we have found a bouillon culture of moderately virulent typhoid bacilli of eighteen to twenty hours' growth at 35° C. to be preferable to suspensions from agar cultures for making the examinations. The specimens for examinations are sent either as dried blood on glass slides or as blister serum in small tubes. The first has the advantage of being quickly obtained, the latter of permitting more accurate work in dilutions. The blister fluid is obtained by means of cantharides plaster, and has proved to be very satisfactory. We depend on the reaction which occurs during the first fifteen minutes after the mingling of the serum and bacilli. A marked reaction occurring in a 1 to 10 dilution of blood or serum we consider to indicate a probable typhoid infection, a marked immediate reaction in a 1 to 20 dilution as indicating a positive typhoid infection. The absence of reaction in any single examination we consider to be of little diagnostic value. We have met with cases where typhoid infection was certain, but where, clinically speaking, typhoid fever did not exist, namely, typhoid abscesses in liver, kidney, etc.

We have recently been greatly interested in trying to obtain the typhoid bacilli from stools, urine, etc., by a new method devised by one of the assistant bacteriologists of the Health Department, Dr. Philip Hanson Hiss. Several months' trials have given very encouraging results.

DR. HISS'S METHOD OF DIFFERENTIATION.

Two media have been devised by him. One for the differentiation of the bacillus typhosus from the various members of the colon group by tube culture, and one for the differentiation of the colonies of the bacillus typhosus from those of the colon group by plate culture. The tube medium contains agar 5 g., gelatine 80 g., NaCl 5 g., extract of beef (Liebig's) 5 g., and glucose 10 g. to the litre, and has a reaction indicating 1.5 per cent. of normal acid, phenolphthalein being the indicator. In this medium the growth of the typhoid bacillus produces a uniform clouding at 37° C. within eighteen hours. The colon cultures do not give the uniform clouding, and present several appearances, dependent upon differences in their motility.

The plating medium contains agar 10 g., gelatine 25 g., NaCl 5 g., beef extract 5 g., and glucose 10 g. to the litre, and reacts 2 per cent. acid to phenolphthalein. The colonies of the bacillus typhosus in plate cultures made with this medium give rise to fringing threads and outgrowths, and are small. The colon colonies are larger and do not form threads. These colonies develop within eighteen hours, and the tube medium may then be inoculated from them. This in its turn gives its characteristic appearance in eighteen hours. The whole process taking but thirty-six hours at 37° C.

The bacillus typhosus alone, of all the organisms investigated during these experiments, has displayed the power of giving rise both to the thread-forming colonies in the plating medium, and to the uniform clouding of the tube medium when exposed to a temperature of 37° C. Hence these two characters in combination have proved of great value in the isolation and identification of the bacillus typhosus, and may even prove diagnostic. The practical application of these media has led to the ready detection and isolation of the bacillus typhosus from the stools and urine of patients suffering from typhoid fever. After the first week the typhoid bacilli have been obtained on the first examination in about 50 per cent. of the cases.

THE Company of Grocers has given £250 in aid of the sustentation fund of Guy's Hospital, and £250 towards the funds of St. Thomas's Hospital.

SCOTTISH BRANCH OF THE QUEEN VICTORIA JUBILEE INSTITUTE FOR NURSES.—According to the ninth annual report which we have received, the Council is extending its work, twelve new branches having been affiliated during the year, making a total of ninety affiliated associations with 146 nurses at work. In Edinburgh and Leith, which is nursed from the Training Home, 3,381 cases have been visited; total of visits paid 65,149, the majority of these patients having been sent by the medical men, and out of the number visited only 138 have been sent to hospitals. This is a significant fact, as it points to the value of the nurse's attendance in preventing the patient coming on the hospital for indoor treatment. We are of opinion that it is sound economy to provide liberally for the nursing of the sick poor in their own homes; the services of these valuable nurses should be placed within the reach of every poor person. Unfortunately the report speaks of a serious deficit in the annual subscriptions, and a balance on the wrong side of over £600; this useful Society has suffered with many others in the diversion of funds during this Jubilee year.

A CASE OF PANCREATIC CYST TREATED BY INCISION AND DRAINAGE, WITH COMMENTS *

By ALBAN DORAN, F.R.C.S.,
Surgeon to the Samaritan Free Hospital.

IN the case of ovarian cysts in the early days of ovariectomy there were at least two points fairly definite. The nature of the cyst was, as a rule, easy to determine, at least anatomically. Its removal was clearly the right course to pursue, whatever the dangers of operation might be. On the other hand, the precise nature and relations of a pancreatic cyst are not always to be made out even by an exploratory operation, nor is it certain that its extirpation is always justifiable even if practicable. Drainage after incision, disastrous for an ovarian cyst, seems to answer well when the cyst is connected with the pancreas.

A patient study of the pathology, diagnosis, and treatment of the disease in question can alone ensure progress in the right direction. Already the literary records of pancreatic disease within the past twenty years have grown voluminous, and the whole subject cannot be discussed satisfactorily in one memoir. The present communication will therefore consist simply of an account of my own case, with comments on its principal features based upon the experience of others.

E. H., aged 24, single, domestic servant, a patient of Dr. J. Williams, of Connaught Street, W., was admitted into my wards at the Samaritan Free Hospital on May 21st, 1897, on account of a prominent abdominal tumour. To all appearances she was a cheerful, well-nourished, healthy-looking girl, who might have passed for 18 or 19 years of age. Her complexion was perfectly clear, free from sallowness, jaundice, or from any of the usual signs of anæmia, nor did her features express suffering. Her pupils were much dilated, and the uvula elongated. The pulse was 84, the temperature normal or subnormal.

The history was somewhat at variance with these appearances. Four years previously she had suffered from melancholia, and the affection returned a year later, lasting over ten months. She was very quiet during the attacks, but then, as in hospital, she was restless at night, often jumping out of bed in her sleep. No history of any fall or injury could be obtained, but it is clear that she might have injured herself under the above circumstances.

For the last two years her friends noticed that the abdomen was enlarging. Nearly eighteen months ago she had fits of spasmodic pain in the epigastrium with nausea, but no vomiting. These pains gradually became more frequent, though not very violent, and, before admission, occurred about every third or fourth day. She, however, gained rather than lost flesh and her mental condition greatly improved.

The abdominal tumour was remarkably prominent, and still more remarkably movable. Fig. 1 shows the range of its mobility. As the patient lay down it appeared to be seated in the left part of the abdomen superiorly, reaching the left loin, the ribs, and the umbilical region; it extended to about 2 inches beyond the middle line to the right, and 3 inches below the umbilicus. It could, however, be pushed to the right till it was perfectly central in position; then there was a clear note in the left loin, and resonance between the tumour and the liver.

The tumour fluctuated distinctly, and its surface felt very smooth. There was no resonance on percussion, excepting occasionally in the course of the first week in hospital, when, a clear note could be obtained over a soft prominence on the lowest limits of the tumour to the right. It was evidently part of the alimentary canal, and proved to be the stomach.

The uterus was small and movable, and unconnected with the tumour. I explored the pelvis carefully, as I have removed tumours from the lumbar and hypochondriac regions, which proved to be ovarian cysts twisted off their pedicles. The urine was perfectly normal, nor was there any evidence, of any hepatic or thoracic disorder. The fæces were solid, fairly dark, and never pale.

* Read at a meeting of the Medical Society of London, December 13th, 1897.

Altogether, the tumour seemed to me to be most probably renal, but I thought of cysts of the pancreas and transverse mesocolon. Unfortunately, the clinical history of spasmodic pain in the epigastrium was not obtained till after the operation. The patient stoutly declared before it that she had never suffered from any pain. Just a day before the operation the

Fig. 1.—Sketch showing range of mobility of pancreatic cyst. Author's case. a, Site of a bulging soft structure, which proved to be the stomach.

history of two attacks of melancholia was obtained. When the nature of the tumour was made clear, Dr. J. Williams succeeded, not without great trouble, in getting a complete clinical history. Not knowing the above history, I did not think pancreatic disease very probable.

I strongly object to paracentesis in cases of doubtful tumour, for I know of selected "dull" areas proving to be empty flattened-out gut, and I dread blood vessels and papilloma. On May 29th, 1897, I made an exploratory incision, assisted by Mr. Targett, beginning close below the umbilicus. I had to enlarge the wound freely, upwards and downwards, for the first object I discovered was the stomach drawn tightly over the front of the cyst anteriorly and inferiorly. (Fig. 2.) The lesser omentum was stretched over the upper part. The great omentum hung from the lower border of the stomach, freely downwards; its vessels were extremely dilated and tortuous. It hung down, free from any adhesions, reaching to the hypogastrium, and bore much fat; the transverse colon was completely below the cyst. The pelvic organs were normal. I passed my hands up behind the great omentum, and found that the tumour lay too high to be tapped below the level of the umbilicus. I noticed that the transverse colon could be pushed down; in fact, the transverse mesocolon was certainly not opened up, nor was the mesentery involved.

Having divided two inches of the lesser omentum on the most prominent part of the cyst, I exposed a distinct wall, and there was no trace of clot. By aid of an aspirator, 44 ounces of fluid were drawn off. This fluid was opaque, greasy, ochreous, and free from odour. The Clinical Research Association examined the fluid, and sent me the following report (Mr. Targett carefully searched for hooklets, but could find none, nor was there any trace of old hydatid membrane):

"July 18th, 1897. This fluid is faintly alkaline, of a dark-straw colour; specific gravity 1011, free from odour; it contains a considerable quantity of albumen. On standing, an oily substance formed on the surface, consisting of fat and cholesterine crystals. There was also a crystalline precipitate which proved to be insoluble in alcohol, chloroform, or ether, and was certainly not fatty in nature. In appearance the crystals suggested tyrosin, but did not give the reaction of this substance; the quantity was too small for identification. On microscopical examination, no hairs or other characteristic elements were found.—C. H. WELLS, Secretary."

Fixing a T-forceps on the puncture in the cyst, now well collapsed, I searched with my hand above and to right and left of the cyst. There were no adhesions, the kidneys and spleen could be felt, the diaphragm was not involved, the liver and gall bladder were quite healthy. The base of the cyst did not reach either loin, but was incorporated with a wide area of the pancreas immediately to the left of the head. I cautiously attempted to enucleate the cyst around the puncture, but big veins soon appeared, and I thought it best not even to excise a portion of the cyst wall. As I found that it sprang from the pancreas, and that no pedicle could be formed as in certain cases where a pancreatic cyst has been successfully excised, I did not contemplate the total removal of the tumour.

Fig. 2.—Parts exposed at operation. Author's case. Lr.O., lesser omentum on cyst; St., stomach on cyst; G.C.L., "gastro-colic ligament," below cyst; T.C., transverse colon; Gt.O., great omentum, below cyst. (See Fig. 4.)

I determined upon thorough drainage, with precautions. I sewed the parietal peritoneum and the cut borders of the lesser omentum to the cyst wall around the puncture, using No. 1 China twist. I passed deep silkworm-gut sutures into the abdominal wound above and below the cyst, tied them, and trimmed away the umbilical cicatrix. To make sure that the cyst was held secure, and acting on a suggestion of Mr. Targett's, I passed a No. 4 silk, both above and below the puncture, through all the layers of the wound, the lesser omentum and the cyst wall, and tied the two silks.

Lastly, the T-forceps was taken off, the puncture enlarged, and a 6-inch glass drainage tube passed into the cavity of the cyst. This tube passed backwards and also very much upwards, as the stomach pressed on the under surface of the emptied cyst. The wall of the cyst was tough, and about an eighth of an inch thick, its outer surface pale yellow, its inner looked dull red and spongy, but was not vascular. The wound was now dressed, and the patient returned to bed.

AFTER-TREATMENT.

The patient went on very well after the operation, but gave some trouble, owing to two complications. An attack of tonsillitis and urticaria set in at the end of the first week, when the weather was intensely hot, but soon subsided, the temperature never rising higher than 100.6°. More serious was the great restlessness during sleep, an old-standing

nervous symptom. When awake, the patient was remarkably quiet and obedient; directly she fell asleep, excitement set in, and she tried to slip out of bed. Her brother informed us that he was troubled in the same way after an operation for hernia, and he seems to have been a somnambulist from childhood.

Owing to the restlessness, I removed the glass tube on the second day, and replaced it by 6 inches of red rubber tubing. From first to last there was free discharge from the cavity of the cyst, staining the dressings; for a day or two after the operation it was pinkish and turbid, but for two weeks afterwards it appeared as a colourless, slightly viscid, alkaline fluid like saliva. According to two reports prepared for me by the Clinical Research Association, this colourless fluid had an extremely well-marked amylolytic power. Towards the end of the month the fluid got mixed up with discharge from the granulations in the integument around the drainage track, and hence could not be satisfactorily analysed.

Although there was much urticaria on the chest and hypogastrium at the beginning of the second week, the skin round the drainage tube never showed any signs of irritation.

The treatment consisted in washing out the cavity daily with a 1 in 20 solution of sulphurous acid. After the middle of the second week the patient rapidly gained flesh. She was discharged on July 7th, 1897. The abdominal wound had united well; it was 4 inches long. The drainage track, opened nearly 3 inches below the ensiform cartilage, and was about $3\frac{1}{2}$ inches deep. The temperature had been quite normal for three weeks, and the patient was strong and able to walk about. There was still enough daily discharge to soak through two layers of gauze and stain the strapping laid over them. A short piece of tubing was left in the orifice of the track, which I thought advisable to keep open for awhile.

At the end of November the patient was in excellent health and had grown stout. The discharge during the first fortnight, which she spent at home, had been very scanty and thick, owing to pus from the granulations around the drainage track in the parietes. Once or twice a week a few drops of clear fluid issued from the track. The last occasion on which I examined the abdomen was November 17th. The cicatrix was strong, the epigastrium concave, and no trace of any tumour could be felt on palpation. The integuments showed no sign of irritation. Having described the case, I will now discuss its principal features of interest.

AGE OF THE PATIENT.

The patient in this case was of an age at which pancreatic cystic disease is relatively frequent—indeed, a quarter of over 100 recorded cases occurred in men or women between 20 and 30 years old. The oldest case was 76 (Stieda).¹ On the other hand the youngest patient, who was under the charge of Dr. Railton, of Manchester, was a female infant 6 months old. The tumour in this instance was a true cyst springing from the tail of the pancreas; its wall was thick and tough. The youngest patient submitted to operation was a boy under 4 years of age (Schoenborn, see Heinrichius). He recovered after incision and drainage with iodoform gauze.

DILATATION OR CONTRACTION OF PUPILS.

The pupils were much dilated before and after the operation. In Treves's case they were contracted almost to pinholes before the abdomen was opened, and remained so for a fortnight afterwards, just as though the patient were under morphine. Theodore Fisher, however, doubts whether the tumour in this case was a true pancreatic growth and not a peritoneal sanguineous cyst. I cannot find any more facts of general value in respect to this question of the pupil in the disease under consideration.

ABSENCE OF GLYCOSURIA.

The urine was perfectly normal before and after operation. I have no time to dwell on that deep physiological question—the relation of diabetes to pancreatic disease. Sugar may be absent in the urine when much of the pancreas is taken up by the cyst. On the other hand, Horrocks, of Bradford, recently observed glycosuria in a man, aged 56, who died of exhaustion. A large cyst occupied the site of the pancreas; no normal glandular tissue could be found, and the duct of

Wirsung could not be entered by a probe. At the duodenal end of the cyst, however, a stone of the size of a pigeon's egg was felt loosely impacted in the contiguous common bile duct. Churton's case of pancreatic cyst with diabetes is better known. Very remarkable is Zweifel's experience. In his patient the urine was free from sugar when first examined, then he removed the pancreatic cyst. On the eleventh day sugar appeared in the urine and did not disappear for three weeks. In my own case the faeces throughout seemed healthy. The pulse, 84 before operation, was usually about 96 during convalescence. Perhaps the relative slowness before the cyst was emptied was due to irritation of the vagus from pressure on the solar plexus. There was never any dislike to fats or any other article of diet.

INJURY AS A CAUSE OF THE DISEASE: EPIGASTRIC PAIN AS A DIAGNOSTIC FEATURE.

The history of melancholia is of interest, as depression is noticed in cystic disease of the pancreas. The chief importance of this complication, in my own case, lies in the possibility of injury during one of the attacks of restlessness from which the patient suffered at the same time. The relation of pancreatic cysts to injuries of the pancreas is well known, but time will not allow me to discuss it. I failed to trace any history of direct violence as is common in the blood cysts of the lesser cavity of the peritoneum, so well described by Theodore Fisher and Jordan Lloyd.

On the testimony of her relatives the patient suffered from fits of spasmodic pain, as I have stated. She denied that she ever suffered, and it was not till after the operation that I, with the assistance of Dr. J. Williams, learnt the truth. Her declaration that there had been no pain misled me. We know, however, that pancreatic cysts do not always cause marked pain. On the other hand, other rare tumours in the upper and middle part of the abdomen are painful. In the case of Gooding of Cheltenham (a cyst of the great omentum) there was sickness and occasional vomiting after meals, and a great deal of shooting and aching pain in and about the tumour. Precisely the same symptoms have been noted in patients with pancreatic cysts.

The patient had gained flesh shortly before the operation, which in itself would seem remarkable, since the cyst had a broad attachment near the head, and was of considerable size. Emaciation is seen under such circumstances, and is observed when a large blood cyst presses on the pancreas. I will dwell no longer on this symptom, however, as I think it of little value in this case. The gain of flesh was due no doubt to the disappearance of the mental depression which had troubled her previously.

BROAD-BASED TUMOURS MAY FEEL MOVABLE: FLUCTUATION.

The tumour could be moved laterally, yet its base was fairly broad, and there was no pedicle. Similar lateral mobility, however, is seen in perfectly sessile broad ligament cysts, which rise high out of the pelvis, especially when they are not very tense. The majority of pancreatic cysts appear to be movable. Fluctuation was marked, and Heinrichius finds that this symptom is the rule, though Treves declares that "fluctuation is very seldom to be obtained."

TAPPING OBJECTIONABLE, EVEN FOR DIAGNOSIS.

I repeat that I strongly object to paracentesis in cases of doubtful abdominal tumour. I have seen fatal results even where the greatest skill and care had been at the patient's disposal. Experience shows that should the tumour prove to be a pancreatic cyst, the danger is considerable. Churton demurs to treatment by incision in diabetic cases, and prefers aspiration, "even if requiring repetition." "Diabetic patients," he writes, "are more likely to become a prey to septic infection, as happened in the present case." I cannot agree with such an opinion. Dr. Churton's case lived a year after incision of the cyst. On the other hand, I should feel inclined to leave alone altogether one of these diabetic cases—at least, until Dr. Churton or some other able physician had cured the diabetes. Again, in Karewsky's, Le Dentu's, and Jacobson's cases the stomach was inadvertently perforated by the aspirator. Such an accident is best avoided, even when we know that, as in Annandale's case, aspiration may ensure accurate diagnosis. Escape of cyst contents may cause severe sym-

ptoms, as in the case of McPhedran (Toronto), where an incision was made and the abdominal wound closed without drainage—a practice even more dangerous in cases of this disease than aspiration. Senn's theory—that normal pancreatic juice cannot hurt the peritoneum—does not apply here, for the juice is seldom if ever normal in the cyst, though it often becomes so after draining.

DILATATION OF VESSELS OF GREAT OMENTUM.

The extreme dilatation of the vessels of the great omentum, entirely below the tumour, was remarkable. Theodore Fisher has already noted that they are often enlarged in pancreatic cystic disease, and in cases of blood cysts of the lesser peritoneal cavity (Jordan Lloyd, Case 2). On the other hand, cysts of the great omentum do not appear to cause dilatation of its vessels. There was no dilatation in Simon's case, in Sir Spencer Wells's case (where I assisted), nor in Dr. Bantock's, which I described sixteen years since; nor is this condition noted in Gooding's, Ormsby's, or Hearn's cases. As in Hearn's and Ormsby's, the cyst was multilocular (indeed there was solid matter in Ormsby's cyst), the vessels were probably dilated to a certain extent. In my case of pancreatic cyst, the great omentum was otherwise quite healthy. It does not become liable, when a pancreatic cyst develops, to disseminated fat necrosis such as Körte has seen in suppurative pancreatitis.

SURGICAL IMPORTANCE OF DEFINING PERITONEAL RELATIONS.

The relation of the cyst to the adjacent peritoneal folds is one of the most interesting features in cases of this kind; but as a general subject it is so well known that I need not dwell on previous experience at any length. Hersche in his commentary on von Hacker's case (Fig. 3) gives the best description of the different ways in which a pancreatic cyst may displace the peritoneum.

Fig. 3.—Parts exposed at operation. Von Hacker's case (after Hersche). The transverse colon (T.C.) lies on the top of the cyst (Cy.), which is invested in front by the descending layer of the transverse mesocolon. The small intestines (S.Int.) are seen below the cyst. (See Fig. 7).

First, the cyst may project into the lesser cavity of the peritoneum, pushing forward the lesser omentum. The stomach will then lie on the lower part of the front of the cyst² (Fig. 4). This is the highest position, in respect to

peritoneal folds, that a pancreatic cyst can occupy, and it is a rare position. Hersche and Heinricius can only find a few examples (Riegner, Karewsky). My own case comes in this class. What settled the class in the case under discussion

Fig 4.

Fig. 4.—Pancreatic cyst in lesser cavity of peritoneum. The anterior aspect of the cyst bears the lesser omentum and stomach as part of its capsule. (Author's case; see Fig. 2.) P, pancreas; Cy., cyst; St., stomach; T.C., transverse colon. (Figs. 4 to 8 are after Hersche and Heinricius)¹

Fig 5.

Fig. 5.—Pancreatic cyst in lesser cavity of peritoneum, but lower than in Fig. 4, the stomach investing its upper part. (McPhedran's case.)

was the fact that not only did I see the lesser omentum and stomach on the face of the cyst, but I found the upper part of the great omentum ("gastro-colic ligament") hanging freely from the lower border of the stomach, which precisely corresponded to the lower border of the cyst, and I noted that the transverse meso-colon passed entirely under the tumour.

Fig 6.

Fig. 6.—Pancreatic cyst, chiefly invested by the upper or ascending layer of the transverse mesocolon. The colon lies low on the anterior surface of the cyst. (Salzer's case.)

Fig 7

Fig. 7.—Pancreatic cyst, chiefly invested by the lower or descending layer of the transverse mesocolon. The colon lies high on the anterior surface of the cyst. (Von Hacker's case; see Fig. 3.)

More frequently, when the lesser cavity is occupied by the cyst, the great omentum, especially its gastro-colic portion, is stretched forwards, then the stomach lies on the upper part

of the front of the cyst (Fig. 5, McPhedian's case). Sometimes the transverse mesocolon is opened up. Then, as Hersche has lucidly demonstrated, if the layers be opened up evenly, the colon must lie across the middle of the cyst. He notes, however, that experience shows that the layers tend to get opened very unevenly. Then when the upper layer of the transverse mesocolon is invaded, the transverse colon must lie on the lower part of the front of the cyst (Salzer's case, Fig. 6); if the lower layer be principally involved, the colon, as in von Hacker's case, will be found on the upper part of the front of the cyst (Fig. 7). This latter form, as Hersche shows, is rare. Lastly, the lowest position for the cyst is in the general peritoneal cavity below the lower layer of the transverse mesocolon (Fig. 8). Heinrichs declares that his second case was of this class; in another instance (Shattock and Bernard Pitts) the true mesentery invested the front of the cyst. The colon and its mesentery lay free from the cyst and far above it, as in my case they lay free from the cyst and well below it. Thus Hersche's simple demonstration will always aid the operator if he bear it in mind, and will make much handling unnecessary.

Fig 8.

Fig. 8.—Pancreatic cyst in the general peritoneal cavity, entirely below the transverse mesocolon. (Heinrichs's case.)

The relations of the cyst to the peritoneum anteriorly were very evident in my case. As to posterior relations, I suspect that growths of this kind sometimes burst through the peritoneum in front of the pancreas so that their outer wall lies free in the lesser peritoneal cavity. Körte and others have shown that rupture of the peritoneum seems common when effusions due to pancreatitis (Körte) or hæmorrhage (Jordan Lloyd) near the pancreas press forwards. Very probably a cyst sets up inflammatory irritation at first, and then perforates the peritoneum. This would account for the occasional freedom of the ascending layer of the transverse mesocolon from any part of the cyst, as I observed at my own operation. Let us remember the relation of the body of the pancreas to that fold, and also bear in mind Hersche's demonstration that the same layer has been known to form the capsule of the cyst, the colon being then stretched over the lower part of the cyst wall. It is difficult to see, then, how a cyst could avoid pushing forwards the ascending layer of the transverse mesocolon unless it perforated the peritoneum,

actually in contact with the pancreas, at a very early stage of its development. A cyst might push forward the peritoneum above the pancreas if it arose entirely from the upper margin of that gland, but in my case the cyst was fixed by a broad attachment to the anterior aspect of the pancreas.

THE WALL OF THE CYST.

I have little or no doubt that the wall of the cyst was a true wall, and not a product of inflammation. I did not cut away a portion for microscopic examination, as I was specially anxious not to let a drop of fluid escape into the peritoneal cavity. We all know that these cyst walls sometimes contain pancreatic glandular tissue, a proof that they arise from the pancreas and not from organisation of lymph around blood after injury, or inflammatory products after pancreatitis. The cyst wall most likely carries many acini along with it as it grows. In this way we can understand why it is often cured by drainage, which would only stimulate the growth of neoplastic glandular tissue in a cyst wall. In Pearce Gould's second case, evidently malignant, this kind of growth possibly existed. But the experience of draining and of extirpation shows that pancreatic cysts are usually of a simple type, and therefore destitute of elements with proliferating power. The traces of glandular tissue detected by Cibert, Heinrichius, and others may be pathologically similar to the Wolffian elements which von Recklinghausen detected in the walls of the Fallopian tube and uterus in very old subjects. They are foetal relics which probably exist in all women, yet rarely burst into growth. The glandular tissue in the wall of a pancreatic cyst probably lies latent in the same way, though something more than a foetal relic.

The microscope has been so freely used by competent authorities that the pancreatic origin of the cyst wall itself cannot be doubted. Hence I need dwell no further on the pathology and causation of these cysts as compared with sanguineous effusions, merely observing (since peritoneal relations are so important to the surgeon) that neither can open up the layers of the great omentum in an adult, as some writers seem to believe, since those layers are obliterated early in life.

LUMBAR DRAINAGE NOT ALWAYS PRACTICABLE.

The base of the cyst, in my case, did not reach either loin. Thus it would have been useless to tap or drain through the loin, as Pearce Gould and others have done. In Gould's case, where the patient was of the same age as mine, the tumour, which had no defined cyst wall, projected in the lumbar region. Gould recommends drainage from the loin whenever the cyst can be easily pushed to below the twelfth rib, but it should be first explored from the front, and R. Leith, who gives valid reasons for preferring lumbar drainage as a rule, admits that anterior incision and drainage are good in movable cysts which come well forward.

ON DEFINING ATTACHMENT OF CYST AT OPERATION:

QUESTION OF CALCULI.

The base of the cyst was sessile, involving the body of the pancreas immediately to the left of the head. About a quarter of the recorded cases are thus inserted, the great majority being attached to the tail (Nimier). I explored the cyst from outside, and easily made out its relations. I did not deem it safe to examine the interior. The insertion of a pancreatic cyst is often easily definable from without (Steele of Chicago and others), whilst searching from within for a calculus (Roswell Park) is barely worth the risk. In the Bernard Pitts and Shattock case the calculi lay in a loculus, not in a duct opening into the cyst—the ideal theoretical position for obstruction. Let it be remembered that even in a necropsy the relation of a pancreatic cyst to the normal duct is often difficult to demonstrate. In Railton's infant nothing more was found than a dimpling of the inner surface of the cyst at the site of attachment to the pancreas. In Mérigot's well-known case, where a blood cyst primarily or otherwise connected with that organ absorbed part of its body by pressure, "the principal pancreatic duct was longitudinally incised, and then found to disappear in the wall of the tumour..... where it was lost."³ These conditions could not be detected by any amount of searching inside a cyst at an operation. In Durante's case the cause of obstruction was an ascaris in

Wirsung's duct, but it was not discovered till after death.⁴ An ascaris might easily escape the most careful search at an operation, besides experience shows that the cause of obstruction was quite exceptional in this case. Above all, pathology teaches that this calculus hunting, recommended in some systematic works, is a wild-goose chase. Mr. Targett, as well as Drs. Goodhart and Theodore Fisher, are all opposed to the theory that a pancreatic cyst is usually due to blocking of a duct by any agency. On the other hand, the risks of handling the interior of a pancreatic cyst are not visionary, for it is liable to slough (Wölfler, Karewski Hersche).⁵

OBJECTIONS TO TOTAL REMOVAL OF SESSILE PANCREATIC CYSTS.

Finding that the base of the cyst had a broad attachment to the body of the pancreas near the head and no pedicle, I did not attempt the total removal of the tumour. I objected to face the self-evident risks of a radical operation when I knew that drainage answers very well, and is attended with little peril.

The surgeon must not in dealing with these purely cystic tumours dwell too much on cases of solid growths of the pancreas, which have been successfully removed by Sandler, Ruggi, and possibly Pearce Gould. The tumour in the latter case is now in the College of Surgeons (Pathol. Series, 2354 C), but was apparently confined to the lesser omentum.⁶ These solid tumours, if not left alone altogether, must be taken away. Krönlein removed very rightly an angio-sarcoma "as big as a fist." The patient did well for a few days, but died on the seventh from gangrene of the transverse colon due to ligature and division of the colica media artery near its roots.

Extirpation of a cyst of the pancreas is, on the other hand, not essential to cure. Poncet admits that his own successful experience was not encouraging, and in that case the base was attached to the tail of the pancreas, the most favourable position for a radical operation. Seven pairs of forceps were left projecting from the abdominal wound, besides another of larger size fixed to the pedicle. On the second day the seven were removed. On relaxing the big forceps blood freely rose out of the wound, so it was tightened again and the bleeding ceased. It was removed on the seventh day, and free discharge of foetid pus followed. On the fifteenth day the temperature was 104°, and not till a day later could the Mikulicz drain, inserted at the operation, be removed, as the least handling set up dangerous bleeding.

Another latter-day operator, Heinrichius, of Helsingfors, who has twice successfully removed a pancreatic cyst, frankly admits that the operation is not always practicable or justifiable. In his first case the base of the cyst stretched like a pedicle from the pancreas, and was treated as such by double transfixion with stout silk and divided, leaving on retraction a cut surface as large as a florin. In the second the patient was pregnant, and the tumour diagnosed as ovarian. After enucleation from its peritoneal capsule, the base was found inserted on to the pancreas. It was ligatured with silk and divided; then, as the pancreas fell back, severe hæmorrhage took place from several points in its tissue, and ligatures had to be applied by means of curved needles (*Umstechung*). The risk of this necessary manœuvre is self-evident to all who remember the relations of the pancreas. The patient recovered, and was delivered of a live child five months later. In Paul Eve's (of Nashville) case, which must be studied from the original report, "a short pedicle was found attached to the body of the pancreas close to the head of this organ." The transverse colon and mesocolon were torn. The pedicle was easily treated by a Staffordshire knot, and a portion of the pancreatic substance removed with the pedicle. There was little or no hæmorrhage during this operation, and no other ligatures were required." The omentum was fixed to the denuded colon. Recovery was rapid. The extirpated cyst grew from the tail of the pancreas—a favourable position, in cases where the operators were Poncet, De Wildt, Zweifel, Clutton, Mikulicz, and others. My colleague, Mr. Malcolm, will presently report a case of this kind. Kosinaki's case is imperfectly reported.

The danger of extirpation lies chiefly in the size and at the same time the difficult accessibility of the important blood vessels lying near the pancreas. What happened in Krönlein's case might occur in removal of a cystic tumour. In

one of Mikulicz's two cases the splenic artery was incorporated with the cyst wall and had to be divided and ligatured. De Wildt had to tie the splenic vein, which proved difficult. Bozeman had a relatively easy experience; the artery in the pedicle was as large as the brachial, but was secured in the pedicle ligature, no other ligature being required. In Mr. Clutton's well-known case, where a portion of the pancreas had to be excised with the cyst, "the cut surface of the gland required many ligatures to arrest bleeding, and even then it continued to ooze, apparently on account of its friable nature, which made it difficult to apply a ligature without tearing some of the surrounding tissue." In Billroth's case both the splenic artery and vein were tied, and the patient died on the tenth day.

Now, it is questionable whether the surgeon ought to perform an operation where the splenic artery may have to be tied whilst simple drainage answers so well. The artery, however, can be seen, though it lies so deep in the abdomen. Unfortunately free bleeding from the surface of the pancreas required in several of these cases ligature by means of curved needles. This practice (*Umstechung*), so valuable in pelvic surgery, is not always safe even in the pelvic region, for the ureter may be tied and large vessels wounded. In the vicinity of the pancreas the danger is even worse, and manipulations are much more difficult.

Out of about a dozen reported cases—I speak indefinitely, as Kosinski's, at least, is doubtful—two died, though neither of these were recent. Several were believed to be cysts of other organs—von Hacker, Heinrichius, etc., "ovarian cysts," De Wildt "hydronephrosis"—and the final step taken when it was too late to do anything else. For partial excision of the cyst is questionable, though, out of 8 cases, the 3 deaths all occurred over ten years since. I am, however, exceedingly sceptical about the completeness of these reports. To my knowledge more than one fatal case has not been published. Sir Spencer Wells removed a pancreatic cyst in 1877, and I made a *post-mortem* examination a few days later. Death was from sepsis, not from hæmorrhage. A portion of the base of the cyst was left on the body of the pancreas.⁸

Thus some bold surgeons have succeeded in extirpating more or less sessile pancreatic cysts, nor will I deny that, for reasons some of which have been given, their operations in particular were justifiable. Certainly they were triumphs of skill. In general, however, I consider that when a pancreatic cyst is distinctly sessile extirpation is unjustifiable, and it did not seem advisable in my case. The base was very broad. A fistula is not a very serious after-result, yet it seems about the worst likely to occur if drainage be properly managed. Nor do such cases suffer after the fashion of patients with biliary fistula.

DRAINAGE AND ITS EFFECTS.

I determined therefore upon thorough drainage, with precautions. It may be asked why a pancreatic cyst should be touched at all. The chief reason for operation is that fatal rupture may otherwise occur (Boeckel). In Dr. T. Savill's case the precise nature of the disease was doubtful. Fatal hæmorrhage is not unknown (Bécourt). Reddingius related, in 1892, a case of fatal peritonitis from sloughing of the cyst and escape of its contents; and here the patient was like mine, an active young girl exposed to injuries. Again, the cyst may become of inconvenient size, as in Martin's case left alone for seventeen years.

Lastly, experience shows that incision and drainage performed with ordinary precautions give almost uniformly good results. Out of about 70 published cases of incision and drainage only 5 died, excluding 1 of Pearce Gould's cases that lived four years afterwards, when cancer appeared. Hartmann's died in six weeks of cancer, which must have existed at the time of operation. Richardson lost a case from perforation of the stomach six months after operation; it was of traumatic origin. Reeves's patient died of a low fever of uncertain origin nearly five months after incision. Durante's case does not come strictly under this head as part of the base was detached at the operation. Bull's patient was diabetic, and he did the operation in two stages. The recovery of over 60 cases is, I admit, remarkable. Some at least of these pancreatic cysts bear not only secondary cysts but also distinct glandular elements in

their walls.⁹ An ovarian glandular cyst would only be made worse by such treatment. The truth remains, however, that drainage cures pancreatic cysts for reasons which I have endeavoured to explain this evening. The cyst in my case was small after it had been tapped, and needed no trimming as in Bernard Pitts's two cases. The precautions which I took to avoid fouling of the peritoneum and to fix the cyst securely have been sufficiently described, and I need not dwell on the dressing. Sulphurous acid is a very good stimulant.

The contents of the cyst were certainly mixed with broken-down constituents of blood and something like tyrosin, and the discharge remained very composite for a few days, then pure pancreatic fluid escaped, as has been observed before; later on the natural secretion was fouled with pus from granulations. The elements of blood are common in old cysts in any region, and do not necessarily imply in this case that the disease was primarily an effusion of blood.

Although my patient had a very tender skin and was worried with urticaria, the flow of pancreatic juice, fairly free at one time, never set up irritation of the surrounding skin, though it ran from June till about the first of October. In some cases the discharge remains bland for several weeks, and then becomes irritant (McPhedran), probably because it is at first diluted with serum or blood, and later becomes charged with an extra strong proportion of digestive principles. In cases like my own, though the discharge was pancreatic fluid, and was amylolytic, it must have been too weakly charged with those principles to damage the skin.

NOTES AND REFERENCES.

¹ Eine Pankreaszyste, *Centralblatt für allgemeine Pathologie u. pathol. Anat.*, vol. iv, 1889, p. 449. This cyst was accidentally found at the necropsy of a woman, aged 76, who had died of bronchitis. It sprang from the substance of the tail of the pancreas. The wall was "tough connective tissue, poor in cells," and the cavity contained blood. ² The surgeon must remember that when writers speak of the stomach, colon, etc., lying "on" a pancreatic cyst, they mean that these viscera actually form part of its capsule, as the colon does in a large renal cyst. ³ I have taken the above quotation from the author's own report ("Kyste hématique de l'abdomen, situé entre le pancréas et l'estomac: laparotomie, mort, autopsie," Mériot de Treigny, *Bulletin de la Société Anatomique de Paris*, vol. ix, 4th series, 1884, p. 428.) ⁴ This remarkable case was imperfectly reported in Italian and German journals. Professor Durante kindly sent me his original memoir (see Bibliography). At a point where an attempt had been made to detach the cyst from the pancreas, "si vede pendere in corrispondenza del dotto Wirsungiano un corpo rotondo riconoscibile.....per l'anzano di un ascaride." ⁵ In von Hacker's case, where much sloughing followed drainage, the process probably began before the operation, where the cyst walls were found very friable and the cavity full of broken-down material. ⁶ The report of this successful case will, Mr. Gould informs me, be duly published. ⁷ The true nature of the cyst was not recognised until it was drawn out of the operation wound, and the tail of the pancreas was seen to run into its base. ⁸ In his last work, *Diagnosis and Surgical Treatment of Abdominal Tumours*, 1885, Sir Spencer Wells writes (p. 206): "But pancreatic cysts must be very rare, as I have never seen one." He informed me afterwards that he had made an oversight. ⁹ In a case where Mr. Bernard Pitts drained after incision, the cyst was actually multilocular. One cavity contained calculi. Mr. Pitts kindly informed me (October 12th, 1897) that a sinus remained for a few months, but ultimately closed.

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ON SOME PECULIAR PIGMENTED CELLS FOUND IN TWO MOSQUITOS FED ON MALARIAL BLOOD.

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(With Note by Surgeon-Major SMYTH, M.D., I.M.S.)

FOR the last two years I have been endeavouring to cultivate the parasite of malaria in the mosquito. The method adopted has been to feed mosquitos, bred in bottles from the larva, on patients having crescents in the blood, and then to examine their tissues for parasites similar to the hæmamoeba in man. The study is a difficult one, as there is no *a priori* indication of what the derived parasite will be like precisely, nor in what particular species of insect the experiment will be successful, while the investigation requires a thorough knowledge of the minute anatomy of the mosquito. Hitherto the species employed have been mostly brindled and grey varieties of the insect; but though I have been able to find no fewer than six new parasites of the mosquito, namely, a nematode, a fungus, a gregarine, a sarcosporidium (?), a coccidium (?), and certain swarm spores in the stomach, besides one or two doubtfully parasitic forms, I have not yet succeeded in tracing any parasite to the ingestion of malarial blood, nor in observing special protozoa in the evacuations due to such ingestion. Lately, however, on abandoning the brindled and grey mosquitos and commencing similar work on a new, brown species, of which I have as yet obtained very few individuals, I succeeded in finding in two of them certain remarkable and suspicious cells containing pigment identical in appearance to that of the parasite of malaria. As these cells appear to me to be very worthy of attention, while the peculiar species of mosquito seems most unfortunately to be so rare in this place that it may be a long time before I can procure any more for further study, I think it would be advisable to place on record a brief description both of the cells and of the mosquitos.

The latter are a large brown species, biting well in the daytime, and incidentally found to be capable of harbouring the *filaria sanguinis hominis*. The back of the thorax and abdomen is a light fawn colour; the lower surface of the same, and the terminal segment of the body a dark chocolate brown. The wings are light brown to white, and have four dark spots on the anterior nervure. The haustellum and tarsi are brindled dark and light brown. The eggs—at least, when not fully developed—are shaped curiously like ancient boats with raised stern and prow, and have lines radiating from the concave border like banks of oars—so far as I have seen, a unique shape for mosquito's eggs. The species appears to belong to a family distinct from the ordinary brindled and grey insects; but there is an allied species here, only more slender, whiter, and much less voracious. My observations on the characteristics of these mosquitos were not very careful, as when I first obtained them I did not anticipate any difficulty in procuring more.

On August 16th eight of them were fed on a patient whose blood contained fair to few crescents (and also filariæ). Unfortunately four were killed at once for the study of flag-

late bodies (flagellulæ cysts). Of the remainder two were examined on the 18th and 20th respectively, without anything being noted. The seventh insect was also killed on the 20th, four days after having been fed. On turning to the stomach with an oil-immersion lens I was struck at once by the appearance of some cells which seemed to be slightly more substantial than the cells of the mosquito's stomach usually are. There were a dozen of them lying among (or within?) the cells of the upper half of the organ, and, though somewhat more solid than these, still very delicate and colourless. They were round or oval, 12μ to 16μ in diameter when not compressed (that is, considerably larger than the largest hæmamoeba in man); the outline sharp but very fine; the contents full of stationary vacuoles; and no sign of apparent nucleus, contractile vesicle or amoeboid or intracellular movement. So far it would have been impossible for any but a person very familiar with the insect's anatomy to have distinguished them from the neighbouring cells; but what now arrested attention was the fact that each of these bodies contained a few granules of black pigment absolutely identical in appearance with the well-known and characteristic pigment of the parasite of malaria (large quartans and crescent-derived spheres).

The granules were more scanty in comparison to the size of the cell than in the hæmamoeba, and numbered from 10 to 20 in each. They were not dispersed throughout the cells, but were collected in groups, or arranged in lines transversely or peripherally, or in a small circle round the centre (just as in some forms of the hæmamoeba). They were black or dark brown, and not refractive on change of focus. In some cases they showed rapid oscillation within a small range, but did not change their position. Owing to their blackness, so different from the bluish, yellow, and green granules and debris found in and about the neighbouring cells, they arrested the eye at once; and it must clearly be understood that I have not confounded them with normal objects. In short (except perhaps that rods were shorter or absent) these granules of pigment were indistinguishable from those of the hæmamoeba.

The eighth and last mosquito was killed next day, five days after having been fed. The stomach contained precisely the same cells, 21 in all, again toward the oesophageal end of the organ. In this case, however, they were distinctly larger and more substantial than in the seventh mosquito, and had a decidedly thicker outline. The size (along the major axis) appeared now sometimes to reach nearly 20μ , on a rough computation made without a micrometer. There thus appeared to be a marked increase in bulk and definition between these cells of the fourth and fifth days, suggesting that they had grown in the interval.

Both specimens were irrigated with 40 per cent. formalin, and sealed. The result of the formalin was, as anticipated, that the bodies became slightly more visible than before, as compared with the stomach cells.

In spite of all attempts, I have not yet succeeded in obtaining any more of the species of mosquito referred to. Thinking, however, that I may have overlooked these delicate cells in former dissections, I have again examined a large number of brindled and grey mosquitos, fed on malarial blood. Their stomachs certainly contained no such cells. Next I caught by hand a number of the more slender and white, but allied, species already referred to (I have failed in finding their grubs also), and examined them. Some had not been fed at all, and others had fed themselves on (presumably) healthy blood, two, three, or four days previously. The results were again negative. I may add that I have not yet succeeded in getting this species fed on malarial blood.

To sum up: The cells appear to be very exceptional; they have as yet been found only in a single species of mosquito fed on malarial blood; they seem to grow between the fourth and fifth day; and they contain the characteristic pigment of the parasite of malaria. It would, of course, be absurd to attempt final conclusions as yet; but I think we may venture to draw some cautious inferences on these observations. First, as to the nature of the cells. Judging from the facts that the elementary cells of allied species of mosquitos are always alike, or very similar, and that I have never observed such bodies in previous or subsequent dissections of mosquitos (I suppose I must have examined quite a thousand