder is first drained through a perineal wound. When this is established two parallel lines of incision are carried down between the mucous membrane and the skin from the symphysis to the end of the glans joining above the bladder opening. A flap is then formed of the whole urethra from the glans backwards, and

* 'Annals of Surgery,' 1895, vol. ii, p. 690.

this being held up the cavernous bodies are separated. The urethral flap is then laid in the gutter thus formed and held in position by two sutures through the mucous membrane and the skin, and tied on the under surface of the penis. A silver catheter is then laid in the urethra and a canal formed by continuous suture of the free edges of the mucous membrane over it. Above this the corpora cavernosa are brought together and reunited by a continuous suture. The skin-flaps are joined over this and a few stitches are passed through the fat of the mons Veneris. Mr. Clutton informs me that he has had three most satisfactory results from this plan.

In a very complete monograph,* Dr. J. W. Ballantyne has drawn attention to that very rare malformation, so-called epispadias in women, of which he has collected 33 recorded observations. I cannot do more than quote his conclusions, but his admirable paper is of the greatest interest as drawing attention to a cause of enuresis in females which may easily be overlooked unless careful examination of the parts be made:—"It has only one symptom—more or less complete incontinence of urine—and in its least marked degree even this may be absent. It consists in the absence of a greater or smaller part of the anterior urethral wall with the division of the clitoris into two parts, and the presence of a median gutter or groove in the region of the anterior commissure of the vulva: the symphysis pubis is normally closed, and so is the anterior bladder wall. In its least marked form the urethra simply opens above the clitoris instead of below it, but in all the other forms there is splitting of the clitoris, and the existence of a median furrow. Palliative treatment consists in the wearing of a urinal; radical methods are found in plastic operations for the lengthening and narrowing of the urethra and for the restoration of the anterior vulvar commissure and clitoris."

Mr. Makins, in an obstinate case of this defect, successfully closed completely the inferior opening of the bladder and established a supra-pubic urethra.

HYPOSPADIAS.

Hypospadias is a fairly common defect, and varies greatly in its degrees, and examples are frequently met with in which the

* 'Edinburgh Hospital Reports,' vol. iv.

opening of the urethra may be situate at any point between the perineum and the spot at which the frenum is attached to the body of the penis. The two chief points of interest in regard to this deformity are as to the possibilities of procreation and the question, which not unfrequently arises in extreme cases, as to the sex of the individual. These I must not discuss, but must limit myself to the question only of its effects on the urinary apparatus. There is, even in those cases where the orifice is in the perineum, a power of control, since the opening of the urethra is always in front of the membranous portion, but such patients are unable to micturate except in a sitting position, and an operation is necessary in order to direct the urine to a point nearer to the end of the penis. The most usual position for the opening of the urethra is just behind the attachment of the frenum. It is generally extremely minute, and many cases have come under my notice in which it has been declared that no opening existed, a state of things which is almost unknown. The minuteness of this opening, at whatever position it is situate, may lead to difficulty in passing water, and in some cases that I have seen the orifice has become so obstructed by mucus and dirt as to cause pain and delay, and in one instance a gleet discharge. This trouble is easily remedied by opening the urethra for a short distance and attaching the lappet-like flaps by stitches to the skin on either side. I have in several cases been able to trace an hereditary transmission of this defect, and Mr. Lingard relates an instance * in which it was traced through six generations, and tells of a case where it was transmitted by the widow of a hypospadian to four sons by a second husband who had no such deformity. I have met with one case of congenital fistula where a probe passed through the natural meatus issued at an orifice midway along the under surface of the penis, the edges of which were thin and resembled those of the meatus. Mr. Holmes describes a case in which there were four openings at different parts of the perineum, from all of which the urine issued as well as from the meatus. A case has been described by Mr. Gay † in which there existed a double urethra, one on the dorsum and one in the normal position, both communicating with the bladder but not with one another, and another similar case has been

* 'The Lancet,' April 19th, 1884, p. 703.

† 'Transactions of the Pathological Society,' vol. xiv.

recorded.* An elaborate article on the origin and nature of these fistulæ has been written by M. René le Fort.†

CYSTITIS.

A chronic catarrh of the bladder occurs from the presence of calculus or tumour, or any cause inducing urinary retention, but an acute state of inflammation rarely arises spontaneously. One instance occurred in a child under my care upon whom I had operated for the cure of a spina bifida by the injection of Morton's solution. Although this was followed by no constitutional disturbance, there was complete and obstinate retention which persisted for over three weeks, during which a catheter had to be passed every few hours, and there ensued an inflammation of the bladder with muco-purulent urine and all the other symptoms of cystitis. These gradually disappeared, and a subsequent injection of the tumour caused its consolidation, and was not followed by similar symptoms. The child was aged 8 months, and is now perfectly well. But there occurs occasionally what has been named an "acid purulent cystitis," to which my notice was first called by Mr. Treves, who has kindly supplied me with the notes of the case which directed his attention to it:—"A boy, aged 2 years and 9 months, passed blood and pus from the urethra. When 12 months old the urine was continuously full of pus, and the discharge has continued without change ever since. He passes water 17 to 18 times in the 24 hours, half an ounce at a time. There is no pain and no wasting. Urine: specific gravity 1,023, full of pus, no mucus, many uric acid crystals, no renal casts, and always markedly acid. No tubercle bacillus. The bacterium coli commune found in almost pure cultures. He has been repeatedly sounded and examined under ether with no result. There is a very tuberculous history in the family. The child looks well and is not wasted. There is no fever, and no evidence of renal disease." This affection has been studied and described by foreign authors, but has been recognised very rarely in this country. Some years ago Clado directed attention to special rod-like organisms associated with

* 'British Medical Journal,' 1891.

† 'Annales des Maladies des Organes Génitaux,' vol. xiv, 1896, p. 624, *et seq.*

pus which occurred in acid urine, and which he called pyogenic bacteria, but which have since been identified as the bacillus coli communis, and it has been shown by Professor Schmidt and others that their passage into the bladder induces cystitis. The anatomy of the parts, as first insisted upon by Dr. Escherich, explains the greater frequency of the condition in girls than in boys. In 1894 he reported seven cases in girls, the patients ranging from 7 to 9 years of age. He regarded the condition as somewhat trivial, curing each case by vesical lavage with creolin lotion and the internal administration of salol. Trumpf, in more than one paper, would have us regard the condition as worthy of occasional anxiety. He brings forward 29 cases which were under his own observation; 21 were girls and eight boys, the youngest was 5 weeks old and the oldest 9 years. He divides the cases into trivial and grave. In the former the symptoms are principally local, and in no way affect the general health of the child. Ten were of this nature, three of them suffering from vulvitis at the same time. In the graver form rapid emaciation takes place, and severe local and constitutional symptoms manifest themselves. Apathy, somnolence, collapse, and vomiting are associated with strangury, hypogastric and lumbar pains, and in two of his cases pyelitis, uræmia, rapid emaciation, and death. The urine in both types is offensive, acid, and albuminous, with varying quantities of pus, leucocytes, and epithelium, according to the severity of the attack. It is usually of a pinkish or opalescent colour, and on bacteriological examination the bacillus coli is readily found. In severe forms the deposit may amount to half the total bulk of urine passed. Mild cases recover on an average in two weeks. Dr. Denys thinks that direct infection of the bladder is only possible when there is a slight catarrhal condition; others argue that the vesical infection occurs from contact with the bacillus-laden coils of intestine. Dr. Escherich, Dr. Czerny, and Dr. Trumpf find the bacillus coli present in the blood in cases of enteritis, especially the clinical variety known as follicular. In a recent work by Dr. Melchior, of Copenhagen, which is reviewed by Dr. Lindley Scott,* he concludes that the colon bacillus is the bacterium of the urine and the organism most commonly associated with cystitis, pyelitis, and pyelonephritis, and he found it in all varieties of cystitis, in acid,

* 'British Journal of Dermatology,' September, 1897.
(6846)

neutral, and ammoniacal urine. When the secretion was acid Dr. Melchior always obtained a pure culture of the colon bacillus; when ammoniacal it always proved to be accompanied by one or several of those micro-organisms which have the power of decomposing urea. He dismisses internal medication as practically useless, and believes only in irrigation of the bladder with solutions of nitrate of silver varying in strength from 1 in 500 to 1 in 200. A close perusal of this book is invaluable to those interested in the subject, and the whole study of this form of cystitis is deserving of much closer attention than it has received in this country.

TUBERCULOSIS OF THE BLADDER.

Tuberculous ulceration of the bladder occurs much more frequently after the age of puberty than before, but I have met with a few cases in children, and there are records of others. The diagnosis presents even more difficulty in children than in adults, and the question of most vital importance as regards treatment, but which is at the same time most difficult to determine, is whether the ulceration commences primarily in the mucous membrane of the bladder or is secondary to disease in some of those organs which communicate with it. In the case of the testes or vesiculæ the primary focus is readily manifest, but in the case of the kidneys it is not so easily determined. Mr. Mansell Moullin, writing on this subject, thinks that primary tubercle of the bladder is probably more common than is generally supposed, and the secondary origin is in all probability exaggerated. He considers that the neck of the viscus is involved more frequently than the fundus, not because of the proximity of the openings of the ureters and vasa deferentia, but because of the greater vascularity of that part and its more active functional capacity. It is as an aid to distinguish its independent origin, as apart from being a sequel to similar disease in the kidney, that the cystoscope may prove of the greatest service. Not only may the extent and character of the ulcer be revealed, but the nature of the discharge from each ureter may be seen, and the presence or absence of pus therefrom will afford evidence of the state of the respective kidneys. In an article in the 'Deutsche Zeitung für Chirurgie,' Dr. Griffenhagen points out that the bladder is most frequently infected from the kidneys,

less often from the prostate, and comments on the remarkable resisting power of the mucous membrane of the bladder to the invasion of the tubercle bacillus. He had met with many examples of chronic renal tuberculosis with no bladder complication, yet the orifice of the ureter is especially liable to be affected by this bacillus. I have recently had under my care a young man who had had one testicle removed for tuberculous disease, and whose remaining testis and both vesiculæ present the typical characteristics of tuberculosis of those organs. The bacillus has been detected in his urine, but he has no frequency of micturition or any other symptom of bladder involvement. In the 'Transactions of the Clinical Society,' 1875, the case of a girl, aged 9 years, is related by Mr. Humby in which ulceration had at two points perforated the bladder; one at the apex led into a circumscribed abscess in the peritoneum, which had discharged at the umbilicus, and the second, at the back of the viscus, had opened into the bowel, through which matter had escaped by the anus.

The diagnosis of these cases from those of calculus is not usually difficult, one pronounced feature being that in tuberculosis the frequency and pain of micturition are as great or greater during night, whereas rest allays and diminishes these symptoms in cases of calculus. The amount of hæmorrhage, as a rule, is slight, but may be excessive if ulceration is extensive or deep. I have already pointed out that in renal tuberculosis the urine remains acid, but when the bladder is invaded it usually becomes alkaline with the increase of purulent discharge. Reliance cannot be placed upon the absence of the tubercle bacillus from the urine, but when present in large numbers it indicates an extensive amount of disease. In the case of a young woman whom I saw some years ago, the disease had advanced too far for any hope of successful treatment, but in a boy who was under my charge the disease was certainly for a time confined to the bladder, and I gave considerable relief by making a perineal opening and thus draining the viscus. But since that time the modern mode of suprapubic cystotomy has come into practice, and undoubtedly offers a means of relieving this very distressing malady. Mr. Battle has brought the advantages of this operation to our notice by an account of a very interesting case.* The patient was a girl, aged 20 years, and

* 'Transactions of the Clinical Society,' 1890.

therefore above the age to which I have endeavoured to confine my observations. But the treatment which he successfully pursued was undoubtedly that which I should myself follow. After giving a fair trial to general and local treatment he performed suprapubic cystotomy. He found that partial healing had taken place as a result of previous treatment, but an extensive ulcer remained, and the surface of this was scraped, and then dabbed over with a solution of chloride of zinc. The urine, which had been slightly alkaline, became acid, and in less than a year after being first seen the girl appeared perfectly well, and could hold her urine for three hours. I agree with Mr. Battle in preferring the application of chloride of zinc, which is so efficacious in the treatment of tuberculosis of other parts, to the use of the actual cautery, which has been applied successfully by M. Guyon, M. Reverdin, and others. Mr. Cheyne believes that much of the benefit of this operation lies in the rest which is given to the bladder by the drainage of the viscus, and in this way he treated a boy, aged 4 years. Mr. Morton, after performing the suprapubic operation, scraped the ulceration and rubbed in iodoform, afterwards keeping up drainage by the aid of Cathcart's suction apparatus. The ulceration in the bladder healed, but the patient died with tuberculosis of the left kidney and calculus in the right ureter. A patient was shown at St. Bartholomew's Hospital who exhibited tuberculous ulceration of the sinus left by a suprapubic wound which had been made for the treatment of ulceration of the bladder. The plan of injecting iodoform and other compounds has not proved satisfactory, although Professor Landerer claims value for the injection which he prescribes, composed of balsam of Peru, chloride of sodium, and other drugs.

TUMOURS OF THE BLADDER.

Tumours of the bladder occur but rarely in childhood. One such case I saw at the Hospital for Sick Children, Great Ormond Street, under the care of Mr. Marsh.* The girl was aged 2 years, and when 1 year old a dark fleshy-looking growth projected from the vagina, and was ligatured and fell off. Then came retention of urine, with attacks of pain and straining. On examination under chloroform a large bunch of polypi were found

* 'Transactions of the Pathological Society,' vol. xxv.

just within the vulva, projecting from the vagina and distending the urethra. They varied in size and colour, some being pale and others dusky purple. Death took place 16 months after the disease had been first observed. The report by Mr. Butlin and Mr. Marcus Beck described it as an overgrowth of connective tissue. Two cases have occurred in the wards of my colleague, Mr. Owen, both happening in boys, for one of which perineal and for the other suprapubic cystotomy was performed. I have inspected all the specimens of this form of tumour which are to be found in the various hospital museums in London. The best known is that in the Hunterian Museum, which was presented by Mr. Crosse, of Norwich, and which is depicted in his treatise on calculus. The patient was a boy, aged 2 years, whose illness began about six months previously to his death with frequent micturition and dysuria. There was no hæmaturia. Perineal section was eventually performed, and many gelatinous polypi were excised. The child died 44 hours after operation. Mr. Targett, in a most comprehensive paper,* groups together all these polypoid growths attached to the mucous coat of the bladder in children, which are described as mucous polypus, fibro-sarcoma, fibro-myxoma, myxosarcoma, and the like, and allowing that the vast majority of primary vesical growths of children are of the polypoid type—that is, rounded elevations of the mucous coat with more or less constricted pedicles, and arranged in clusters—maintains that the minute structure of these formations is of subsidiary importance, that pathologically they are best considered as members of one group, and that clinically they have one common character, viz., that they are uniformly fatal, though death is chiefly, if not entirely, due to urinary obstruction and its backward effects upon the kidneys. The growths may extend in the substance of the mucous coat, into the muscular tissue of the vesical wall, as secondary deposits in the cellular tissue outside the wall of the bladder and as deposits in the neighbouring lymphatic glands. Other writers, as, for example, Dr. Vander Veer, classify the tumours which occur in children under the same headings as those of adults, but Mr. Targett has examined the subject so closely that his conclusions may be accepted as final. The only record of any innocent tumour is that described as a small papilloma which was

* 'Transactions of the Pathological Society of London,' vol. xlvii.

removed by Mr. Bryant in the eye of a catheter. Treatment must generally be limited to relieving the bladder of the confined urine either by a perineal or a suprapubic opening. But removal has more than once been successfully performed. Thus Professor Humphry removed by means of lateral cystotomy and with forceps and finger-nail a fibro-sarcoma from a boy, and a case of great interest occurred in the practice of Professor Billroth, where in a boy, aged 12 years, with frequent painful micturition, a tumour could be felt in the region of the bladder which was suspected to be connected with the back of the viscus. The lateral incision was made and a tumour of nearly the size of a fist, with an uneven surface, was found projecting from the posterior wall into the cavity of the bladder. It measured 8 inches in its longest diameter, 5 inches in its broadest, and 3 inches in basal circumference. Owing to its size it was found impossible to extract the tumour through the perineum. A suprapubic incision was then made, both recti were cut across and a transverse incision was carried into the bladder. The tumour was then torn through near its base with the finger and the pedicle dissected out. It appeared to take its origin from the muscular coat, and had not attacked the peritoneum. It is described as principally a myosarcoma and in some places a myocarcinoma. The boy was discharged in a month perfectly well. Clearly the only chance for surgical relief lies in an early diagnosis and a suprapubic incision when on inspection the possibility of removal can be considered and, if feasible, carried out in the same manner as tumours are removed from the bladders of adults.

A case in which retention of urine was occasioned in a girl, aged 2 years and 4 months, by a primary sarcoma of the vagina is related by Mr. D'Arcy Power.* The growths were of polypoid appearance and had been observed to project from the vulva five months previously. She died with symptoms of uræmia. The specimen is preserved in the Museum of St. Bartholomew's Hospital. The growths are classed as myxosarcoma, whilst some more dense were of the type of fibro-sarcoma. Mr. Power has collected a series of 26 cases, principally from German literature. Except from this cause retention of urine only occurs in children by reason of the pressure of an abscess in the perineum or the impaction of a stone in the urethra, which is at once readily

* 'Transactions of the Pathological Society of London,' vol. xlvii.

detected by the sound or catheter. If the stone is arrested in any part of the urethra anterior to the scrotum it can be extracted with suitable forceps or by means of an incision made directly upon it, but if it be further back it can generally be pushed into the bladder and can be removed later or at once by the lithotrite and evacuator. If, however, it remains obstinately lodged in the scrotal or perineal part of the urethra it is easily removed by a median incision.

EXTRAVASATION OF URINE.

The impaction of a calculus or the opening of an abscess into the urethra are the only causes which may give rise to extravasation of urine in young patients with the exception of rupture of the urethra by falls upon the perineum and the subsequent obstinate form of stricture which ensues upon that accident. The treatment of such injuries and their consequences in no wise differs from that followed in the case of adults, but considering the firmness of the cicatricial tissue which forms at the site of these lesions, the rapidity of its contraction and the speed with which destructive changes in the kidneys supervene and the fistulæ which form, it may sometimes be necessary to resort to some extreme measure in order to avert these after-consequences. Many operations have been devised for dealing with this obstinate form of stricture. John Hunter proposed to reach the rear of the constriction through the apex of the bladder with a metal instrument, to be met by another in front. Mr. Furneaux Jordan in his '*Surgical Injuries*,' describes an operation through the rectum for the treatment of impassable stricture. In the '*Practitioner*,' 1888, I related the case of a boy, aged 14 years, who a year after the operation for the re-establishment of the urethra, which had been divided by a fall, returned with the stricture firmly closed and with two sinuses in the perineum through which all urine was voided. The tissues of the perineum and scrotum were densely infiltrated. In order to reach the utmost limit of the sound urethra with the smallest possible wound I performed what is termed posterior catheterisation—that is to say, I opened the bladder above the pubes and passed a bent probe through the vesical orifice of the urethra down to the posterior surface of the stricture. Cutting down upon this I attached the mucous membrane of the urethra to the edges of the

incision. The result was most satisfactory. The sinuses closed, the perineum resumed its normal condition, and the boy passed his urine voluntarily at intervals of three hours. At the end of a year I inspected him and found him very greatly improved in health. The urine was voided from a nipple-like elevation close to the posterior edge of the scrotum. No irritability of the bladder existed, and the control over it was perfect. The urine, which previously to the operation contained pus and albumin, was perfectly normal, and the cicatrix of the abdominal wound was firm and level. So satisfactory was his condition that he and his parents declined any further surgical interference.

PHIMOSIS.

On the many baneful effects which result from an elongated or contracted prepuce I have no space to dilate, and can only allude to their effects upon the urinary apparatus. Reference has already been made to cases of hydronephrosis which are ascribed solely to this condition, and as a reflex effect may be mentioned nocturnal enuresis and daily incontinence and all the symptoms of calculus, including even hæmaturia. The hypertrophy of the bladder which ensues from this cause has been pointed out by Sir James Paget. The eczematous state which so often exists at the end of the prepuce frequently starts a slight urethritis in the region of the meatus by which urination is rendered painful and at the same time frequent, and which, if permanent, causes the meatus to contract and renders its division by the scalpel a necessity. For these and very many other reasons connected with the effects of this condition in youth and in later life, I consider that the simple operation of complete circumcision should be performed at an early age wherever complete retraction cannot easily be performed, and whenever the prepuce considerably overlaps the glands.

The urethra of girls is not often the site of any surgical affections, but a remarkable case is described by Mr. Davies-Colley,* in which the orifice of the ureter protruded through the meatus in a girl, aged 18 months. This protusion was ligatured, and after death the right kidney and ureter were found to be healthy, but the left kidney was suppurating and diseased by chronic

* 'Transactions of the Pathological Society of London,' vol. xxx.

obstruction. He considered that the condition was due either to the impaction of a calculus or to congenital constriction of the orifice of the ureter.

Mr. Croft has related a case of inversion of the bladder in a girl, aged 14 years. The bladder was turned inside out through the urethra and meatus. It was easily reduced under chloroform and did not recur. Similar cases have been reported by Dr. Lowe and Mr. Crosse, of Norwich, who by a timely recognition of the parts prevented their removal by the surgeon.

Mr. Bryant* describes a case of extreme prolapse of the female urethra occurring in a girl, aged 6 years. It was reduced and the child remained well. Several similar cases are mentioned. The prolapse seems to occur as the result of straining in the later years of childhood. It does not cause much trouble in micturition, but the protusion is tender and the mucous membrane often bleeds. All these conditions must be carefully diagnosed from urethral caruncle, which, common enough in women, is found occasionally to exist in children.

And now, Sir, time bids me conclude these somewhat scattered observations on some points of the subject which I set before myself. That I have by any means exhausted it I cannot pretend to hope; but that I have taxed, if not exhausted, the kind patience with which you and the Fellows of the Medical Society of London have been amiable enough to listen to what I found to say I greatly fear, and it remains only to thank you for your patience and to crave indulgence for the many omissions of which I am fully conscious.



* 'Transactions of the Royal Medical and Chirurgical Society,' vol. lxxvii.

