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Postoperative Motility of the Small Intestine

A Study with Endoradiosondes

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ABSTRACT

The postoperative motility of the small intestine was studied by means of pressure-sensitive endoradiosondes in patients who had undergone abdominal operations with and without enterotomy. The curves recorded were analysed qualitatively and compared with curves from healthy intact control persons. In 9 patients distinct activity was recorded between 20 min and $3\frac{1}{2}$ hours after the operation and in 3 patients between $3\frac{1}{2}$ and $5\frac{1}{2}$ hours postoperatively. No difference was found between cholecystectomized and gastrectomized patients. In a patient who had undergone duodenopancreatectomy, on the other hand, activity was delayed until $16\frac{1}{2}$ hours postoperatively. The initial contraction waves were predominantly of type I, and only in a few cases were type III waves seen. The propulsive motility was studied by following the point of maximal signal strength. After only 1–$4\frac{1}{2}$ hours after cholecystectomies and gastric resections this point lay above the symphysis pubis or at the right or left iliac fossa, indicating that the propulsive intestinal motility of the small intestine was not notably delayed postoperatively. Only after extensive operations was considerable delay in this motility observed.

INTRODUCTION

Divergent opinions have been expressed concerning the motility of the small intestine after an abdominal operation. Devine (5) considers that the small intestine does not attain normal motility until the 3rd day after operation. Kewenter & Kock (11) studied the variations in intestinal pressure by an electromanometric technique and open catheters in the postoperative period after gastrectomy and after cholecystectomy. They found that only 2 out of 11 cases displayed increased intestinal motility to intraintestinal administration of food. In most of the patients there was no reaction until the 3rd day after operation, and in one patient not until the 5th day. Neither did prostigmin produce intestinal activity after Billroth II gastric resections before the 3rd or 4th day. After Billroth I gastric resections this response was obtained somewhat earlier. In experiments on the dog and rabbit, using endoradiosondes, Dahlgren & Thorén (4) observed intestinal peristalsis immediately after abdominal operations. Similarly, Faxén et al. (8), using roentgenological methods, noted intestinal motility immediately after laparotomies.

The aim of the present work was to study, by means of pressure-sensitive endoradiosondes, the motility of the small intestine after abdominal operations with and without enterotomy.

MATERIAL AND METHODS

The activity of the small intestine was studied by means of endoradiosondes. These are small wireless transmitters which convey information to a radio receiver and a recording unit. They have been described earlier by Jacobson & Nordberg (10). A receiver of the type described by Jacobson & Lindberg (9) was used. This was connected to one channel of a two-channel recorder.

In order to record at the same time the pressure changes in the abdomen due to respiratory movements, an apparatus described previously (3) was used.

The material comprised 13 patients, 5 of whom had undergone cholecystectomy, 5 gastrectomy, 1 explorative laparotomy, 1 plastic repair of a diaphragmatic hernia and pyloroplasty and 1 duodenopancreatectomy. Of the 5 gastrectomy patients, 4 underwent a Billroth I and one a Billroth II resection; in one of these 5 patients a hemicolectomy was also performed.

The curves were analysed qualitatively and compared with curves from a series of 10 healthy persons in whom the gastrointestinal motility had been studied with endoradiosondes (3). The classification of pressure waves in the digestive tract first suggested by Templeton & Lawson (14) was used.

The propulsive motility was calculated approximately in 4 cases by attempting always to hold the aerial at the position on the abdomen where the strongest signal was recorded. The aerial thus had to be moved in accordance

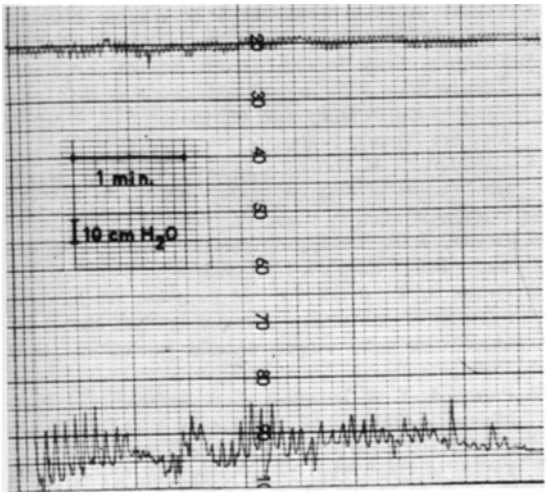

Fig. 1. Curve recorded $1\,^1/_2$ hours after the end of a gastrectomy.

with the propagation of the sonde in the analward direction.

The non-enterotomized patients swallowed the endoradiosonde with a drink of water about $^1/_2$ hour before the operation. The surgeon then moved the sonde to the duodeno-jejunal flexure. In the enterotomized patients the surgeon placed the sonde in the intestine via the enterotomy. The recording started immediately after the operation or within about 1 hour postoperatively. In one case recording was started during the operation. The measurements were made continuously, as a rule for about 2 days, but in a few cases 3 days.

RESULTS

The curves obtained correspond well with previous findings, e.g. by Templeton & Lawson (14). These and other authors have described four different types of contraction waves, viz. types I, II, III and IV (1, 3, 4, 7). In 9 patients the activity commenced between 20 min and $3\,^1/_2$ hours after the operation, and in 3 patients between $3\,^1/_2$ and $5\,^1/_2$ hours postoperatively. After the duodenopancreatectomy, however, no activity was observed until $16\,^1/_2$ hours had elapsed. In all cases the initial waves were exclusively or predominantly of type I; only in a very few cases was activity of type III observed, and this was very sparse. The amplitudes of the type I waves corresponded to a pressure of about 10 cm H_2O.

Immediatley after the operation the point of maximal signal strength was noted in the epigastrium or in the left or right hypochondrium. After 1 hour, 4, 5 and 7 hours respectively in those 4 cases where the study could be carried out consistently, the maximal signal strength was recorded above the symphysis pubis or at the right or left iliac fossa. Fig. 1 shows a curve recorded $1\,^1/_2$ hours after the end of a gastrectomy, where clear signs of motility are seen in the small intestine.

The relationship between pressure wave and propulsion could not be elucidated by this method, however, since the propulsion was only studied indirectly. As in a previous study (3), we observed that the sonde sometimes moved in an analward direction without any appreciable pressure changes occurring. In other cases considerable activity was recorded while the sonde remained relatively still.

DISCUSSION

The gastrointestinal motility has been studied previously by several methods, which have been reviewed in a previous paper (3).

The technique of using endoradiosondes has been described earlier by Jacobson et al. (9, 10) and employed by several authors (1, 2, 3, 6, 7, 13). The advantage of this method is that the sonde does not disturb the normal physiology when it passes through the intestinal tract. The intestinal propulsion can be studied to some extent by the simple technique that we used, or by a more exact method, as described by Bárány & Jacobson (1). The disadvantage that the endoradiosonde, when lying in the upper part of the abdomen, sometimes records pressure changes caused by respiratory movements, has been overcome essentially by means of the breathing indicator that we have constructed.

The finding in some cases that the sonde moves analwards without any pressure change being recorded is assumed to be due to the fact that for a short period of time the sonde moves with exactly the same velocity as the contraction wave. Usually, however, these two velocities differ and the sonde then records the pressure changes adequately.

In this study type I waves predominated. Only to a small extent were waves of type III observed. The amplitudes of the waves corresponded to pressures of 5–20 cm H_2O. On comparison with

the controls, not operated on (3), it is found that the intestinal activity in the laparotomized patients is somewhat more sparse, in both amplitude and frequency. The occurrence of type III waves is also more sparse in the laparotomized than in the control series. No quantitative analysis of the intestinal activity, of the type made in our previous study (3), was performed on this series of patients, since the sparse activity was distributed over a long period.

The propulsion of the endoradiosonde through the small intestine—measured indirectly by observing the location of the point of maximal signal strength—appears to have approximately the same velocity in the laparotomized patients as in the control persons.

The study supports the assumption that the resting motility of the small intestine is only moderately reduced by laparotomy. Neither does enterotomy seem to inhibit the resting peristalsis of the small intestine to any appreciable extent. Major operation such as duodenopancreatectomy result in a clear inhibition, however. The observations on the propulsion of the sonde also indicate that the propulsive motility of the small intestine is not greatly disturbed by less extensive abdominal operations. The finding that a short time postoperatively the point of maximal signal strength lay at the right iliac fossa was considered to mean that the sonde lay in the region of the distal ileum. This is supported by our observations on the control series, where typical colonic activity was recorded a short time after the maximal signal strength had been observed over the right iliac fossa.

In this study the sonde was placed distal to the pylorus in order to obtain information specifically on the motility of the small intestine. No observation of the gastric evacuation was thus possible or intended. To judge from various investigations, however (8, 12), the gastric evacuation seems to be considerably more inhibited than the motility of the small intestine after laparotomy.

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