into the rectum. He states that this back flow occurs independently of muscular contraction, and is brought about by a reversed mucous current along the bowel.

Advantage was taken of the opportunity to investigate the relation between the small bowel and the colon in some 5 or 6 cases of ileo-colostomy (division of the lower end of the ileum and implantation of the proximal end into the pelvic colon low down). An enema of barium sulphate was given in the way already described, and its course watched as it travelled along the bowel. In cases in which the operation had been performed recently—within a month or so—the barium was seen to travel up the large intestine, and in one case to the caecum, but there was no indication that it entered the small bowel.

On the other hand, in cases in which the operation had been performed one or two years previously, the solution ran up into the small bowel, and was seen in distended loops of small intestine lying on the right side of the abdomen; it was not until a considerable amount of the fluid was so disposed that the large intestine proximal to the anastomosis began to show a shadow.

This observation suggests that in cases of ileo-colostomy in which the operation has been performed some considerable time—a year or more—the dilated coils of small intestine adjacent to the colon assume somewhat the functions of the large gut.

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THE PRE-PERITONITIC STAGE OF ACUTE APPENDICITIS.

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If the mortality from appendicitis is to be reduced almost to vanishing point, it is essential that the earliest signs and symptoms of the condition should be appreciated clearly; the view is accepted in America and is gaining ground in England that every case of acute appendicitis should be operated on within the first twenty-four hours from the onset, or as soon after as is possible. There are two reasons why cases are operated on later than this—either the patient may think that the symptoms are not serious enough to seek medical advice, or his adviser may think the symptoms not typical of appendicitis or not serious enough to demand operation. It is clear that we have no remedy against the first cause save the education of the public, but in regard to the second something can be done by way of explaining that the so-called typical symptoms of appendicitis as given in the textbooks often indicate a somewhat advanced stage of the condition, and that it is impossible to say at the beginning of an attack whether it is likely to be mild or severe in type.

It is desirable and in most cases possible to diagnose appendicitis before peritonitis has set in, or at least before there is any more than that slight amount of congestion of the peritoneum which is commonly associated with any inflammatory process within the gut.

It must be understood that the pre-peritonitic stage does not always coincide with a simple catarrhal state of the mucous membrane; quite commonly there is deep ulceration of the interior of the appendix, and sometimes even gangrene of part of the wall extending through to the peritoneal coat.

In diagnosing the pre-peritonitic stage of acute appendicitis the following points must be noted:

(a) The History just Prior to the Onset of Pain.

There is often a history of some unusual irregularity of the bowels. Constipation is of less significance than diarrhoea, which is especially common in children. The occurrence of diarrhoea is likely to mislead; it is probably

due to activity in the caecum and colon of the virulent microbes which cause such damage in the appendix. This early diarrhoea has to be distinguished from the later variety due to irritation of the rectum by pelvic peritonitis or a pelvic abscess. Frequently also there is an account given of flatulence or indigestion for a few days prior to the onset of the attack; in a patient who has never previously been subject to pain after food this history should be sufficient to put one on guard.

(b) The Symptoms of the Attack.

The early symptoms are pain, nausea or vomiting, local deep tenderness as felt from the abdomen or by the rectum, sometimes rigidity or local distension, and generally fever. The pain in the majority of cases is first referred to the epigastrium and is later localized in the right iliac fossa. But this localization is not by any means constant in the pre-peritonitic stage. Sometimes the patient asserts that the initial pain is felt all over the abdomen, or it may be hypogastric in distribution. When the appendix is in the retro-caecal position the pain may be from first to last felt only in the right iliac fossa. The causes of the early pain are probably two. First, and most important, is the exaggerated peristalsis of the appendix excited by the relative or absolute obstruction to its lumen by a concretion, a kink, or swollen mucous membrane; bacterial infection causes the accumulation of irritating products, which lead to a distension of the appendical lumen. Secondly, there may be bouts of pain caused by painful peristalsis of the caecum. Vomiting generally, but by no means always, occurs in the pre-peritonitic stage, and usually the patient only vomits once or twice. Nausea is nearly always present, even though there be no vomiting. The degree of nausea and the amount of vomiting in this stage appear to depend on two factors—first, the amount of distension of the inflamed appendix; and, secondly, the reflex nervous susceptibility of the patient. Vomiting is thus more prone to occur in children, or in patients whose digestive tract is easily deranged. It may be taken as an important general rule that the severity and frequency of the vomiting at the onset indicate the degree of distension of the appendix, and consequently the immediate risk to the patient that perforation may occur.

Local deep tenderness is probably to be elicited from the onset of the attack, but at first it is frequently masked by the more generalized referred pains. When the latter have subsided the local deep tenderness is easily elicited. Quite frequently there is no superficial tenderness in the early stage.

Rigidity of the abdominal muscles over the appendix is not a constant symptom. In most cases well-marked muscular rigidity coincides with commencing peritonitis, though I have certainly seen it when no peritonitis has been present; but it is quite a common experience (I believe it is the general rule) not to get rigidity in the pre-peritonitic stage. I am certain that the failure to realize this fact is responsible for many delayed operations and lost lives. An appendix may be on the point of bursting into the general peritoneal cavity without a single adhesion to limit infection, though at the same time the abdominal wall may be flaccid and allow of free manipulation without any rigidity appearing. This fact must be known to every surgeon of experience, but in general it is certainly not fully appreciated, nor do the textbooks make the point clear. Rigidity is taught to be one of the earliest signs of acute inflammation of the appendix, whereas in quite a large proportion of cases it is almost completely absent in the earliest stage and in some cases is absent even though pelvic peritonitis exists.

Fever may not be present at the beginning of the attack, but nearly always develops before twenty-four hours have passed. As a rule, the temperature does not go much above normal, two or three degrees being the average elevation. Mistakes are liable to happen owing to the fact that the temperature is not elevated at the time of the onset of the pain, and thus the more serious disease may be mistaken for an attack of simple intestinal colic. In any suspected case the temperature should be taken every two or four hours, and if it rise in a gradual manner it is a point in favour of appendicitis. If at the very beginning of any attack of acute abdominal pain the temperature is raised, the presumption is against appendicitis.

The pulse is only slightly, if at all, accelerated in the early stage; it may be normal in every way, even though the temperature be raised. Any continued or decided acceleration of the pulse generally corresponds with the occurrence of local peritonitis; to wait for such alteration is, therefore, to sacrifice the best time for operation.

When the appendix is acutely inflamed gaseous distension of the caecum is frequently present; this local distension is due partly to the excessive formation of gases by the active bacterial decomposition of the contents of the caecum and appendix, and probably in some cases partly to an accompanying inflammation of the interior of the caecum (typhlitis) with atony of the gut. It is more likely to be present when the appendix is retrocaecal in position and closely embedded in the wall of the caecum. It gives rise to a local swelling with a tympanitic note on percussion, to borborygmi, and occasionally to painful peristaltic waves. This may cause the observer to think that he is merely dealing with a case of caecal dyspepsia, and the swelling of the caecum may mask the inflamed appendix placed behind it; or the painful contractions of the distended gut attempting to empty itself may even suggest intestinal obstruction.

(c) *The Order of Occurrence of the Symptoms.*

It is largely due to Murphy that the importance of noting the order of the symptoms has been realized. Pain is always the first symptom; a few hours later nausea or vomiting occur; after a few more hours local tenderness manifests itself, and the temperature rises. Murphy states that leucocytosis is a still later symptom. He adds: "The symptoms occur almost without exception in the above order, and when that order varies I always question the diagnosis." Every surgeon who has carefully investigated this point must be able to confirm this dictum, though it must be allowed that important exceptions occur. If fever precedes the onset of pain, if vomiting accompanies or precedes the first bout of pain, it is generally not appendicitis that we are dealing with.

(d) *The Local Conditions found on Examination.*

On examination of a case of acute appendicitis in the pre-peritonitic stage there will accordingly be found slight elevation of temperature with slight quickening of the pulse-rate. Local tenderness will be determined over the position of the appendix either in the right iliac fossa or on the right wall of the pelvis as felt from the rectum. There may, but more likely will not, be local rigidity. These points, taken with a suggestive history of onset, are in most cases sufficient to enable one to make a diagnosis of acute appendicitis before any local peritonitis has developed. At the same time the great probability of the condition being acute appendicitis does not absolve one from the obligation to make the most thorough examination in order to exclude any lesion elsewhere. Examination of the chest and urinalysis are especially important.

ALTERNATIVE METHODS OF TREATING THE APPENDIX STUMP.

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In the ordinary operation undertaken for quiescent or catarrhal appendicitis, ligature or crushing of the appendix stump followed by its invagination into the caecum presents no difficulty and is entirely satisfactory in its results. In another class of case with local or general suppurative peritonitis and profound toxæmia, any search for the appendix may be mistaken enthusiasm, and likely to extinguish the last hope of the patient's recovery.

Between these two extremes other conditions may be found which may tax considerably the ingenuity of the operator, and cannot be dealt with by the ordinary methods. Such conditions may be encountered in the following type of case: The patient may have been ill for some four, five, or more days, or may in addition have had previous attacks. On opening the abdomen a mass is found, consisting of omentum, ileum, caecum, and

appendix, partially or wholly matted together, in the centre of which there may or may not be some thick pus or thin sero-purulent fluid. I have recently operated upon three such cases, in which the condition of the patient contraindicated prolonged manipulation; though it seemed very desirable to remove a highly infective appendix, yet it appeared inadvisable, if not impracticable, to do so in its entirety by the usual method.

In these circumstances I was forced to adopt unorthodox methods of dealing with the stump—methods for which I do not claim originality, though I have not myself seen or heard of their use; as they were very happily successful they may be useful to others.

Cases I and II presented a very similar condition of affairs—a matted mass of bowel and omentum of the consistency of soft cheese, enclosing a little thin offensive fluid, and a gangrenous, perforated appendix. In each case the terminal half of the organ was gangrenous, whilst the proximal half was deeply infiltrated, stiff, and densely adherent to neighbouring bowel. In each case no difficulty was experienced in separating the distal gangrenous portion; it was the proximal half which proved intractable in view of the patient's inability to stand prolonged manipulation.

In Case I separation of the proximal half of the appendix was accompanied by profuse venous haemorrhage, flooding the wound and flowing over the abdominal incision. Attempts at securing bleeding points with forceps only made matters worse, the softened tissues crumbling and tearing with the utmost readiness; the bleeding could only be arrested by firm gauze packing.

It seemed unwise to make further attempts at separating this portion, and accordingly all the freed part of the appendix was tied off, the base was "squeezed" by forceps to obliterate communication with the caecum, and the still adherent proximal portion crushed longitudinally to destroy its vitality. The caecum was now brought up to the abdominal wound and secured by a few points of suture; the "dead" appendix stump was now extra-peritoneal, and it was further isolated by ribbon gauze. The usual drainage was employed, with closure of the rest of the incision.

In Case II, with gangrene and local peritonitis, the proximal end of the appendix was adherent to the ileum, and its separation was attended by tearing of the latter. The tear was sutured, and a further attempt made, with a similar result. As time was valuable, the stump was treated as in Case I, the ileum and caecum being secured in the wound and the appendix stump isolated in the abdominal incision.

In Case III an inflammatory mass as large as a child's fist, without abscess formation, was found. The appendix was at first retrocaecal, and then passed upwards and outwards, embedded as it were in the outer wall of the caecum. The caecum itself was glued to the posterior parietes, and was absolutely immobile. The distal half of the appendix lying on the outer caecal wall was easily separated, but the proximal end lying behind the fixed caput caeci seemed a difficult problem. The distal end of the appendix was cut off without ligature, a small stab hole made into the lumen of the caecum through its outer wall, and the open end of the appendix stump thrust into the caecum and secured by two or three points of catgut. The appendix stump now opened into the caecum at both ends, and the wound was closed without drainage.

All three cases made good recoveries. I feel confident that in Cases I and II the crushed appendix stump sloughed into the dressings, and that in Case III it discharged at both ends into the caecal cesspool.

THE thirteenth Congress of the German Orthopaedic Society will be held this year in Berlin on Monday and Tuesday, April 13th and 14th, under the presidency of Professor Th. Kölliker of Leipzig. The principal subject proposed for discussion is the operative treatment of spondylitis, to be opened by Dr. Albee, of New York, with an address on his method of osteoplasty in spondylitis. The next day Professor Biesalski will open the proceedings with an address on the physiological advantages of transplantation of tendons. Among other communications are the following: Dr. Gocht, on the technique of arthrodesis; Dr. Schulthess, on the theory and practice of Abbott's procedure; Dr. Wilms, on the operative treatment of flat-foot.