He entered the train in perfect health, but in the course of the journey was seized with violent pains in the abdomen, and felt very ill. On arriving at Euston it was all he could do to creep into a cab and drive to his home at Surbiton. Dr. H. F. T. Chambers was at once sent for, and found the young man in a very grave state, suffering from a general peritonitis. Twenty-four hours later I saw the patient with him in consultation. The young man's condition was then most serious; his abdomen was tense, greatly distended, and everywhere excessively tender; his pulse small and hard, and his face pale and drawn and ghastly in the extreme. He was so desperately ill that I spoke with great caution as to his chances of recovery, which I feared were of the slightest, and Dr. Chambers was of much the same opinion. The patient was already taking morphine. As there was a strong rheumatic tendency in the family, we ordered 20 grains of sodium salicylate to be taken every three hours, on the chance of the inflammation being of this nature, but I left the house with small expectation that this or any other treatment would be found of the slightest avail. In spite, however, of our gloomy anticipations, the result was as happy as it was unexpected. In twenty-four hours after beginning the medicine there was a great and unmistakable improvement, and at the end of another twenty-four hours the patient was declared to be out of danger. He was convalescent by the end of the week.

Now this case, which had all the appearance of an attack of general peritonitis of the most virulent character, changed its whole aspect with unlooked-for rapidity, and it is surely not unreasonable to assume that this fortunate result had some connexion with the treatment adopted. I may repeat that the condition of the patient at my visit appeared to both Dr. Chambers and myself to be almost hopeless, and yet in the course of twenty-four hours the improvement was such as to justify the most sanguine expectations. If it be conceded that this happy change was due to the sodium salicylate, the inference that the inflammation of the peritoneum was of a rheumatic nature seems to me to be unavoidable. The after-history of the case is interesting. I heard recently that the patient left Surbiton shortly after his recovery, and Dr. Chambers lost sight of him. He learned, however, indirectly that the young man had remained perfectly well for two years and had then had an attack of appendicitis, for which he was operated on and recovered. It would be interesting to ascertain the nature of this attack, of which I have been able to learn nothing. It may very possibly have been of the same nature as the first. Certainly at the time of my visit, if the physical signs had been limited to the right side of the abdomen I should scarcely have dared, in view of the extreme urgency of the symptoms, to take the responsibility of opposing an operation.

I venture to submit that the two cases narrated above furnish evidence which cannot be lightly dismissed as to the nature of some attacks of serous inflammation in the abdomen, and suggest, at any rate, the possibility that these may at times have a rheumatic origin. If this be granted, it is advisable in all cases of appendicitis to begin the treatment with a few substantial doses of the salicylate of soda, for the rheumatic element cannot be excluded until the result of treatment by this remedy has been ascertained.

I have seen not one or two, but many, cases of appendicitis in which the question of operation was being considered which underwent such rapid improvement under antirheumatic treatment that all idea of surgical interference was quickly set aside. If the treatment fail—that is, if no improvement be noticed within thirty-six hours of taking the first dose of the salicylate (which should be of substantial quantity and given every three hours)—the assumption of a rheumatic origin for the inflammation may be definitely abandoned.

A NEW code of instructions recently issued by Dr. H. E. Armstrong, Medical Officer of Health for Newcastle, for persons entering the enteric fever pavilion of the City Hospital for Infectious Diseases, gives fuller recognition to the risk of direct propagation of this disease than any similar code which has come under our observation. In addition to ordinary precautions in regard to the treatment of stools, urine, and other discharges, it is laid down that all persons entering the pavilion must don and button up one of the special garments provided and wash and disinfect their hands on leaving. Friends of the patients are not to be allowed to kiss them or to sit on their beds, and inhalation of the patient's breath or of foul air from beneath the bedclothes is to be avoided as far as possible. After handling any patient a nurse is at once to wash and disinfect her hands, and everything used in the wards is to be carefully protected from flies.

ABDOMINAL AUSCULTATION AS AN AID IN DIAGNOSIS.

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IN 1705 a posthumous work by Robert Hooke¹ was published, in which he suggested "that it may be possible to discover the Motions of the Internal Parts of Bodies . . . by the sound they make, that one may discover the works performed in the several Offices and Shops of a Man's Body, and thereby discover what Instrument or Engine is out of order, what Works are going on at several Times and lie still at others." In this connexion he mentioned the noises produced by the "motion of wind to and fro in the guts." But it was not until exactly two centuries later that the first serious attempt was made to analyse the numerous sounds which can be heard on listening to the abdomen. In 1905 Cannon² succeeded in demonstrating the rhythmical production of sounds in the stomach and small intestines of normal individuals. Though I have been able to confirm his observations on a few occasions in the stomach, I have never recognized any rhythm in the sounds produced in the small intestine. On the other hand, in a paper published in the *Guy's Hospital Reports* for 1907³ it was shown that the sounds heard over the caecum undergo definite and important variations in the course of the day.

We listened on a number of occasions at short intervals throughout the morning and afternoon to the sounds heard when the stethoscope was placed over the caecum of normal individuals. Before deciding that any series of sounds originated in the caecum, we listened to other parts of the abdomen, in order to determine whether anything similar in character and rhythm could be heard elsewhere. In the morning before breakfast, about twelve hours after the last meal had been eaten, no sounds could ever be heard over the caecum. The silence continued until between three and a half and four and a half hours after breakfast, when a few sounds could be heard, which were quite distinct from anything present in other parts of the abdomen. The sounds gradually became louder and more frequent, until they reached a maximum in one hour to two and a half hours after their commencement. After this it is not of much use to listen again to the caecum, as the relation of the sounds to the time at which breakfast was taken is confused by the taking of other meals.

An ounce and a half of bismuth oxychloride was taken with the breakfast on one occasion by four different individuals. It was found with the *x* rays that the appearance of a shadow in the caecum immediately followed the occurrence of the earliest sounds in the right iliac fossa. In those investigations in which auscultation was practised without skiagraphy, the first caecal sounds were always heard at about the time that *x*-ray observations had previously shown that the first traces of the food would reach the caecum.

We have thus in auscultation a means by which the rate of passage of the contents of the small intestine from the stomach to the caecum can be measured. Auscultation may therefore take the place of skiagraphy, when the latter cannot for any reason be used, in the diagnosis of the rare cases in which constipation is due in part to the slow passage of food through the small intestine.

The sounds heard over the caecum are in all probability due to the actual entry of the fluid contents of the ileum into the gas-containing caecum. Their loudness varies considerably in different individuals. When, five or six hours after a meal, the gas is largely replaced by faecal material, the sounds diminish in intensity and become less continuous. At all times they are louder in the upright than in the horizontal position, but for the first few seconds after lying down the sounds are generally loud and almost continuous, owing probably to the movements of the fluid contents produced by the action of gravity.

In 1903 Keith suggested from anatomical considerations that a strong ileo-caecal sphincter exists in man and most animals, as the transverse layer of the muscular coat of the ileum is greatly thickened where it enters the colon. In the following year Elliott⁴ proved experimentally that such a sphincter exists. He found that it was kept in a condition of moderate tonic contraction by impulses

carried by the splanchnic nerves; when these were cut it became permanently relaxed and the contents of the small and large intestines mixed freely with each other. Direct stimulation of the splanchnic nerves or the reflex effect of exposure of the peritoneum for a moment to cold air caused the sphincter to contract tightly, although the movements of the rest of the intestines were simultaneously inhibited. Stimulation of the vagus and pelvic nerves had no influence on it.

It seems probable that the peristalsis of the small intestine is insufficient to cause its contents to pass into the colon without the occurrence of active relaxation of the sphincter. Thus I have very frequently observed after a bismuth meal a diffuse shadow in the right half of the pelvis for half an hour or more before that of the caecum has appeared, and it is often still present after the appearance of the latter, with which it is continuous. Sometimes it can be clearly recognized as the shadow of the last few inches of the ileum. It is this part of the intestine, also, in which segmentation can most frequently be seen. On the other hand, the bismuth is present so sparsely in the rest of the small intestine, that it hardly interferes with the passage of the rays through the abdomen. Hence it seems clear that there is a tendency for the bismuth to accumulate in the last part of the ileum, as if there was a certain amount of obstruction to the passage of the contents of the small intestine into the caecum. Moreover, Heile⁶ has observed through a caecal fistula that the contents of the small intestine enter the colon in spurts, which occur at more or less regular intervals, corresponding to the sounds already described as being heard over the caecum. This suggests that the ileo-caecal sphincter relaxes only at intervals, and that it is perhaps controlled by some regulating mechanism in the caecum and the end of the ileum, just as the pyloric relaxation is controlled by impulses from the duodenum and the stomach.

The action of the ileo-caecal sphincter is at once upset by irritation of the neighbouring peritoneum, produced, for example, by the presence of foreign material after perforation of an inflamed appendix. Contact of foreign material is well known to give rise to reflex stimulation of the splanchnic nerves, whereby cessation of the motor activity of the neighbouring intestine is produced. It follows also from Elliott's experiments that spasmodic contraction of the ileo-caecal sphincter must occur when the neighbouring peritoneum is the seat of the irritation. The passage of the contents of the end of the ileum into the caecum is thus stopped, and caecal sounds cease to be produced. A knowledge of these facts can be of considerable value in determining the exact state of affairs in cases of appendicitis. The majority of patients, when first examined, have been taking fluids at short intervals during the previous few hours, so that, in the absence of vomiting, frequent gurgling sounds are heard over the caecum so long as there is no reflex activity of the splanchnic nerves. If, however, peritonitis is present in the neighbourhood of the ileo-caecal junction, as it is in the majority of the severer cases of acute appendicitis, no sounds are heard.

On the other hand, if in a clear case of acute appendicitis such sounds are still heard, it is certain that relaxation of the ileo-caecal sphincter is not inhibited, and peritonitis is absent from the immediate neighbourhood. I have been able to demonstrate the truth of this statement in the only 12 cases examined since I began to pay attention to the matter, in which I have heard such sounds over the caecum immediately before the performance of an operation for acute appendicitis. In 5 there was tenderness in the loin, so that retrocaecal appendicitis was diagnosed and a gangrenous appendix was found behind the caecum. In 5 there was extreme tenderness on rectal examination, the tender rigid appendix being on four occasions actually palpable, and in some of these cases frequent micturition and a tendency to diarrhoea instead of constipation assisted in making the diagnosis of pelvic appendicitis clear; a gangrenous appendix, hanging into the true pelvis, was found in each instance. In the remaining 2 cases the appendix was in the most common situation, but, though gangrenous, it had not perforated, and the peritonitis was strictly confined to the distal part of the appendix itself.

One case of retrocaecal appendicitis was seen at intervals

for four days, during which the sounds were always heard, and at the operation performed at the end of this period an abscess was found behind the caecum, but no trace of inflammation was present in the general peritoneal cavity, which was explored before the abscess was opened.

In one patient an inflamed pelvic appendix was felt on rectal examination, and the caecum was auscultated an hour and a half before the operation and again immediately before it. On the former occasion the sounds were loud and frequent, on the latter they were faint and heard only at long intervals. At the operation it could be clearly seen that peritonitis was spreading up from the pelvic appendix, which must have perforated quite recently and was just invading the ileo-caecal junction, thus accounting for the recent almost complete disappearance of the caecal sounds.

Gurgling in the right iliac fossa has been described as a characteristic feature in typhoid fever. It is not, however, a distinctive sign, as it occurs in all patients who are given frequent small feeds, as in them fluids enter the caecum continuously instead of only for a limited period, beginning four hours after each meal. But the sudden disappearance of caecal sounds, if associated with symptoms suggesting perforation of a typhoid ulcer, is very valuable confirmatory evidence, for the perforation, being almost always in the neighbourhood of the ileo-caecal junction, inhibits the passage of the contents of the small intestine into the caecum at a very early stage. In a case of typhoid fever recently under my care I had auscultated over the right iliac fossa at each visit, and had always heard the typical caecal sounds. The patient, who was very ill, complained one day of abdominal pain. His pulse was found to have risen slightly, but the temperature was unaltered. There was a slight increase in the rigidity of the abdominal wall, but no distension had occurred. I saw the patient two hours after he first complained of pain. No caecal sounds were heard on listening for two minutes, although occasional gurgles were still audible in the upper part of the abdomen. A perforation was diagnosed, and at the operation two were found in the ileum within an inch of the caecum, and spreading peritonitis was present.

Absence of all sounds during five minutes spent in auscultation of the abdomen was regarded by Grieg Smith as an indication of complete intestinal paralysis due to general peritonitis. This sign is, however, not infallible, as I have observed it on a few occasions in normal individuals before rising in the morning. It is, in fact, only of value if a patient has had food within the last eight hours, as the passage through the small intestine and the entrance into the caecum are generally complete within that period, the subsequent movements of the contents of the colon being in most cases silent. If there has been much vomiting, so that all food taken during the last eight hours has been rejected by the mouth, the small intestine will be empty and no sounds will be heard even in the absence of peritonitis. Moreover, if we wait for the disappearance of sounds from all parts of the abdomen before diagnosing peritonitis, much valuable time may be lost, as inhibition of peristalsis is to a great extent localized to the area of irritation. Thus I have frequently heard gastric sounds after the complete disappearance of caecal sounds due to peritonitis starting from a gangrenous appendix; and, on the other hand, I have still heard caecal sounds at an early stage after the perforation of a gastric ulcer when the stomach sounds had completely ceased. In perforation of a duodenal ulcer the caecal sounds are likely to disappear as early as the gastric sounds, owing to the tendency of the escaped material to pass towards the right iliac fossa.

The presence of sounds in the abdomen in suspected cases of peritonitis is thus of greater importance than their absence, as when the seat of origin of the sounds can be recognized it may be assumed that the peritonitis has not spread to that locality, or inhibition of peristalsis would have occurred.

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