

Urachal cyst simulating appendicular abscess : arrested development of genital tract : with notes on recently reported cases of urachal cysts / by Alban H.G. Doran.

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old woman who for seven days had suffered from intestinal obstruction evidently low down in the ileum. As she was dying I left her alone and death took place within an hour of my first seeing her. At the necropsy I found a stone of the size of a florin tightly impacted in the lower end of the ileum six inches above its termination. The patient's daughter assured me that her mother had never suffered from biliary colic, and this was explained by the fact that this was a solitary stone which had ulcerated into the duodenum, leaving an opening between the gall-bladder and this segment of the intestine.

A more frequent result of gall-stones is the presence of dense fibroid adhesions around the pylorus and the commencement of the duodenum, which so narrow these parts as to give rise to gastric dilatation and call for the performance of gastro-enterostomy. I have several times found gall-bladder, liver, duodenum, and pylorus imbedded in adhesions (in one case so dense as to simulate a neoplasm when examined through the abdominal wall), and have been enabled to give relief to the gastric symptoms by the performance of gastro-enterostomy.

Permanent Obstruction of the Biliary Ducts.

We have hitherto considered cases in which the gall-stone obstruction in either duct was only temporary. We now turn to such in which the calculus remains permanently impacted. When this happens in the cystic duct the bile no longer enters the gall-bladder, which may undergo various changes. It may dwindle to a shrivelled sac with thickened walls which may, in part, calcify; it may become distended with clear, rosy fluid derived from the mucosa until it attains so vast dimensions that it may be mistaken for an ovarian cyst or a hydronephrosis, or the fluid in the gall-bladder may become pus, and lead to perforation of the viscus and peritonitis. Much more serious is the case when the common bile-duct is permanently and totally obstructed by a calculus, for in such the bile is prevented gaining access to the intestine and jaundice results. This, however, not invariably occurs, for I have operated upon several cases in which the common bile-duct was, to all appearance, blocked by calculi varying in number from one to nine, and yet bile was able to find its way adequately into the intestine. It is noteworthy that in some instances the common duct is obstructed by calculi so completely as to cause jaundice, and yet the closest examination of the patient reveals no history of gall-stone colic. Complete blockage of the common duct may cause no symptom beyond jaundice with clay stools and slight hepatic enlargement. In other cases sooner or later ensue the results of infection—viz., suppuration of the biliary passages and gall-bladder, cirrhosis (biliary) of the liver, suppuration of the intrahepatic ducts, or of the liver substance.

Allow me now to direct your attention to infection of the biliary ducts and its results. Normally the entire biliary apparatus is sterile. I have (in *Virchow's Archiv*, 119. Band, 1890) shown that in animals the introduction of bile into the peritoneal cavity does not cause a fatal peritonitis, and that the bile is really free from micro-organisms. The bile, however, though sterile, has no antiseptic qualities, but is a suitable medium in which microbes may grow and flourish. Hence it follows that the entrance of pathogenic bacteria into the biliary passages is fraught with utmost danger. The ampulla of Vater is normally swarming with microbes which may be found at least half an inch up the duct. These are in health washed out by the flow of bile, but the arrest of this secretion enables them to ascend the duct and thus to produce their baleful action. I am convinced that in such cases ascending infection is the rule, though I do not deny the possibility of infection by the blood stream.

Experimental ligation of the common duct may produce ascending infection of the biliary passages, especially if it be performed in the last inch of the duct. Here injury to the duct wall acts as a *locus resistentiæ minoris*. Ascending infection of the biliary passages is usually ushered in by rise of temperature, 101° to 105° F., with rigors and profuse sweats. The fever is markedly intermittent and frequently simulates malaria. Between the exacerbations the temperature may fall to the normal or remain somewhat elevated. In other cases, which are of serious omen, the temperature remains the whole time at or near its maximum, this being an indication that the infection has reached and seriously attacked the liver in addition to the extrahepatic biliary passages.

Angiocholitis.—In this condition the intrahepatic biliary ducts are involved in the infective process. On post-mortem examination the liver is found to be swollen, pulpy, and infiltrated with pus. Some of the pus lies in the dilated intrahepatic biliary ducts, some in real abscesses which have their origin in the periductal connective tissues.

Gall-stone cholecystitis is the result of ascending biliary duct infection attacking a gall-bladder containing calculi. Should the infection occur in a gall-bladder only recently occupied by gall-stones, the gall-bladder will form a definite swelling. If, however, it occur in a gall-bladder long the container of gall-stones and the subject of previous inflammation, the sac, now contracted and shrunken, will not be able to assume tumour dimensions. The fluid in the gall-bladder may be sero-purulent, purulent, or hæmorrhagic, and in cases of some standing the viscus itself is adherent to neighbouring viscera (the duodenum, the transverse colon, the pylorus). These adhesions are not infrequently dense and fibroid in character.

Regarding the question of diagnosis, let me draw attention to the value of radiography. In many cases my colleague, Dr. W. Ironside Bruce, has given me assistance of very real value and has confidently and correctly diagnosed the gall-stones present. In other cases he has reported that the evidence was inconclusive. Such have commonly been in fat patients, in some of whom I have found, in others failed to find, gall-stones. I think it only due to my colleague to say that in no case in which he has stated that calculi were present have I failed to find them. I conclude, therefore, that in skilled hands such as his a positive diagnosis has a positive value. In some cases of calculous cholecystitis there will be found just outside the margin of the right rectus abdominalis, at its junction with the costal margin, a swelling and in all a point of tenderness on deep pressure.

The treatment of calculous cholecystitis is purely surgical, and it may be laid down that no delay, once the diagnosis has been established, is permissible. My preference in nearly all such cases is for cholecystotomy with drainage of the gall-bladder, an operation that, except in gangrene of the gall-bladder, has afforded me results that leave little to be desired. Cholecystectomy, or extirpation of the gall-bladder, has always appeared to me to be a more serious operation and to lack the virtue of drainage of the biliary passages which cholecystotomy affords. I reserve it solely for those cases in which I fear that the gall-bladder wall is seriously compromised in whole or part. Cholecyst-duodenostomy—i.e., making an opening between the gall-bladder and the intestine (duodenum) or transverse colon (cholecyst-colostomy)—should, I consider, be rarely performed and should be reserved for those rare cases in which the common bile-duct obstruction cannot be relieved. I have in two such cases performed cholecyst-duodenostomy.

Of *suppurative phlephlebitis* I have personal experience of one case only, and can therefore give you no information of any value concerning this condition.

Gall-stone peritonitis is a condition which I have not infrequently met with. Many cases are fortunately localised by adhesions and thus form encysted abscesses. Frequently the origin of the abscess is not diagnosed. I have twice last year opened a subhepatic abscess without obtaining any history of biliary colic. In one case seven gall-stones were immediately passed by the incision and rapid healing resulted. In the other a biliary fistula resulted which persisted for five months. A large gall-stone was then felt with a probe at the bottom of the sinus. The sinus having been dilated, a large single stone was extracted with forceps and six weeks later the sinus closed.

Far more serious are the cases of acute generalised peritonitis in which infected bile is poured out into the peritoneal cavity owing to sloughing of the wall of the gall-bladder or of one of the biliary ducts. In my experience this is a very fatal complication. Of the five cases that have come under my care, three occurred during an attack of biliary colic, and I confess that in two I did not immediately recognise, amid the agonising pain of biliary colic, that perforation had occurred. In the remaining cases perforation of the gall-bladder took place without any history of biliary colic, and the diagnosis of perforative peritonitis was easily made, though I attributed it to a duodenal or gastric ulcer in both. One recovery out of five cases is my melancholy experience of this grave condition. Of biliary fistulae the result of gall-stones I have seen but few which

discharged bile externally, and rarely has the discharge been at all copious. Internal fistulae—i.e., of the gall-bladder with the duodenum the more common form, or with the transverse colon—are not uncommon. In no case did an internal fistula cause apparent damage to the patient and in the majority the diagnosis was only made at the necropsy, the patient having died from some other malady.

Let me now briefly refer to those far from infrequent cases of relapsing cholecystitis of microbic origin which so closely simulate gall-stone cholecystitis but in which no gall-stones are found on incising the gall-bladder. I do so for this reason, that their treatment by cholecystotomy and drainage is almost as satisfactory as is that of those cases in which gall-stones are found. I will content myself with the history of a single case. My old friend and fellow student Dr. G— was obliged to relinquish practice owing to repeated attacks of abdominal pain and ill-health. I saw him in consultation with Dr. W. Aldren Turner. It was clear that he was suffering from chronic appendicitis. I removed the appendix vermiformis, which was obviously diseased, and thought that all would now be well with my friend. Some months later he consulted me again and told me that though he felt much better he was not yet well. He was now certain that his abdominal attacks were of two kinds: one the symptoms of which were due to appendicitis which had disappeared since the offending organ was removed; the other, of less severe nature, still persisted and frequently recurred. Dr. Turner and I diagnosed infective cholecystitis and I drained the gall-bladder, which contained no calculi, with the happiest results. My old friend, who for two or three years had been unfit for work, is now, I am glad to report, in excellent health, and doing useful service as medical officer of health to a large district. This combination of cholecystitis and appendicitis is by no means unusual. I have frequently met with it.

Time will not permit me to enter into the interesting question of the relation of gall-stones to pancreatic disease. I may, however, remark that a stone impacted at the ampulla of Vater is a serious menace to the pancreas. The pancreatic secretion may be dammed back into the gland, ascending inflammation of microbic origin of the pancreatic ducts may occur, or bile may find its way into the duct of the viscus with grave results. It is well known that the most efficient treatment for chronic pancreatitis consists in drainage of the biliary ducts by way of the gall-bladder.

PROGNOSIS.

I would insist that prognosis in cases of gall-stones is most uncertain. No one can foretell the outcome of the condition. I have learned never to prophesy. Some of the cases in which the symptoms have been trifling have terminated in death. Some of the most threatening and ominous have made apparent recoveries without operation. Two cases in which attacks of biliary colic and cholecystitis had recurred over and over again for several years with marked jaundice, rigors, and high fever, and in which I gave a grave prognosis, owing to operative treatment having been refused, made ultimate recoveries after the passage of gall-stones per anum, one when the patient appeared to be almost in *extremis*. In one, however, grave loss of vision occurred owing to retinal hæmorrhages.

The most frequent causes of death are: (1) microbic cholangitis; (2) perforation of the gall-bladder and ducts; and (3) carcinoma of the gall-bladder. I have met with carcinoma of the gall-bladder in a definite proportion of cases of cholelithiasis and have never seen it as a primary growth apart from gall-stones. I am convinced that their irritation is the usual cause of carcinoma of the gall-bladder. I think I may fairly claim that every death from gall-stones is a preventable one, that early operations are very safe, that they avoid many and grave complications, and that drainage of the gall-bladder is practically never followed by the re-formation of calculi. Were the question put to me, "In what cases would you advise operation for the removal of biliary calculi?" I confess I would wish to answer, "In all." This, which I am convinced will be the treatment of the future, would probably induce the majority of my hearers to label me an extremist. Let my reply be: Let me ask you to tell me something about your patient? If he will assist you in your endeavour to keep him out of the

hands of the surgeon, will adhere to simple living, avoiding alcohol and rich foods, will drink a tumbler of hot water with preferably a little alkali in it thrice daily, and take a daily dose of Carlsbad salts to insure free movement of the bowels and relieve any gastro-duodenal catarrh, then let him, if he wish, postpone the operation, for such treatment tends in many careful patients to induce a condition of absence of symptoms, commonly mistaken by the patient for a cure. But even such an ideal patient would be safer with operative treatment.

Should, on the other hand, your patient be one of those who live to eat, and is intolerant of restraint, who will not carry out instructions but persists in over-loading his stomach with rich food and alcohol, far exceeding what is required by a middle-aged man, then surely disaster awaits him if he insist on retaining his gall-stones; and if, in the absence of any contra-indication, his medical attendant aids and abets him in his refusal of surgical relief he cannot absolve himself from blame should some grave complication endanger his patient's life.

In conclusion, I would insist that as soon as the medical attendant makes up his mind that operative treatment is indicated the less the delay the better for the patient. The operative treatment of gall-stones in the early stages of the disease is one of the safest and most beneficent of all surgical procedures. I am convinced that an early cholecystotomy is far less dangerous to the patient than the passage of a single stone *per vias naturales*. I know no operation more easy or more entirely satisfactory than an early cholecystotomy. I know few more difficult than choledochotomy or extraction of a stone from the common bile-duct in a long-standing case. In the latter, even if the stone be removed the dangers are by no means overcome, as infection of the biliary passages may persist or adhesions may cause trouble in adjacent organs, especially the stomach. My advice to you, therefore, must be that as soon as you have, with some assurance, diagnosed the presence of biliary calculi, and especially if you can satisfy yourselves that they have produced definite symptoms and are threatening to give rise to some complication, the earlier they are extracted from the gall-bladder the better for your patient's safety and for your peace of mind.

URACHAL CYST SIMULATING APPENDICULAR ABSCESS; ARRESTED DEVELOPMENT OF GENITAL TRACT:

WITH NOTES ON RECENTLY REPORTED CASES OF URACHAL CYSTS.*

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OVER ten years ago I read before a meeting of the Royal Medical and Chirurgical Society a communication entitled "A Case of Cyst of the Urachus, with Notes on Urachal and so-called 'Allantoic Cysts.'" Several years passed by, but I came across no further examples of urachal cyst in my own practice until last summer, when I revealed by operation a remarkable and, I must add, undiagnosed example of this form of tumour. It simulated appendicular abscess and was associated with arrested development of the upper part of the genital tract. I will relate this case and then dwell upon others recently reported by Mériel, Weiser, Binnie, Delore and Cotte, E. D. Ferguson, &c., adding an unpublished report of a cystic sarcoma of the urachus in the practice of my friend Mr. F. S. Eve. I shall discuss almost exclusively pure urachal cysts as distinguished not only from tumours which are not urachal, but also from cystic urachal fistula, which, like other forms of urachal fistula, is clinically and surgically quite different from urachal cyst. The consideration of the pure cyst, in itself somewhat complicated, is quite sufficient for a single paper. I will endeavour to explain how much has been added to our knowledge of these cysts since I reported my first case in 1898.

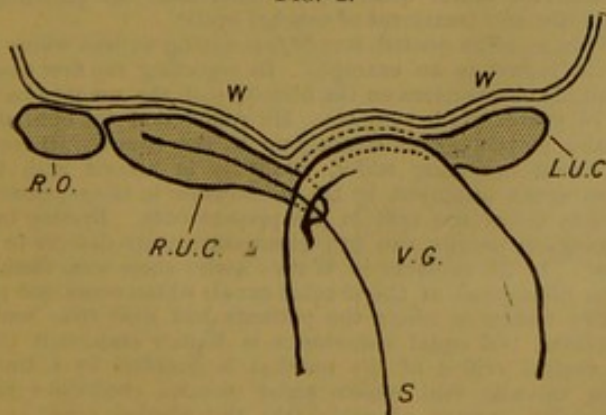
* A paper read at a meeting of the Surgical Section of the Royal Society of Medicine on March 9th, 1909.
† Transactions of the Royal Medical and Chirurgical Society, vol. lxxxii., 1898, p. 301.

Urachal Cyst Simulating Appendicular Abscess; Arrested Development of the Upper Part of the Genital Tract.

The patient, aged 17½ years, unmarried, applied to Dr. R. Drummond Maxwell at the out-patient department of the Samaritan Free Hospital on July 16th, 1908. She complained of tenderness and swelling in the right iliac fossa, associated with a history of a sudden attack of pain in that region a month previously, and she was admitted into my wards at once. After admission I found that the relations of the swelling to adjacent organs could not well be defined until I examined the patient with the aid of anaesthetics under circumstances presently to be explained. The patient's mother informed me that the catamenia were established at the age of 14 years without pain or constitutional disturbance. The periods were always scanty and attended with very little pain, and the interval was about five weeks. The patient had never suffered from any neurosis before, at, or after puberty. On June 16th, one calendar month before admission, the menstrual flow appeared as usual, but was accompanied by violent pain never experienced before. The pain continued for two days and then it abated. The patient at once resumed her work, but the pain returned two days later and obliged her to take to her bed again. During the whole of the week before admission she was quite incapable of attending to her duties. Roughly speaking, as regards what could be made out before anaesthesia was employed, there was a fairly well defined, almost spherical, swelling in the right iliac fossa, slightly moveable and tender to touch. There was resonance on percussion over its outer aspect. The lower part of the swelling could be defined on rectal examination. I refrained from making a vaginal exploration until a consultation was held. Then it was found that the vagina was barely two inches deep. A kind of dimple could be defined at the blind extremity towards the right. The tumour did not bulge into the vagina. At the lower limits of the swelling was a tuberosity which lay behind the vagina and in front of the rectum. The temperature and pulse were low. The patient had never been laid up with any severe illness. Before the arrested development of the vagina had been detected appendicular abscess was suspected, but after the examination hæmatometra or hæmatosalpinx seemed equally probable. On July 21st the period began, as usual, about five weeks after that which preceded it. I found that there was no palpable increase of pain or tenderness in the tumour nor any appreciable increase or decrease in size. The show was unusually free. I decided to examine the patient under anaesthesia during the period in order to discover the channel which transmitted the menstrual blood into the vagina, and for other manifest reasons.

Examination under anaesthesia.—The patient was a fairly healthy but slightly anæmic blonde. Her manner and appearance were perfectly feminine. Though hardly over

FIG. 1.



W, Wall of cyst. R.O., Right ovary. L.U.C., Left cornu of uterus. R.U.C., Right cornu of uterus. V.G., Vagina. S, Sound.

5 feet in height she was well proportioned, broader at the hips than at the shoulders, and free from hair on the face. The breasts were well-developed; there was no areola round the nipples. The axillary and pubic hair corresponded to the patient's age. The inguinal canals contained no tender body. The perineum was markedly deep, so that the anterior commissure lay far forward. The labia, clitoris, and meatus

urinarius were normally developed. There appeared, on the other hand, to be no hymen nor was there the least trace of carunculae. The vagina formed a blind pouch about two inches deep; the rugae were prominent. The vaginal pouch was distinctly deeper on the right side, whence dark menstrual blood was seen to issue. On stretching the adjacent mucosa with the fingers a crescentic fold with the concavity towards the left was detected. It covered the aperture whence proceeded the blood. A uterine sound could be passed into this aperture and pushed onwards for three inches upwards, backwards, and a little to the right, closely following the outer limits of the lower pole of the swelling, as could easily be defined on digital exploration from the rectum. (Fig. 1.) On bimanual palpation the swelling was found to be a well-circumscribed tumour, firm, oval, and as tense as a recent hæmatocoele. It could be pushed a little downwards, yet even then its lower pole did not bulge into the vagina, but passed behind it. The tuberosity in the recto-vaginal septum discovered at the previous examination lay to the left of the menstruating tract. It felt like a small cervix. The nature of the case remained obscure. I kept the patient at rest for a week. The period ceased and the tumour remained stationary. There was one sharp attack of local pain on July 28th without any rise of pulse or temperature.

Operation.—On July 29th I operated, with the assistance of Dr. R. V. G. Monckton, Dr. S. H. Belfrage administering ether and chloroform. I made an incision in the middle line. The parietes were unusually vascular. After separating the recti I came across a thick membrane of doubtful character and lower down I exposed the wall of the bladder which extended for quite two inches above the pubes. The membrane was cut through and about half a pint of a perfectly clear fluid was removed; unfortunately, none was preserved. The fluid lay in a cyst behind the recti and anterior to the parietal peritoneum; the membrane through which I had made the incision being the anterior portion of the cyst wall. The cyst was connected with the bladder by a thick cord half an inch in length. The upper limits of the cyst lay close below the umbilicus. In exploring the upper end of the tumour I laid open the peritoneal cavity. The omentum adhered to the peritoneum investing the back of the cyst in this region. The intestines seemed healthy; there was no evidence of tuberculous disease, no free fluid, and no intraperitoneal tumour. Lower down some coils of ileum adhered to the parietal peritoneum behind the tumour. I endeavoured to define the relations of the cyst to the genito-urinary tract. A catheter was passed into the bladder and a few ounces of urine were drawn off. There was no communication between the cavity of the bladder and the cavity of the cyst; the thick cord between the two was clearly a portion of the urachus and I observed that it ran into and not over the cyst wall.

As might have been suspected from what could be defined before the operation, the cyst lay to the right of the middle line. On pressing against its wall on the right inferiorly, from the inner side, I detected a fusiform body, like a uterine cornu or a small but entire virgin uterus, lying in the position of the menstruating tract along which a sound had been passed a week before. Above this body thickened tissue could be felt, apparently a small ovary. The tuberos cervix-like body already mentioned could be plainly defined through the walls of the lowest part of the cyst. When thus explored it was found to be a distinct, fairly moveable structure, the left ovary or uterine cornu. On further palpation through the cyst wall the pelvic cavity felt quite free from any tumour or deposit. There certainly was no such thing as a collection of retained menstrual blood.

At this stage of the operation it became evident that the swelling, which disappeared entirely when I opened the cavity full of fluid, was a urachal cyst. That swelling—in other words, the cyst—had been the cause of all the patient's recent trouble. As there was no trace of a hæmatometra or hæmatosalpinx I did not feel justified in dissecting in the dark behind the cyst, amidst deformed structures in very uncertain relations to ureters, blood-vessels, &c., merely to make out the extent of arrested development of the uterus and appendages. It was with the cyst, therefore, alone that I had to deal. I knew of several objections to the draining of a urachal cyst, nor could I dissect away its outer wall, since, as I have just observed, its positive relations to malformed structures were very uncertain. For

these reasons I simply trimmed away as much of the lining membrane as could be safely removed. Then I cautiously passed several fine catgut sutures along the substance of the outer wall and tied them, so that the cyst cavity was closed in. This outer wall was the muscular sheath of the urachus abnormally thickened, so that the manoeuvre just described was easy and nothing was caught up behind the cyst. I transfixed the segment of the urachus which ran between the lower limits of the cyst and the bladder with a fine linen suture and tied it on both sides. It was then divided between the cyst and the ligature. As will be explained presently, it is fortunate that I transfixed the urachus instead of tying a single ligature round it as though it were an artery. I kept the portion attached to the cyst for microscopic examination. Lastly, the sheaths of the recti were united with interrupted fine linen sutures and the integuments closed with interrupted silkworm gut.

After-history.—During convalescence there was no difficulty in micturition, which was voluntary from the first, and no urine leaked through the wound. By August 7th all the silkworm-gut sutures were removed; the wound was by then well healed. There was at that date no trace of any swelling in the right iliac region or pelvis. The firm moveable body which lay until the operation below the lowest part of the cyst was found, on bimanual palpation, to be connected with the fusiform body to the right of the middle line.

During the summer vacation Dr. Maxwell took charge of the patient in my absence. He reported that up to the day of her discharge at the end of August there was no sign of leakage of urine through the wound nor any show of blood.

On Sept. 12th the patient came to see me at the hospital. Her general condition was good. A slight show of blood had been noted on the previous day, the first indication of a period since the operation. The abdomen was flat and free from tenderness. The cicatrix had completely healed. No trace of any abdominal tumour remained, the right iliac fossa was free; there was no resistant area or gurgling on pressure within its limits. No solid or cystic tumour nor any ill-circumscribed resistant body could be defined in the pelvic cavity. The fusiform body which transmitted menstrual blood and the firm moveable body on its left were now definable as one tough, smooth, irregular structure which could be pushed up to the level of the pelvic brim, slipping down immediately the examining finger was withdrawn. The mobility of this structure was very marked, the segment towards the left was not in the least tender, which would imply that it was the left cornu and not the corresponding ovary. Thus the urachal tumour had disappeared and no hæmatometra had formed, whilst the uterus was reduced to a right cornu which communicated with the vagina yet had no cervix, and most probably a left cornu connected with the right by a membranous band.

By the middle of October the patient was in very good health; she had been able to work for nearly four weeks, and a month later she reported herself as quite able to continue at her duties without feeling pain or fatigue.

I saw the patient once more on Dec. 15th. She was quite strong and able to work. The last period began on Nov. 26th and was moderate. The pelvic condition remained unchanged. Close above the fusiform body I could define the thickened tissue which I detected at the operation. It was slightly tender on firm bimanual pressure. There could be little doubt that it was the right ovary.

Microscopical appearances of the cord between the cyst and the bladder.—A section of the cord-like structure which ran on the surface of the parietal peritoneum between the fundus of the bladder and the cyst was made at the Royal College of Surgeons of England. There could be no doubt that it was a portion of the urachus. Mr. S. G. Shattock reported that the canal was quite patulous and lined with perfect transitional epithelium of the bladder type. The lumen was free from catarrhal or other morbid products. The muscular coat was abnormally thick but showed no evidence of inflammation or oedema. Its inner portion was mostly made up of circular and its outer portion of longitudinal fibres, but there was some irregularity in the direction of the fibres in both portions. Some subperitoneal fat was intimately connected with the periphery of the urachus. The appended reproduction of a photo-micrograph (Fig. 2) shows the above-described appearances of the urachus as seen under the microscope. The urachal canal, according to Wutz, is well developed in young subjects. In

this instance it must have been closed at the bladder end, or if not there must have been an efficient Wutz's valve, as the contents of the cyst showed no evidence of being fouled by urine.

FIG. 2.



Section of the segment of urachus which passed between the bladder and the cyst wall as seen under a low power. The canal is quite unobstructed and lined with transitional epithelium. The muscular coat is very thick.

Having related this case, the second in my experience, I will now turn to the anatomy of the urachus, dwelling on certain peculiarities of importance in respect to the surgery of urachal cysts.

THE URACHUS.

The surgical anatomy of the urachus deserves more attention than it has hitherto received in this country. There is no necessity for us to slight the embryologists, indeed we can take on trust what A. Keith, Ballantyne, Bryce, Cunéo and Viau, and other authorities teach us, being fairly convinced that the urachus is developed from the allantois. There is likewise no need for us to disparage the labours of Bland-Sutton, Byron Robinson, Freer, and others who have demonstrated the pathology and surgery of urachal cysts and urachal fistulae under their own observation. Let us rather turn our attention to a matter intermediate between embryology and pathology, in other words, let us study the anatomy of the urachus as revealed by special investigation of human subjects other than patients suffering from distinct disease of that interesting embryonic relic. Then, perhaps, we shall be better qualified to understand the pathology, diagnosis, and treatment of urachal cysts.

Wutz, so often quoted, stands first among writers whom we should follow as an example. In reporting my first case I noted his observations on the histology of the urachus based on 74 post-mortem subjects. He found that the epithelial tubular portion grows steadily up to the twenty-fifth year, the canal becoming wider, which is in accord with the appearances displayed by the microscope in the segment of urachus below the cyst in the present case. Passing over histological details, two important statements deserve to be noted. In 24 subjects in Wutz's series there were distinct cystic dilatations of the urachal canal, which contained pus in two instances where the patients had died from septic affections. Of equal importance is Wutz's statement that the vesical orifice of the urachus is guarded by a transverse valvular fold which under normal conditions prevents the passage of urine into the urachal canal. In 1898 I expressed my hopes that these researches would be followed up in this country, but up to the present Wutz has found but few imitators. We want to know more about the valve, for instance. Is it constant? The best recent work after the Wutzian method, as I may call it, has been undertaken by Binnie and Clendenning in America. I will quote in full their summary: "Mr. Clendenning recently examined for me 16 adult cadavers and 7 fetuses, with the following results:—1. In 7 adults and 6 fetuses the bladder showed a distinct diverticulum from 1 to 2 cm. deep

at the fundus where the urachus is attached. 2. In 1 adult there was a slight projection instead of a diverticulum. 3. In 8 adults and 1 foetus the dome of the bladder was smooth. 4. In none of the cases were there found lacunae lined with epithelium in the urachus. 5. The average adult urachus was 12 cm. long by 1.5 cm. [*sic*. 1.0-1.5 cm.] wide. 6. The urachus was usually adherent to the belly-wall, but in one case (diabetic with frequent retention of urine) it was not close to the parietes but lay between loops of small intestine. 7. In all the cases the urachus was well supplied with vessels." Binnie adds: "Early in their development the urinary bladder and the urachus are completely surrounded by peritoneum except on their ventral surface where a meson (meso-cyst?) exists. This disposition usually disappears and the urachus becomes extra-peritoneal. That the meso-cyst sometimes persists was well exemplified in an adult cadaver examined for me in which the urachus did not lie close to the abdominal wall but lay between loops of small intestine. The persistence of the meson explains the occurrence of some otherwise puzzling intra-abdominal cysts." This case was the clinical evidence on which Clause 6 in the above summary was based.

The meso-urachus question is of high importance in respect to urachal cysts, especially those which have attained a large bulk. Delore and Cotte's researches were published almost simultaneously with the monograph prepared by the two American writers and, as will presently be related, they claim to have detected and removed a true urachal cyst that was intraperitoneal.

The French authorities quote Cunéo and Viau, who have found that in a section of an embryo 45 millimetres in length the intra-abdominal portion of the allantois and the umbilical arteries are for the greater part completely invested by peritoneum. This disposition persists when the allantois has begun to differentiate itself into urachus above and bladder below. It is, however, transitory, and the urachus becomes, as a rule, extraperitoneal in its entire length.

Professor A. Keith, conservator of the Museum of the Royal College of Surgeons of England, informs me that he has on several occasions detected a very considerable mesentery enfolding the urachus in adult subjects. He adds that under these circumstances the obliterated hypogastric arteries have even deeper and better marked mesenteries. Professor G. D. Thane has likewise observed this condition in several adult subjects. In these particular cases there was no evidence, I presume, that the mesentery was acquired, but Professor Keith tells me that he has never chanced to come across a meso-urachus in the new-born infant. Pathological evidence, as I will explain presently, does not lead us to believe that the urachus can acquire a mesentery after foetal life. Mr. C. B. Lockwood reminds me that different observers are not agreed as to where a "fold" ends and a "mesentery" begins, but admits that the urachus may be invested in a fold of parietal peritoneum.

Thus, on the testimony and experience of independent embryologists, anatomists, and surgeons, we learn that the urachus may possess a mesentery or at least a fold of peritoneum, representing most probably the persistence of an embryonic condition. Still, we wish to know more about this matter and about Wutz's valve, so important in respect to the question of the precise relation of a urachal cyst to a cystic fistula connected with the bladder. Therefore, it were well if some British teacher of anatomy or pathology would follow the good example of Wutz and of Binnie and Clendenning. A series of several hundred subjects investigated after Wutz's method could hardly fail to furnish fresh evidence of high value.

The Urachus and Diverticula of the Fundus of the Bladder.

Although, for reasons given in the introductory remarks at the beginning of this communication, urachal fistula must be dismissed, I may be allowed to say a few words on abnormal prolongations of the urinary bladder upwards. Garrigues discovered, in a single woman, aged 45 years, who died after hysterectomy for fibroid, a bladder prolonged nearly to the umbilicus to which it was connected by a very short urachal tube. Balfour Marshall reports a case where a patent urachus over an inch in diameter formed a tubular prolongation of the bladder and was wounded when an abdominal incision was made for ventrofixation of the uterus, though

without bad consequences. I turned attention to these diverticula in 1898,³ and have noted Binnie and Clendenning's researches above. The surgeon will hardly trouble to distinguish a diverticulum of the bladder from a patent urachus, even if there be any distinction. What concerns him is the fact that such a structure may be wounded during an abdominal section.

Tait's Pseudo-allantoic Cysts.

In 1898 I showed how the long series of cases reported by Lawson Tait had been misinterpreted by that great surgeon when he ranked them as urachal cysts, excepting one published by himself and Teichmann in *THE LANCET* twenty years ago.⁴ Several writers, who have apparently never read my criticisms, have recently expressed precisely the same views. Mériel, Binnie, and Delore and Cotte all maintain, as I did, that Tait's series were instances of encysted peritonitis, probably tuberculous, where, as I pointed out, communication between the bladder and peritoneal cavity is not infrequent. I may add that Mr. Tait himself, in a letter about my monograph in 1898, informed me that he had detected mature hair follicles in sections of the cyst wall in one case. This would imply that the cyst was a universally adherent ovarian dermoid, or a dermoid tumour derived from some other organ, but urachal it could hardly be. There were no after-histories to these cases and no verification of the relations of the cysts at necropsies. Hoffmann's case, where the cyst contained 50 litres of fluid when opened at the necropsy, was shown by Wutz to be an example of chronic hæmorrhagic peritonitis. The original report was so defective that an absurd error about the sex of the patient was included. Yet Delore and Cotte agree with Hoffmann, though rejecting Tait, and in articles on urachal cysts by living writers Tait's series and Hoffmann's equally spurious case are persistently included, as though they really represented urachal disease. The error seems, like King Charles the Second, a most unconscionable time dying. Let them be henceforth relegated to the archives of chronic peritonitis—in other words, to their proper place.

Cases of Cysts of the Urachus Recently Reported.

Two years ago W. R. Weiser published tables of nearly 90 reported cases of cysts of the urachus. These tables are indispensable for the study of their subject, but they show, as their author admits, that we cannot as yet draw from the literature of urachal cysts any sound conclusions such as may be inferred from published series of the ligature of big arteries for aneurysm, or Wertheim's operation, where at least there was always the aneurysm or the cancerous uterus to begin with. Weiser includes Tait's and Hoffmann's spurious cases and a considerable number of examples of cystic fistula, two being in his own practice.

Weiser's second case seems an authentic instance of a pure urachal cyst. It bore some relation to my own as it occurred in a young subject (a girl, aged 11 years). It gave rise to an acute attack of abdominal pain, headache, vomiting, and fever, and was markedly unsymmetrical. There was impaired resonance between the umbilicus and pubes from the left loin to about two inches to the right of the median line. When the abdominal incision was made the parietal peritoneum was found investing the posterior aspect of a large cyst which was connected inferiorly with a duct running into the bladder and patulous, let it be noted, to within three-eighths of an inch of the vesical cavity. The cyst almost filled the left side of the abdomen below the level of the umbilicus; it contained pus and had ruptured at one point into the peritoneal cavity. As much of the sac as could be dissected out without tearing through the parietal peritoneum was taken away, the cavity left behind was washed out and drained with iodoform gauze, and the patient recovered. Let it be noted that before the operation tuberculous peritonitis was suspected.

Whilst Weiser's own case is well reported, as I have stated above, no safe inferences can be drawn from his tables, so judiciously prepared that among other things the defective character of many of the reports by other writers is to be seen at a glance.⁵ Let us trust that the next writer who

³ Transactions of the Royal Medical and Chirurgical Society, vol. lxxxi., 1898, p. 307.

⁴ Congenital Cyst of the Urachus; Abdominal Section; Recovery; *THE LANCET*, Oct. 6th, 1888, p. 675.

⁵ Weiser has overlooked a case of cystic fistula reported by Unterberger. A woman had a bad fall during the first month of pregnancy. Acute backward displacement of the uterus occurred, the

² This expression, meaning, of course, mesentery of the bladder, is best discarded, lest it should be taken to signify the mesentery of a urachal cyst.

takes the trouble to tabulate all recorded cases of urachal dilatation will carefully group under separate headings: (1) fistulae; (2) primary cystic fistulae communicating from the first with the bladder or opening at the umbilicus; (3) pure urachal cysts (the subject of this communication); and (4) secondary cystic fistulae, developed from pure cysts which have acquired communications with the bladder or umbilicus. Surgically and clinically the fourth as well as the second must be carefully distinguished from the third, hence I will pass over all statistics and will now proceed to the consideration of cases of pure urachal cyst published during the last ten years, but not included in Weiser's tables. That writer, I must add, omitted Bryant's two cases which were appended to my monograph in 1898. The first was a pure cyst in a woman, and simulated an ovarian tumour, the second was a cystic fistula, primary or secondary, in a male patient.

The recent cases which I will now dwell on were under the observation of surgeons who, like myself, have enjoyed the advantage of studying the experience of others, and were thus the better able to avoid the fallacies which beset the original observer. It happens that these recent cases form a group fairly typical of every variety of pure urachal cyst, sessile on the bladder or separate, extraperitoneal or provided with a mesentery, incipient, moderately developed, or large—a most instructive series, in fact. We need not dwell on cystic dilatations detected in foetal bodies, but as surgeons we must not disregard certain records of the accidental detection of small urachal cysts in the course of operations.

Small Cysts Detected at Operations.

Morestin, a few years ago, operated upon a woman, aged 24 years, removing a suppurating Fallopian tube. When making the abdominal incision he brought to light two cysts too small to be detected by palpation. One lay above the other in juxtaposition but independent, and they occupied the middle line behind the recti and in front of the peritoneum. The urachus could be seen running from the fundus of the bladder into the lower cyst and from the upper cyst to the umbilicus. The cysts did not adhere to the peritoneum behind them. They were tense, smooth, globular, and transparent. One was opened and found to contain a limpid, colourless fluid. The outer wall consisted of connective tissue, the inner was lined with pavement epithelium. Let it be noted that there was no trace of a meso-urachus, nor in either of the cysts which I have described, which were both of moderate size, was the tumour invested with peritoneum except posteriorly. This fact would lead us to believe, as was mentioned above, that a urachal cyst does not make for itself a mesentery as it develops. When a urachal cyst is intraperitoneal the urachus most probably had a mesentery before the cyst existed.

Again, we see that Morestin operated for pyosalpinx, a suppurative condition which was localised. When that condition is more diffused an incipient urachal cyst may be involved, as in two instances recorded by Wutz, to which I have already referred. Hence, it is always possible that an abscess in the middle line below the umbilicus may have developed in the urachus. Lastly, Morestin's cysts probably represented an incipient bilocular urachal cyst, like that which I described in 1898.

Mérel of Toulouse laid open a cyst of the urachus when performing a cystotomy for retention of urine. Its walls were thin, but distinctly thicker towards the bladder,⁶ into the fundus of which it was inserted. The cyst had three walls, the outer of connective and fibrous tissue, the middle muscular, and the inner thin and smooth.

Lastly, the experience of Opitz is interesting to all who undertake abdominal sections. When performing what he calls a *relaparotomie*, in other words, when repairing an incisional hernia, he exposed a small cystic body which at first sight appeared to be a displaced and adherent vermiform appendix. On closer examination there could be little doubt that it was a urachal cyst. If so, it would seem that a segment of the urachus where the canal happened to be

unobliterated was involved in cicatricial tissue at its upper and lower limits, the canal subsequently undergoing dilatation owing to a collection of fluid and broken-down epithelium in its lumen. The main interest of this case is, however, as in Balfour Marshall's experience already mentioned, the manner in which the vagaries of the urachus and fundus of the bladder may puzzle the operator. Whilst the little cyst in this instance simulated a vermiform appendix, the big cyst in my own case gave rise to symptoms indicating appendicular abscess.

Cystic Tumours Removed by Operation.

In 1899 E. D. Ferguson operated on a man, 47 years of age; his original report is very carefully written. The tumour rose to two inches above the umbilicus and extended laterally to the iliac spines. Its surface was flat, resistant on pressure, and felt as though in the abdominal wall, yet malignant disease of the omentum was suspected. The chief symptoms were hypogastric pain and frequent desire to pass urine. It proved to be a cystic tumour containing over two quarts of a watery fluid, which unfortunately was not examined; it was intimately connected with the wall of the bladder and extended deeply into the pelvis, where the peritoneum lay behind it. Ferguson dissected away the whole lining membrane of the cyst, excepting at the umbilicus, where he found digital processes penetrating the tissues of the abdominal wall. "That portion of the posterior part of the cyst which could be placed in a fold and allow easy approximation of the peritoneum was stitched together and excised." The upper part of the abdominal incision, close to the umbilicus, was drained with gauze and the remaining portion carefully sutured. Six months after the operation the abdominal cicatrix was found to be perfectly sound.

Delore and Cotte's intraperitoneal urachal cyst, to which I have already referred, is reported in their instructive monograph on big cysts of the urachus. The patient was a girl, aged 20 years, very sickly, and believed to be the subject of tuberculous peritonitis of the ascitic type. There was uniform distension with distinct fluctuation. A large cyst was exposed when the parietal peritoneum was incised; it descended into the pelvic cavity. It contained blood-stained fluid and fibrinous masses, and when it was emptied and drawn through the abdominal incision Delore found that it was connected below with the fundus of the bladder by a short cord which formed an entirely extraperitoneal pedicle and was clearly the lowest portion of the urachus. When the cord was divided the cyst was free of all connexions with the patient's body. The broad ligaments and other peritoneal folds near the cyst were normal. The patient made a speedy recovery. The outer wall of the cyst was the muscular coat of the urachus; the inner wall had been greatly altered and deprived of its epithelium by inflammatory changes. The authors describe minutely how they found on careful dissection that the cyst was invested over the whole of its extent by the peritoneum, and that at the level of the attachment of the cord connecting it with the bladder this fold of serous membrane ceased. A tough cord ran from the pedicle over the anterior surface of the cyst and was lost in the tissues of the tumour and abdominal wall at the level of the umbilicus. In its middle portion this cord, like the cyst, was completely intraperitoneal. There can be little doubt that Delore and Cotte's tumour was a cyst developed in a urachus which possessed a mesentery, an exceptional condition observed, however, as above mentioned, by more than one writer in adult subjects where the urachus was otherwise normal. The authors are probably correct in their theory that it represented the persistence of a foetal condition. That, on the other hand, a meso-urachus can be acquired is very doubtful, for reasons given above in reference to Morestin and Mérel's incipient urachal cysts in adults.

The last in this series of recent cases has hitherto been unpublished. Mr. F. S. Eve has presented to the Museum of the Royal College of Surgeons of England a unique specimen of cystic sarcoma of the urachus and has kindly supplied me with the following notes:—

A man, aged 38 years, was admitted into the London Hospital with a swelling in the hypogastrium noticed for several weeks and associated with pain after micturition. A cystic tumour filled the lower part of the abdomen, especially to the right, where it extended towards the loin. It did not dip into the pelvis. On puncture dark blood came away; a few days later a rigor occurred with vomiting and a rise of temperature to 104°. Mr. Eve then operated, exposing a large cystic

bladder became distended, and at length urine passed entirely through the umbilicus. Rupture of an adherent ovarian cyst was suspected, but a catheter passed into the umbilicus met another introduced through the urethra. The uterus righted itself and delivery occurred at the fifth month. Unterberger gives a good summary of cases of urachal fistula and cystic fistula.

⁶ Vesicæ is misprinted *veine* in the original report.

tumour; the parietal peritoneum was reflected over its anterior and superior surface. Five pints of dark bloody material were removed. The cyst adhered to the omentum which bore engorged veins, and to an inch and a half of small intestine which was infiltrated where adherent. The adherent portion of the wall of the gut was excised and the wound closed with sutures. The lower part of the cyst was intimately connected with the bladder, the serous coat of which organ was reflected on to its surface. This peritoneal covering was divided and the cyst carefully dissected away from the bladder. During this process the bladder was opened, for the vesical wall at this point was so thin that the cavities of the cyst and the bladder were only separated by the vesical mucous membrane covered by a few muscular fibres. The opening was sutured, but not without great difficulty owing to the thinness of its walls at this point. The sutures were further protected by gauze packing. A gauze drain was passed into the pelvis and a catheter retained for a while in the bladder. Neither flatus nor feces could be made to pass after the operation and the patient died on the fourth day. There was no general peritonitis, but the pelvic peritoneum had become inflamed at the point where the gauze had been applied.

Mr. Eve examined the specimen and found that it was a large allantoic cyst separated from the posterior superior surface of the bladder by nothing except a very much thinned mucous membrane. Their cavities, however, did not communicate. The inner wall of the cyst was lined at certain points with very vascular polypoid masses which proved on microscopical examination to be sarcomatous. The most unusual feature of this cyst was its malignancy, but its peritoneal relations were of greater importance in respect to the subject of this communication.

Aveling and Bland-Sutton have already reported a case of multilocular myosarcoma of the sheath of the urachus, but it did not involve the urachal canal and was quite unconnected with the bladder. The specimen No. 417B in the pathological series of the Museum of the Royal College of Surgeons of England was supposed, when first examined, to have developed in the urachus, but Mr. J. H. Targett considered that it was a myxo-sarcoma which originated in the connective tissue surrounding the bladder.

Mr. Eve's cystic sarcoma seemed to possess a partial peritoneal investment, as in Delore and Cotte's case, but it was sessile on the bladder, whilst in the latter case the cyst was separated from the bladder by a segment of urachus. In the instances of extraperitoneal urachal cyst above noted the tumour was sessile on the bladder in E. D. Ferguson's case, and so also was the bilocular cyst which I reported in 1898. On the other hand, in the case which is the subject of this communication the cyst and the bladder were separated by a segment of urachus. These opposite relations of cyst to bladder were demonstrated respectively in the incipient tumours discovered by Morestin and Mériel.

The malformation of the genitals, a unique feature in my case, deserves a little consideration. After discussing it I will dwell once more on the extreme asymmetry of the cyst which together with the inflammatory complications in its neighbourhood simulated appendicular abscess. In conclusion I will comment on the surgery of pure urachal cysts.

Relation of the Urachal Cyst to the Arrested Development of the Genital Tract.

In my case it was clear that there was not a cystic urachal fistula but a pure urachal cyst which was separated by a short cord, the lowest part of the urachus, from the bladder. There was no evidence of malformation of the bladder itself; its fundus and anterior portion as well as the urethra were normal, nor was there any sign of abnormality in the ureters sufficient to interfere with their functions. The structures making up the vulva were also well developed and the lower part of the vagina was present, nor had either genital gland strayed into the inguinal canal. On the other hand, the upper part of the genital tract showed marked arrest of development. The short canal, which transmitted menstrual blood into the right side of the blind end of the vagina, represented the upper part of the vagina, the cervix, and more or less of a right uterine cornu with its endometrium. The firm, moveable body above and behind the blind end of the vagina was most probably the left cornu connected with the right by a thin band, as is not rarely seen in cases of uterus unicornis in parous women. These relations were not difficult to define after the patient had recovered from the operation, and no cyst remained to interfere with bimanual palpation. I admit that the body which felt like the left cornu might have been the left ovary, in which case the cornu would more probably be suppressed altogether. I made out during the operation an ovary-like structure close to the right cornu. The presence or absence

of the Fallopian tubes and the disposition of the pelvic peritoneum remain mysterious, though there was no trace of a hæmatosalpinx or a hæmatometra. Although there were no external signs of hermaphroditism, I cannot say positively that both genital glands must have been ovaries. Dr. A. Broca recently operated for double inguinal hernia on a subject who was a female according to all external appearances. The vagina, clitoris, and hymen appeared normal, yet both genital glands were true testicles. Each occupied a hernial sac.

Some pathological change early in foetal life must have caused the two abnormal conditions. Professor Keith in his recent museum demonstrations at the Royal College of Surgeons of England explained how there was every reason to believe that disease of adjacent maternal structures, such as endometritis, prejudicially affects the normal evolution of foetal elements derived from the allantois, and the same may be said of the gradual conversion of Müller's duct into Fallopian tubes, uterus, and vagina. For the cystic condition of the urachus and the arrested development of the uterus in my case there must have been a common cause. The urachal cyst presumably represented in a very mitigated form the arrest of development known when extreme as ectopia vesicæ.⁸ In this distressing variety of malformation and also in complete ectopia of the abdominal viscera non-union of Müller's ducts has repeatedly been observed (E. Chill, Author). According to A. Keith the uterus is double in one out of six specimens of ectopia vesicæ in London museums, whilst in seven specimens of ectopia in females combined with an open yolk sac Müller's ducts are unfused in all.

The faulty condition of the genital tract in my case was of little surgical interest, as it was not of a kind such as could be remedied by the knife or by some plastic procedure. It was the condition of the urachus which demanded operative interference.

Asymmetry of Urachal Cysts.

In the present case the cyst lay in the right iliac fossa, the middle line forming its limits to the left. Some intestine was adherent to the cyst on the right, so that there was resonance on percussion, and there was likewise local pain and tenderness. Thus an asymmetrical urachal cyst may simulate appendicular abscess.

Arguing without clinical evidence we might conclude that a urachal cyst would develop symmetrically. This conclusion, however, is belied by experience. In the remarks on recent reports given above it was noted that in Weiser's case the cyst filled the left side of the abdomen, whilst Eve's cystic sarcoma lay mainly to the left. The cyst removed by Douglas of Nashville in 1897 was also asymmetrical, distending the abdomen chiefly to the right.

This asymmetry becomes less surprising when we remember that it often exists from the beginning. Delore and Cotte, speaking of minute urachal cysts as described by pathologists, observe that these dilatations sometimes involve the entire lumen and circumference at the point of the urachus where they develop, but that as a rule they affect only a portion and form true diverticula, which may become completely isolated from the canal of the urachus. Thus the pathology of this asymmetry is very clear and its clinical importance quite evident.

Association of Urachal Cysts with Peritonitis.

The symptoms of peritonitis in this case, where there was a conspicuous swelling in the right iliac region, indicated appendicular abscess. Peritonitis had developed around an asymmetrical cyst of the urachus. The first attack of pain occurred at a menstrual period, so that when the atresia was detected I naturally suspected retained menses. But the

⁷ Compare the case recently reported by Arnolds in the *Monatsschrift für Geburtshilfe und Gynäkologie*, October, 1908 (vol. xxviii.), p. 463, where an operation was performed on a married man, aged 59 years, subject to diabetes, for the removal of a "tumour of the left testis." The "tumour" proved to be a uterus bicornis with well-developed Fallopian tubes and a pair of testes each with an epididymis, but neither had a vas deferens. See also Cornil and Brossard "Un cas de Coexistence dans la Tunique Vaginale d'un Uterus, de deux Trompes et de deux Testicules," *Revue de Gynécologie et de Chirurgie Abdominale*, March-April, 1908. The patient was a man aged 26 years. See also Cranwell's long series, *Les Hernies Inguinales de l'Uterus*, *ibid.*, Sept.-Oct., 1908, p. 777.

⁸ Epispadias is the rule in ectopia vesicæ in males: A. Keith finds that hypospadias is not associated with this condition. In Bryant's second case of urachal cyst, or rather cystic fistula (*vide supra*), there was slight hypospadias.

swelling did not increase during the next monthly period when the patient was under my care, and I found at the operation that it was not a hæmatometra or a hæmatosalpinx. We must therefore turn back to the local peritonitis. The patient in this case was evidently exposed to some unfavourable influence which caused peritonitis around the cyst.

In my first case, reported in 1898, the patient, aged 59 years, had been subject for nine months to pain in the lower part of the abdomen; the cyst was then detected, and symptoms of peritonitis came on periodically until two months later, when I operated. I find on referring to my original case-book that the menopause had become complete over nine years before—that is, when the patient was about 50. In fact, there is no reason to believe that the catamenia had anything to do with either case. In both I found omental and intestinal adhesions to the parietal peritoneum lining the back of the cyst. Other writers, Delore and Cotte, Weiser, &c., have reported similar complications. Indeed, peritonitis seems to be the rule when a urachal cyst has reached proportions sufficient to give rise to symptoms leading to its detection.

These symptoms appear very irregularly, which is one reason why *encysted dropsies* and *tuberculous peritonitis* are so apt to be confounded with urachal cysts. The error of mistaking the former for the latter, into which Hoffmann and Tait fell, has, as I have been at some pains to explain, greatly impaired the value of statistical records of urachal tumours.

Age.—In the present case the patient was 17 years of age, in Weiser's she was only 11 years, and in Delore and Cotte's 20 years. Urachal cysts are relatively frequent in young girls, and as they are likewise subject to tuberculous peritonitis and to inflammation of the vermiform appendix we can see how easily errors of diagnosis may occur.

Surgical Treatment of Pure Urachal Cyst.

Any communication between the interior of a urachal cyst and the cavity of the bladder, or the surface of the body at the umbilicus, greatly increases the difficulties and dangers of operative measures. It is partly on that account that I have confined my observations almost entirely to pure urachal cysts. Whenever it seems fairly clear that a cyst of this kind can be extirpated without the dangers of dissecting in the dark amidst uncertain relations posteriorly the radical operation should be undertaken. This, however, itself not free from risk even under the most favourable circumstances, is not always possible, as shown by the reports of many surgeons, whilst in the present case the posterior wall, for special reasons already given, could not have been safely separated from the abnormal structures in close relation to it. We must remember that in urachal fistula the insertion of the ureters into the bladder may be abnormally high (Mikulicz), and we are dealing with a malformation closely related to fistula. The surgeon must in many cases be content with partial measures which, as I have explained, were successful in Weiser's, E. D. Ferguson's, and my own two operations. As much as possible of the inner lining membrane must be dissected away; in the present case this was readily effected, but in my 1898 case it was impracticable, the membrane having been destroyed by degenerative changes. Partly on that account and partly because the tumour was bilocular I found drainage necessary. A sinus developed but closed within six months, nor did it ever open again. The patient died from cancer of the pylorus and pancreas six years later. In the present case there was no indication for drainage. The firm and fairly thick main wall of the cyst, fibromuscular or purely fibrous, is very favourable for treatment by whip-stitching or any similar plastic procedure suitable according to circumstances.

During the operation, complete or partial, the surgeon must always carefully ascertain the relations of the cyst to the bladder. If the cyst be sessile it may be impossible to remove it without damage to the walls of the bladder, which will therefore require repair by suture. When, on the other hand, the cyst is separated from the bladder by a segment of urachus, it must be remembered that the segment may have an open canal communicating with the bladder. The microscope showed that in the present case (Fig. 2) it was open, although there was no proof that it actually ended unobstructed in the bladder. Lest a urinary fistula should develop, as appears to have happened in a case described

by Ill many years ago, that writer treats the divided segment as though it were a vermiform appendix, turning in its cut edges and applying a Lembert suture. In the present case I transfixed the segment and tied it as though it were a pedicle of an ovarian cyst. In any case, it should not be tied without transfixion as though it were an artery. The loop might easily loosen or come away, and the canal would then be patulous. We know that this may happen when the stumps of both Fallopian tubes have been ligatured in a double ovariectomy, as pregnancy has followed, which means that the canal of one tubal stump must have transmitted an ovum from the relics of one ovary. Should the ligature come away from the urachal stump a urinary fistula of a very bad type would develop if Wutz's valve were forced open by over-distension of the bladder. The risk of such a complication under these circumstances, and the fact that a pure urachal cyst in males is occasionally converted into a secondary cystic fistula full of urine, reminds the surgeon that, as I have already remarked, we ought to be more sure about Wutz's vesico-urachal valve, or whatever it may be, that really protects the vesical orifice of the urachus.

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THE ALCOHOL INJECTION TREATMENT FOR NEURALGIA AND SPASM.

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THE treatment of trigeminal neuralgia, or "tic douloureux," by means of drugs, electricity, vibration, percussion of the nerves at their points of exit from the foramina upon the face, and other devices of various kinds has always proved a failure in genuine severe cases of this extremely painful disease, ever since Trousseau 50 years ago drew attention to it under the title of "epileptiform neuralgia." Peripheral injection of the painful spots by means of osmic acid, chloroform, cocaine, &c., has given relief for short periods, varying from hours to a few weeks, but hitherto real relief has only been obtainable by means of surgical aid. Resection of the various branches of the fifth nerve, either peripherally at their points of exit from the foramina upon the face, or more centrally in the zygomatic fossa, or intracranially, has brought relief from the pain for several months or even years, the results being generally better the nearer the resection is done to the Gasserian ganglion. Permanent cure does not result from resection, as with the regeneration of the nerve fibres and consequent disappearance of the anaesthesia on the face which was produced by the division of the nerve the pain returns eventually with equal or greater severity, probably being hastened in some cases through the irritation of the nerve by the cicatricial contraction of the scar tissue resulting from the cutting operation. This scar tissue produced by resection operations makes a second operation at the same spot practically impossible, and