days. These results scarcely endorse the view so frequently advanced as to the great danger of operating between the second and fifth days. But even though all these cases recovered, yet the earlier the operation the better the recovery. In all the operations within twenty-four and in the majority of those within forty-eight hours, the recovery was exactly similar to that after an "interval" operation, without any risk of a weak scar. In most of those on the third and fourth days drainage was necessary, convalescence was more prolonged, and the chances of a weak scar greater.

Of the nine deaths in the series five had general peritonitis, two had diffuse peritonitis with gangrene of the caecum as well as of the appendix, one a local abscess, and one a large abscess extending to the subphrenic region. Surely these fatalities may be justly ascribed to delay rather than to operation; the operation certainly failed to save, but it cannot be said to have materially hastened the inevitable end.

The great reduction in the mortality after operations for acute appendicitis that has followed the policy of "interfering" at an earlier period points irresistibly to the conclusion that were all cases submitted to operation in the early stages of the attack appendicitis would cease to be a fatal disease.

REFERENCE

¹ BRITISH MEDICAL JOURNAL, November 30th, 1907.

INTUSSUSCEPTION DUE TO POLYPUS.

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THE following two cases are interesting examples of intussusception due to polypus. Both of them occurred in adults, and in both of them treatment by excision was successfully carried out.

A. T., a woman aged 25, was suddenly seized with excruciating pain in the abdomen without any apparent cause; the pain was not localized. There was some vomiting but no increase of temperature; the pulse was 90. Her bowels had been constipated. She was kept in bed and treated with small doses of belladonna and hot stupes, with small sips of hot water to drink. As the vomiting continued and the bowels did not act, enemata were administered. These were continued twice daily; faecal matter always returned, but there was never a good result. After forty-eight hours a mass of an indefinite nature was discovered in the right inguinal region. Operation was suggested and refused.

On each succeeding day her general aspect was worse, and each day the question of operation was forcibly put forward, without avail. On the eighth day she was vomiting the contents of her intestine, and although the enemata still brought away faecal matter, her general aspect was very bad. The temperature remained normal and the pulse 96.

She was placed under ether, and the abdomen was opened by a vertical incision on the outer side of the right rectus. The mass which had been felt was found to be an intussusception of the ileo-caecic variety. As it was impossible to reduce it, the whole of the intussusception was excised. The divided ends were united by two layers of silk sutures. She was much collapsed in spite of saline transfusion direct into her veins and hypodermic injections of liquor strychninae. She, however, gradually improved and made an uninterrupted recovery. Her temperature only once reached 100°. The skin stitches were removed on the ninth day, and she was up in three weeks. She has since married, and remains in perfect health—nearly five years after operation.

The portion of bowel excised consisted of 8 in. of the ileum. There was a considerable amount of gangrenous degeneration and at the apex of the intussusciplens a sessile polypus. The specimen was submitted to the Clinical Research Association for examination, and they reported it to be of an innocent nature.

T. S., a male, aged 50, was sent by Dr. Dickinson, of Tenbury. He had suffered from total obstruction of the bowels for a week; no flatus had passed. He had been vomiting constantly for three days, and during the last twenty-four hours the vomit had been faecal. He had had a similar attack six months previously which lasted a week, when, he states, "the doctor syringed me and it came away."

When admitted, on October 8th, 1907, although he had come by train and walked from the station (a mile and a half), he did not appear much distressed. He was a well-nourished man, and his organs were healthy. He vomited at frequent intervals, and the vomit consisted of intestinal contents. The abdomen was swollen and tympanitic, but there was no tenderness. By the rectum a prominent mass could be felt with an orifice, but the finger could not reach the sulcus. No polypus was felt, but as Dr. Dickinson had felt it, it is probable that it

had slipped back. There had not been any discharge of mucus or blood per anum.

He was placed under ether and the anus was dilated. The left hand was easily introduced, and was passed upwards, carrying the intussusciplens in front of it and completely reducing it. The fingers were easily palpable just to the left of the umbilicus. Nothing further was discovered by bimanual examination. The bowel was thoroughly washed out, and he was returned to bed. On the following day he was quite comfortable, he passed flatus, and his bowels acted naturally. He continued to progress satisfactorily, and was discharged at the end of a week. He was warned that the condition might recur, and was advised to return immediately if it did.

A week later he returned. The intussusception had occurred again; there was a considerable amount of tenesmus, with passage of blood and mucus. By the rectum the intussusciplens could be easily felt, and at its apex there was a hard flattened mass, which felt ulcerated on its surface. During the night it protruded from the anus, and was seen by the nurse.

He was placed under ether, and an incision was made in the left iliac region from an inch inside the anterior superior spine of the ilium vertically upwards for 3 in. The intussusception was found to reach to just above the brim of the pelvis, the intussusciplens was with difficulty reduced, and was found to consist of more than a foot of the colon. At a point corresponding to the level of the umbilicus there was a puckered and hardened condition of its wall, interfering considerably with its calibre. Twelve inches of the bowel was removed, commencing 2 in. above the puckered portion, and the ends were joined by two rows of silk sutures. Several enlarged glands were also removed. The abdominal wound was closed in layers. There was very little shock. The following day he had some distension and vomiting, which was relieved by the stomach tube. Otherwise he made an uninterrupted recovery. He passed flatus after forty-eight hours and the bowels were well moved on the fifth day. He was discharged at the end of a month.

On opening the portion of excised bowel a sessile polypus about $\frac{1}{2}$ in. in diameter was discovered with its surface ulcerated. A portion of this, together with one of the glands, was sent to the Clinical Research Association, and they reported: "This growth of the sigmoid is a columnar-celled carcinoma, showing the usual branching tubules lined by proliferating columnar epithelium. The enlarged gland contains a similar growth, but has almost completely undergone colloid degeneration. It is probably a secondary growth, not necessarily in a gland, as no gland structure can be seen."

The first case is remarkable for two reasons: (1) The slight symptoms attending such an acute condition. There was nothing beyond the sudden onset to suggest the nature of her trouble. There was no tenesmus, no blood or mucus in the stools; her pulse did not increase, and her temperature did not rise. (2) The daily passage of flatus and faecal matter. At the operation the large bowel was found empty, and there can be no doubt that flatus and fluid faeces were able to pass through the intussusciplens, although it was sufficiently constricted to produce gangrenous degeneration. It emphasizes the necessity of exploratory operation in cases where the general aspect of a patient remains unsatisfactory.

The second case, although of a chronic type, was, in the last attack, accompanied by far more acute symptoms. There was constant tenesmus, with passage of blood and mucus, frequent vomiting, and an increasing pulse. No attempt at reduction was made on this occasion, as it was evident that some more radical treatment was necessary. I therefore decided to shorten the bowel by excision.

In the course of the after-treatment we have yet another instance of the value of the stomach tube. With it a large quantity of gas and filthy material was removed, and in a few hours his alarming condition had disappeared. After such operations the use of enemata or aperients is contraindicated, and it is especially in such cases that the stomach tube is indispensable.

It is interesting to note that on the first occasion the hand and arm were easily introduced into the bowel, and in spite of this the polypus was not discovered. The portion of bowel containing it was evidently carried in front of the approaching hand. The kidney was felt and the fingers were seen and palpated to the left of the umbilicus. Although I remember a paper, by a bygone surgeon, on palpation of the kidney per rectum, I have not previously been able to do so, and it is probable that few surgeons have had such an experience. The size of the hand, in the present instance $7\frac{1}{2}$, is no doubt an important factor in rendering such manipulations possible.

The presence of a polypus is not only likely to produce intussusception, but when once this has happened it is

likely to recur. It is not always possible even to suspect its presence, but whenever it is found the best treatment is excision.

Lectures

ON

THE PASSAGE OF FOOD THROUGH THE HUMAN ALIMENTARY CANAL.

DELIVERED AT GUY'S HOSPITAL FOR LONDON UNIVERSITY
ADVANCED STUDENTS DURING OCTOBER, 1907.

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(Continued from p. 137.)

III—THE MOVEMENTS OF THE SMALL INTESTINES.

The old experimental methods, in which the viscera of an animal were exposed to view, demonstrated the occurrence of peristaltic waves, which propelled the contents of the small intestines slowly towards the caecum. Cannon,²⁸ by means of *x*-ray examinations in cats and dogs, discovered that another and equally important type of movement occurred, which he termed "segmentation." This probably is the normal form of the "swaying pendular movements," first described by Ludwig, which are seen in the exposed gut of animals whose splanchnic nerves have been cut.

The function of segmentation is to mix the food thoroughly with the bile, pancreatic juice, and intestinal juice, and at the same time to bring every portion into frequent contact with the absorbing mucous membrane. Mall²⁹ has also pointed out that it assists in the pumping of blood from the submucous venous plexuses into the radicles of the superior mesenteric vein and in the discharge of chyle from the lacteals of the villi into the larger lymph vessels of the mesentery.

Plaff and Nelson,³⁰ on the strength of 60 negative experiments, have recently denied the existence of segmentation, even in cats; this is difficult to understand, as on the only occasion on which we watched the intestinal movements in a cat, segmentation—exactly as described by Cannon—was perfectly obvious.

The shadow of the small intestines cannot, as a rule, be very definitely seen in man, owing to the rapid passage of the bismuth through them, and the diminished concentration of the salt due to the large quantities of digestive juices present. This probably accounts for the fact that when we began our investigations segmentation had never been observed in man. But in three healthy individuals and in three patients who had been given bismuth meals for diagnostic purposes, we have seen the shadow of a short length of small intestine and have watched its movements at intervals over a period of half an hour. Apparently a small quantity of food, containing more bismuth than the rest, kept together as it passed along the gut on these occasions. We were, in the first place, able to trace the onward movement of the shadow as a whole, due, no doubt, to ordinary peristalsis. It was obviously impossible to ascertain the rate of progress, as the movement occurs in such varying directions and in more than one plane. We also saw well-marked segmentation. The shadow of the short length of small intestine, at first of uniform thickness, became constricted in its centre; the constriction increased until the single shadow was more or less completely divided into two. Then each half underwent a similar division, but the two central segments of the four thus produced joined together. The new central segment then divided again, the segmentation continuing in one case at the rate of ten divisions in a minute and a half. The process, as seen with the *x* rays, is shown somewhat diagrammatically in Fig. 3.

On eight occasions we made skiagraphic observations at short intervals on normal individuals who had taken an ordinary meal, to which one or two ounces of bismuth carbonate had been added, in order to determine how soon the first traces of the stomach contents reached the caecum. We found that the shadow of the caecum began to appear between three and a half and five hours, with an average of four and three-eighths hours, after the food

had been taken, and numerous other observations, less accurately carried out, were all in accord with these times. Thus the shadow of the caecum is always obvious before that of the stomach has disappeared. Presuming, as we are probably justified in doing, that some of its contents begin to leave the stomach within half an hour of the beginning of a meal, it is clear that the average rate at which the contents of the small intestines travel is $22\frac{1}{2}$ ft. in four hours, or 5 ft. and 7 in. per hour, which is equivalent to about one inch per minute.

Fig. 3.—Diagram of segmentation in human small intestine occurring simultaneously with peristalsis.

Cannon hoped to obtain evidence of the occurrence of antiperistalsis in the colon by auscultation, but he came to the conclusion that the sounds often heard in the ascending colon were due to the oscillating contractions of the walls of the sacculi described by Elliott and Barclay-Smith. It occurred to me that the sounds heard over the caecum would more probably be due to the entry of the fluid contents of the ileum through the ileo-caecal valve. In order to test this view we listened on a number of occasions, at short intervals throughout the day, 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 four 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 carbonate were taken with the breakfast on one occasion by four of the five individuals investigated. It was found that the appearance of a shadow in the caecum, when examined by the *x* rays, coincided in point of time with 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. Hence it seems clear that in auscultation we have a means by which we can time the rate at which the contents of the small intestine pass from the stomach to the caecum. Auscultation may thus take the place of skiagraphy, when the latter cannot for some 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 intestines.

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 at a later period 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 quarter or half minute after lying down the sounds are generally loud and