those of *E. histolytica*, *E. nana*, and *Chilomastix* from one another are: the chromatoid bodies of the first, the apparently uniformly granular contents of the second, and the mouth of the third. It must always be remembered, of course, that the cysts here described form only a part of the numerous small "bodies" commonly present in human faeces. Some of these are probably vegetable organisms resembling yeasts, others possibly cysts of protozoa as yet unidentified. Although we are familiar with several different kinds of these, we are not yet able to determine and describe them satisfactorily.

Although we are usually able to arrive at a certain diagnosis from a study of the cysts, it is sometimes impossible to reach definite conclusions when unencysted forms only are found, since these are all too often dead and degenerate. As already noted, *E. nana* dies very quickly after leaving the host. This is also the case with the small "*minuta*" forms of *E. histolytica*, and often also with flagellate *Chilomastix* and *Trichomonas*. The flagellates, when they have degenerated to such an extent that they are merely small rounded masses of protoplasm, devoid of flagella, are not distinguishable with certainty from similarly dead and degenerate amoebae.

An unencysted *E. nana* can easily be distinguished, when alive, from the small "*minuta*" forms of *E. histolytica* by its pseudopodia, which are never so hyaline and blade-like, and by the numerous food vacuoles (containing bacteria) which are not seen in *E. histolytica*. In both forms the nuclei are very difficult to observe in the living organism, though they serve to differentiate them with certainty in good stained preparations (Figs. 1 and 2). Degenerate *Chilomastix* flagellates can usually be distinguished from degenerate small *E. histolytica* amoebae of the "*minuta*" type by their ingested bacteria and the persistent outline of the mouth. It is often impossible to determine whether a rounded-up and degenerate organism, in which nothing but vacuoles containing bacteria can be clearly distinguished, was originally a *Chilomastix* or an *E. nana*. Such forms are almost certainly not "*minuta*" amoebae, but, in the absence of cysts, a further diagnosis cannot be made with certainty. The degenerate forms of *Trichomonas* can usually be distinguished by the peculiar undulating "amoeboid" movement which they often continue to display for a long time.

Although *E. nana* could hardly be mistaken for the much larger *E. coli*, with its similar inclusions but characteristic nucleus, it might be confused with one of the small so-called "*limax*" amoebae sometimes found in stale stools. If the stool is more than a day old and the amoebae are actively motile on a cold stage, it is certain that they belong, not to any species of *Entamoeba*, but to some free-living form. Although it is usual in medical works to include all these small free-living amoebae under the term "*Amoeba limax*," there are probably many different species belonging to quite different groups which may occur in human faeces. A common form is shown in Fig. 3 for comparison with *E. histolytica* (Fig. 1) and *E. nana* (Fig. 2). The most distinctive characters of this and related forms are the nucleus, with its large central karyosome, and the presence of a contractile vacuole. Some free-living amoebae possess more than one contractile vacuole, but such structures are never found in any species of *Entamoeba*. All the common "*limax*" amoebae form uninucleate cysts, which, in typical forms, cannot be mistaken for those of any *Entamoeba*. The cyst wall is always thick and frequently—but not always—very irregular in outline and brown in colour (see Fig. 10). The single large nucleus usually lies near the centre, surrounded by numerous deeply-staining masses, probably homologous with the chromatoid bodies of some entamoebic cysts. Most of these small free-living amoebae can be readily cultivated on agar.

The figures accompanying this paper have been selected in order to illustrate the more important points considered above. We have thought it superfluous to give new figures of the more familiar forms. Accordingly, of the three common intestinal amoebae with which this paper chiefly deals we have figured only certain forms of *E. histolytica*, and *E. nana*, whilst *E. coli* is unrepresented and two other organisms are added.

The observations here recorded have been made in the course of work undertaken with the aid of grants from the

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POST-OPERATIVE TYMPANITES:

ITS NATURE AND SOME POINTS IN ITS TREATMENT.

BY

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IN the Cavendish lecture of 1915¹ Professor Arthur Keith described a neuro-muscular tissue specialized from Auerbach's plexus of nerves and situated where delays in the passage of the bowel contents normally take place. He regarded the myenteric plexus of the intestine as similar in nature and functions to the nodal and conducting system of the heart, each specialized nervous area in the alimentary canal being the regulator of peristaltic activity in the part of the intestine immediately beyond it. According to this view, a want of co-ordination between the muscular activity of the various parts may give rise to effects comparable to those of heart-block, and it was concluded that the condition of intestinal stasis is brought about by such a want of co-ordination of function.

Keith's teaching supports certain views which I have long held. At the meeting of this section in October, 1914,² I attributed the tympanites following some abdominal operations to an enfeebled peristaltic action, and especially to delay in the large bowel. I suggested then that the condition might be described as one of acute intestinal stasis. Five cases were published in which an otherwise irremovable tympanites following an operation upon the abdomen was treated by making an intestinal fistula, and four of the patients recovered. The fifth died, and it seemed to me that in this case the second operation was too long delayed, and that it could not have been undertaken too early. I argued that if a persistent tympanites can be cured by making a fistula its onset should be preventable by the same means, and that treatment by prevention in suitable circumstances would be more certain of success than any method of cure. This view was put into practice, and two cases were recorded³ in which a caecal fistula was made when intestinal difficulties seemed likely to arise. Recovery was uncomplicated by any bowel symptoms, and I have since treated eleven cases in this way with two failures, and assisted at one successful operation for the relief of a fully developed tympanites. In the ten successful cases the fistula was closed after a short time.

To save space only four cases are here briefly recorded.

CASE I.

On the second day of acute symptoms a diffuse peritonitis was found affecting the pouch of Douglas, the Fallopian tubes and the intestine and mesentery in the lower portion of the abdomen. Much lymph floated in free fluid or adhered in thick layers to the parts named, except the Fallopian tubes. These were of a deep blue colour, and greatly enlarged by oedema. They contained no pus and were not removed. All the intestines in the middle and upper abdomen were red and moderately distended. The vermiform appendix showed signs of old inflammation and was removed, but it lay outside the

* Abstract of a paper read at a meeting of the Section of Obstetrics and Gynaecology of the Royal Society of Medicine.

area of acute infection. Drainage of the peritoneal cavity and of the caecum was arranged, and an uninterrupted recovery followed. The cause of the inflammation was obscure.

CASE VI.

Dr. Hubert Roberts kindly allows me to publish this note. Tympanites threatened death six days after he removed an extrauterine foetation. On reopening the abdomen, about half a pint of serous fluid was found in the peritoneal cavity, whilst a partial volvulus and distension to about two inches in diameter affected several coils of intestine in the upper abdomen. The dilated portion of the gut was emptied by an incision, which was carefully closed and many adhesions were separated. A Paul's tube was placed in the caecum, and a rubber tube in the peritoneal cavity; an uninterrupted recovery followed.

CASE VII.

On the eighth day of appendicitis in a girl, 8 years old, the appendix was removed, and as the intestines were greatly distended a Paul's tube was fixed in the caecum, but the child died about three hours later.

CASE IX.

In an exceedingly anaemic and unhealthy woman a mass of breaking down tissue forming an enlargement of the left Fallopian tube and ovary was continuous with the mucous membrane of the sigmoid flexure through a gap in its wall, which easily admitted my finger. After removal of the diseased part the edges of the opening in the colon were freshened and brought together by sutures which necessarily passed through unhealthy tissues. A Paul's tube was placed in the caecum and recovery was uncomplicated.

In the cases which recovered an unusual freedom from intestinal trouble was obtained, but I would urge strongly that treatment by making a fistula should be employed as seldom as possible and only when there appear to be good reasons for adopting it. The seven cases published in 1914 and the first five recorded now are all those* in which I endeavoured to prevent or cure post-operative tympanites by making a fistula in one thousand consecutive operations involving the peritoneal cavity.† In that series I considered myself fortunate in obtaining a death-rate of 3.8 per cent. The four cases in which life was saved by making a fistula after tympanites was fully developed, cases resembling No. vi above, would have raised the mortality to 4.2 per cent. if no second operation had been performed. It is impossible to prove that any case in which a fistula was made to prevent an onset of tympanites would have developed that condition if the fistula had not been made, but in my opinion, formed whilst operating, these cases would have suffered from intestinal difficulties and some would have been added to the death-rate. Even if this view was mistaken, a difference of 0.4 per cent. in the mortality is well worth considering.

During the most satisfactory recoveries from operations upon the abdomen patients frequently complain of slight, it may be very slight, discomfort, nausea, or crampy pains until gases pass freely from the anus. If gases do not escape downwards post-operative tympanites develops, which may be removable after more or less difficulty in clearing the bowels, or may persist and be followed by death. Every variation between almost imperceptible discomfort and fatal retention of the intestinal contents may be observed. It would appear, therefore, that in some cases the most serious symptoms are due to an exaggeration of conditions existing after every abdominal operation.

When a case of persistent tympanites is cured by making a fistula, the distension rapidly diminishes with the escape of gases and faeces through the artificial opening, and the bowels act naturally after a few days, although an evacuation could not be brought about by any means before the fistula was made. There is in such cases no obstruction and no paralysis of any part of the intestine. All that is necessary to effect a cure is a free escape for the contents of the upper bowel and a short rest for the colon.

When death follows a post-operative distension of the intestine, signs of a spreading peritonitis are always found at an autopsy if the patient dies slowly. But if the patient dies quickly there may be no spreading peritonitis. Moreover, operations for the relief of a post-operative intestinal distension, in aseptic cases which have been carefully treated, rarely reveal any sign of spreading peritonitis before the patient is moribund.

Dr. Mary A. D. Scharlieb recorded such a case in the discussion on my paper above mentioned. At an operation for the relief of a post-operative tympanites nothing was found to account for the distension except an enormously loaded colon and no spreading peritonitis was discovered afterwards. Cases resembling this were not very uncommon when a prolonged administration of opium was the routine treatment after abdominal operations. The diffuse peritonitis found at an autopsy in an aseptic case is therefore sometimes secondary to the intestinal distension and cannot be its cause.

Thus there may be no paralysis of the intestine, no obstruction and no diffuse peritonitis preceding the onset of a post-operative tympanites. In such circumstances the only explanation of the complete retention of the contents of the bowel is a want of co-ordination between the activity of its upper and lower parts. A post-operative distension of the stomach which occasionally arises may be explained in the same way.

Any opposition to the flow of the intestinal contents, such as a formation of adhesions, an overloaded bowel, or habitual constipation, must favour a development of tympanites. An administration of opium has the same effect, and a very remarkable diminution in the number of cases of trouble and of death from post-operative tympanites took place when the injudicious use of this drug was discontinued.

Septic organisms left in the peritoneal cavity are often rendered harmless by the bactericidal action of the peritonium. But an intestinal distension may so lower the vitality of the tissues that the pathogenic bacteria are not destroyed, and so a peritonitis may arise much earlier than in an aseptic case and signs of it may be found at a second operation.

If this inflammation is not too far advanced it may be safely ignored when the tympanites is relieved by making a fistula, but if signs of severe spreading peritonitis are found drainage of the peritoneal cavity also is necessary. In operating for gangrene of the vermiform appendix the same condition of peritonitis which may be safely ignored in its early stages is often found. These cases of gangrene of the appendix are in every way comparable with those of a post-operative tympanites, in an aseptic case, as regards their relationship to a diffuse inflammation of the peritoneum which is curable. In appendix cases removal of the diseased part or drainage of the affected area of the peritoneum is essential to a cure. When post-operative tympanites exists its removal is essential for the cure of a spreading peritonitis, and nothing else is essential in the milder cases. Therefore in these milder cases the gangrene and the distension are respectively the causes of the peritonitis. In appendix conditions the more serious changes are certainly a development of the milder, and this may be true in cases of intestinal distension also. On the other hand, a diffuse peritonitis is a cause of tympanites, and it may be exceedingly difficult to decide which causes the other.

Peritonitis is a vague expression. Like the word dermatitis it conveys little information unless the nature, position, and extent of the inflammation are stated. Lister taught that "a certain amount of inflammation, as caused by direct irritation, is essential to primary union." Such an inflammation of the peritoneum is aseptic and of no clinical importance, except that it may be a cause of a formation of adhesions. These also are in themselves harmless, but they may cause symptoms by hindering or arresting the flow of the bowel contents.

A spreading peritonitis is always septic. There are many degrees of septicity, but a well-defined septic inflammation of the peritoneum is altogether different from the inflammation which necessarily accompanies any sufficient injury of that membrane. A spreading inflammation always arises from some focus of infection and rarely affects the whole peritoneum. The treatment is by removal of the cause, by drainage of the affected peritoneum, or by both of these methods. When drainage is necessary it cannot be employed too early. If the inflammation continues to spread and is sufficiently severe the intestine becomes paralysed and tympanitic, and this condition when thus produced is hopeless.

A complete retention of the intestinal contents must be relieved after an abdominal operation if the patient's life is to be saved, but when the intestine is paralysed only a few coils can be emptied by incising it. Moreover, if the whole

* Cases of fistula formation for acute intestinal obstruction, of anastomosis for any cause, and of colotomy for cancer are excluded.

† Of these operations 553 were for the treatment of disease in the female generative organs, the death-rate of these being 2.52 per cent.

intestine could be emptied this would not arrest the spread of a peritonitis which caused the intestinal distension.

Tympanites and septic peritonitis may each be an indirect cause of the other, but each may be brought about also directly in another way—tympanites by intestinal obstruction (mechanical or physiological), and septic peritonitis by bacterial infection. In one set of cases an intestinal obstruction causes tympanites, and peritonitis follows. In another set of cases septic infection causes a spreading peritonitis, and tympanites follows.

Neither of these sequences can be understood without recognizing the other; and if both are not considered, confusion must arise between the peritonitis which causes distension of the bowel and the peritonitis which is caused by distension of the bowel.

The two causes of trouble—intestinal obstruction, whether mechanical or functional, and septic infection—may arise together, and it may be wise sometimes to try to prevent their development by draining both the intestine and the peritoneal cavity. The indications for these measures are difficult to formulate, because they involve a prognosis several days in advance.

Drainage of the peritoneal cavity is required when it is believed that an onset of septic inflammation is likely to occur. Drainage of the caecum is required when it seems necessary to facilitate the emptying of the upper bowel or to rest the lower bowel. For example, in a case of multiple perforations of the small intestine, if a continuous ali-

mentary canal can be made and the patient's condition is otherwise satisfactory, it may still be wise to drain the depending parts of the peritoneal cavity, and in some cases of this kind I would consider that provision for an immediate escape of the contents of the small intestine through a caecal fistula would offer a better chance of recovery than leaving the faeces to escape after a day or two, by passing through the colon. Damage to any part of the large bowel would be an additional reason for anxiety lest it should not carry off its contents in time to prevent the development of a strain upon sutures or weak places in the wall of the small gut.

CONCLUSION.

I submit that by draining the alimentary canal in suitable circumstances the mortality from abdominal operations may be reduced by a case here and there, and that patients whose lives may be saved in this way are generally suffering from an intestinal obstruction brought about by a disturbance of co-ordination between the muscular activity of the different parts of the alimentary canal, aggravated perhaps by mechanical, physiological or therapeutic hindrances to the flow of the intestinal contents, the colon being the part in which difficulty most frequently arises.

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TWO CASES OF PREGNANCY COMPLICATED BY MYOMA UTERI.

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EVERY case of pregnancy complicated by myoma must be dealt with according to its individual features. Some cases may be left to take their natural course throughout pregnancy, labour, and the puerperal period; some may be allowed to go to full term and then be treated by abdominal section; some require to be treated by operation during pregnancy in either a conservative or radical manner according to the conditions present. I published two illustrative cases in the *BRITISH MEDICAL JOURNAL* for June 29th, 1909, where Caesarean hysterectomy was performed at term. Two further examples are here detailed.

CASE I.—Pregnancy Complicated by Myoma and Retention of Urine treated by Abdominal Hysterectomy in the Sixth Month.

Mrs. A., aged 29, primigravida, was admitted to the Leeds Infirmary on September 10th, 1916, for retention of urine. She was married in March, 1916, and ceased to menstruate in April. Her health previous to marriage had been good, and her menstruation regular without marked excess; the retention of urine was quite recent.

She was a well-developed healthy woman with normal signs of pregnancy. A uterine tumour rose out of the pelvis to the navel, corresponding in size to the uterus at the end of the sixth month of pregnancy, but the upper part of the tumour presented a hard, rounded, and not very mobile swelling caused by the myoma, which is shown in the photograph here reproduced. The pelvis was filled by a tense, cystic, elastic tumour which, as will be seen, was formed by the cavum uteri containing the fetus, membranes, and placenta. The cervix was drawn up

almost out of reach on digital examination, and the urethra was correspondingly stretched. A loud uterine souffle was to be heard on the left side of the abdominal tumour, but the fetal heart sounds were not made out. The case thus strongly resembled an ordinary one of retroversion of the gravid uterus, but the hard abdominal tumour was a distinguishing feature in the conditions present.

On September 12th the patient was anaesthetized, and an attempt was made to push the uterus up out of the pelvis and to draw down the cervix to its normal position, but reduction could not be achieved. The fingers passed into the vagina could indeed be made to touch the sacral promontory by compressing the elastic swelling, but on withdrawing the pressure the uterus filled the pelvis again. A large rubber ring was inserted to see whether elastic pressure would succeed, but this was unsuccessful. After ten days it was found that the patient was no better in spite of regular catheterization, the vesical distress had increased, and there was some haematuria. The temperature had begun to rise.

On September 22nd abdominal section was performed with the purpose of thoroughly exploring the conditions present and of dealing with them as might seem best. On opening the abdomen the bladder was found lying very high up and bulging into the wound. It was seen that the tumour was entirely uterine, but that the abdominal part consisted almost wholly of a large myoma and that the uterine cavity was squeezed down into the pelvis. With little difficulty the whole tumour was lifted up to the abdominal wound. The cervix then formed a well marked elastic pedicle. It seemed best not to attempt myomectomy, but to remove the whole by supravaginal hysterectomy. This was quickly and easily accomplished in the usual way, leaving the left ovary. The patient made a quick and uncomplicated recovery, except that the bladder needed irrigation for a few days. The retention of urine disappeared at once.

Description of Parts Removed.

The specimen, after being fixed with formalin, was divided by a sagittal section, and was photographed by Mr. Wagstaffe of the electrical department of this hospital. The whole tumour measures about 8½ in. in vertical diameter, and there was certainly some shrinking during fixing. The upper portion

CASE I.—Pregnancy complicated by myoma. The left half shows trunk and funis; the right half shows fetal head.