

THE ILEO-CÆCAL SPHINCTER. By ARTHUR F. HERTZ, M.A., M.D., F.R.C.P., *Assistant Physician to Guy's Hospital.*

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No mixing takes place under normal conditions between the contents of the small and the large intestines, so that fæcal material which has once reached the cæcum can never return into the ileum. This has been believed to be due to the mechanical action of the ileo-cæcal valve ever since its discovery in 1579 by Casper Bauhin, who found that after death it can resist a moderate degree of pressure from the side of the colon, but very little from the side of the small intestine. In 1903, however, Keith⁽¹⁾ suggested from anatomical considerations that a strong ileo-cæcal 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, and in the following year Elliott⁽²⁾ proved experimentally that such a sphincter exists.

It was thought by many that the function of the sphincter was to prevent the regurgitation of fæces from the cæcum into the ileum when antiperistaltic waves were set up in the ascending colon. Our X-ray investigations have, however, shown that antiperistalsis does not occur in man under normal conditions¹; moreover, the ileo-cæcal sphincter does not always prevent regurgitation into the ileum, as, in common with other observers, I have seen a bismuth suspension pass into the ileum when run into the colon through the rectum at as low a pressure as one foot of water. There can be no doubt that the function of the

¹ J. T. Case in a communication read before the Radiological Section of the International Congress of Medicine since this paper was written states that he has seen antiperistaltic cases with the X-rays in several normal individuals. But they were generally shallow compared with the wide lumen of the cæcum and would therefore hardly increase the pressure behind the ileo-cæcal sphincter, but would have a churning rather than a propulsive action, very different from the purely propulsive action of the peristaltic waves of the end of the ileum, which completely obliterate its lumen and cause a very considerable rise of pressure in part of the sphincter.

sphincter is, as Keith originally suggested, to prevent the contents of the ileum passing too rapidly into the cæcum. Some recent observations made with Mr Alan Newton of Melbourne have confirmed and amplified my earlier investigations on this subject. We have found that the bismuth-containing chyme reaches the end of the ileum an hour or even longer before any appreciable quantity passes into the cæcum, and that the ileum is often still full four, five or more hours after the last traces of bismuth have left the stomach. Consequently an accumulation of chyme occurs in the last few inches of the ileum, where it remains and undergoes digestion, actually for a greater period than in the stomach. During the whole of this time active segmentation, but very little peristalsis, can be seen. It is clear, therefore, that the function of the ileo-cæcal sphincter is to prevent the passage of the contents of the ileum into the cæcum until sufficient time has elapsed for digestion and absorption of foodstuffs to be complete, as the chyme which reaches the cæcum contains only very small quantities of nutrient material in solution. Iliac stasis is thus a normal physiological condition of the utmost importance for adequate digestion.

The ileo-cæcal sphincter begins to relax at infrequent intervals some time after the chyme first reaches it. Relaxation appears to occur each time a peristaltic wave passes along the last few inches of the ileum. As, however, our X-ray observations have shown that peristalsis is never very active in the extreme end of the ileum except during and immediately after meals, it is then that the greater part of its contents enter the cæcum. This agrees with the observations of Cash⁽³⁾ who found that the peristalsis of the small intestine of a dog was increased by the smell of food and the mere act of swallowing, and that the entry of food into the stomach produced still more active movements. I first described some radiographic observations which pointed to the presence of a gastro-iliac reflex in 1909⁽⁴⁾, but its great importance was only clearly demonstrated by my recent observations with Mr Alan Newton. It is now clear that the filling of the cæcum depends to a large extent upon a gastro-iliac reflex, which results in active peristalsis in the end of the ileum and relaxation of the ileo-cæcal sphincter whenever food enters the stomach.

The normal iliac stasis is increased in all conditions leading to spasm or to the inhibition of the normal relaxation of the ileo-cæcal sphincter. In peritonitis due to acute appendicitis, for example, the sounds which normally indicate the squirting of the contents of the ileum into the gas-containing cæcum cease completely owing probably to spasm of the

sphincter, which Elliott has shown occurs in animals when the splanchnic nerve is stimulated or the neighbouring peritoneum is irritated. In chronic appendicitis similar but less marked delay often occurs. One of the most marked cases of iliac stasis I have ever seen was in such a case. Six hours after the bismuth meal the stomach was empty, but no bismuth was present in the cæcum, all of it having collected in the end of the ileum, though in the average normal individual the shadow by this time would have reached the hepatic flexure. The last few inches of the ileum could be clearly defined, as they were distended with chyme. Palpation under the screen showed that there were no adhesions, the whole of the ileum being freely movable. Twenty-four hours later some bismuth was still present in the last inch and a half of the ileum and a little in the cæcum and ascending colon, all the rest having passed to the rectum, from which some bismuth-containing fæces had just been evacuated. It was clear, therefore, that the only stasis in this patient's alimentary canal was in the end of the ileum. Mr R. P. Rowlands operated and removed an appendix full of pus, but found that the ileum was perfectly normal and was free from adhesions. The ileo-cæcal junction was not abnormally narrow, so that it was clear that the stasis could have been due to nothing else than inhibition of relaxation or spasm of the ileo-cæcal sphincter.

REFERENCES.

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- (3) Cash. Proc. Roy. Soc. xli. p. 212. 1886.
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