Feasibility of Early Postoperative Feeding Following the Resolution of Gastric Ileus after Colonic Surgery

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Abstract: Purpose: To evaluate the effect of early oral feeding following the resolution of gastric ileus after open colonic resection. Methods: Eighteen unselected patients (median age 64 years) undergoing colonic resection were included in this study. None of the patients had nasogastric tubes. On the first postoperative morning, radiopaque markers were administered orally and abdominal X-rays were taken 6 h later and daily thereafter, until more than 80% of the markers had emptied out of the stomach. Patients were then allowed oral feeding. Findings: Greater than 80% of the markers had emptied out of the stomach in 39% of the patients by the first postoperative afternoon, and cumulatively in 78% of the patients by the second postoperative morning. The median postoperative time to 80% gastric emptying of markers followed by an oral diet was 39 h, which was significantly shorter than that of flatus or defecation (56 h and 70 h, respectively). One patient with an adverse side effect to morphine vomited. Conclusion: These results suggest that early oral feeding should be resumed following the resolution of gastric ileus to avoid vomiting.

Key words: early oral feeding, gastric ileus, colon resection

Introduction

Adequate nutrition has always been a major goal of postoperative care. However, early oral feeding after abdominal surgery was usually avoided due to ileus, and nasogastric decompression was routinely used. More recent studies indicate that the routine use of a nasogastric tube after elective colorectal surgery may be unnecessary. Regardless of the use of a nasogastric tube, oral feeding was usually delayed until after the resolution of postoperative ileus. Other studies showed that early enteral nutrition in surgical patients reduced septic complications and overall morbidity compared with parental nutrition. Early feeding after elective open-colectomy has also been shown as safe and tolerated by the majority of patients. However, morbidity may have been overlooked, as 14–48% of patients vomited after early oral feeding, which had been resumed on the first postoperative morning. This could be due to not taking account of individual resolution of postoperative gastric ileus. The present study was undertaken to determine when early oral feeding could be resumed following colonic surgery to avoid vomiting.
Methods

Patients
This study included 18 consecutive patients undergoing elective surgery for colon carcinoma. Patients who underwent emergency laparotomy or any laparoscopic procedures were excluded. Informed consent was obtained from all patients and the investigation was approved by the Showa University Ethics Committee. All patients had a preoperative mechanical bowel preparation with polyethylene-glycol along with perioperative intravenous antibiotics. Procedures were performed by residents in training under the guidance of senior staff (A.T.). The protocol used general anesthesia, supplemented with epidural anesthesia. The median age of the patients was 64 years (range, 31–83 years). The study cohort comprised 7 males and 11 females.

Surgical procedures
The surgeries performed included 9 sigmoidectomies, 6 right hemicolectomies, two transverse colectomies, and 1 ileocecal resection (Table 1). All patients had a standard midline incision and received an identical pain management regimen. Accordingly, pain was treated with a continuous epidural infusion of bupivacaine 0.25%, 2 ml/h and morphine 0.2 mg/h for 96 h postoperatively using a Basal/Bolus Infusor (Baxter Healthcare Corp., Deerfield, IL, U.S.A.) and intravenous administration of flurbiprofen axetil (50 mg) every 6 h for 2 days. None of the patients had nasogastric tubes. Specific information was collected regarding meals, nausea, vomiting, flatus, bowel movements, abdominal discomfort, and complications. Operative time, blood loss, and length of stay were also recorded. Anastomoses except for the patient with a transverse colon carcinoma, were performed with a mechanical stapler. Colorectal anastomosis was performed with the Proximate TM ILS CDH (Ethicon, Cincinnati, OH, U.S.A.). Ileocolonic anastomosis was performed in a functional end-to-end manner with a Linearcutter stapler (Ethicon). An intraabdominal drain tube was introduced in all patients.

Table 1. Characteristics of patients

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of patients</td>
<td>18</td>
</tr>
<tr>
<td>Age (years)</td>
<td>64 (31–83)</td>
</tr>
<tr>
<td>Sex (M/F)</td>
<td>7/11</td>
</tr>
<tr>
<td>Site of tumor</td>
<td>Cecum 3, Ascending colon 4, Transverse colon 2, Sigmoid colon 9</td>
</tr>
<tr>
<td>No. of operative procedure</td>
<td></td>
</tr>
<tr>
<td>ileocaecal resection</td>
<td>1</td>
</tr>
<tr>
<td>right hemicolecotomy</td>
<td>6</td>
</tr>
<tr>
<td>transverse colectomy</td>
<td>2</td>
</tr>
<tr>
<td>sigmoid colectomy</td>
<td>9</td>
</tr>
<tr>
<td>Duration of operation (min)</td>
<td>165 (150–250)</td>
</tr>
<tr>
<td>Operative blood loss (ml)</td>
<td>225 (15–680)</td>
</tr>
</tbody>
</table>

Figures are median (range)
Study design

On the first postoperative morning at 9 am, Sitzmarks (Konsyl Pharmaceuticals, Inc., U.S.A.), 20 radiopaque markers were administered orally and abdominal x-rays were taken 6 hours after and then daily at 9 am, until greater than 80% of the markers were emptied out of the stomach. We provisionally regarded 80% as the resolution of gastric ileus in this study. Confident localization of radiopaque markers to the stomach was possible in most based on various radiographic features—either singly or in combination: (a) soft tissue outline of the stomach along its contour and/or in the fundus resulting from intragastric fluid; (b) the known course and position of the stomach and duodenum; (c) the majority of markers in the stomach existed in the fundus (lt subphrenic area on X-ray film). In 5% of the radiographs, it was difficult to determine whether a marker was in the distal stomach or proximal duodenum. Whenever this uncertainty arose, we arbitrarily assumed that the marker had not yet emptied from the stomach. Immediately after greater than 80% of the markers were emptied out of the stomach, patients were allowed an intake of clear liquids.

Diet

Rice-water was then offered for two meals, followed by rice gruel. There were three sorts of rice gruel which was defined according to the proportion of rice to tap water (1:9, 1:6, and 1:2). These were offered daily until the usual boiled rice meal, which was served as a proportion of 1:1. Side-dishes were offered corresponding to the rice status. Diet began and continued regardless of bowel sounds, flatus, or stool frequency. Patients were discharged after they had bowel movements and when they were able to ambulate without difficulty, and felt socially secure.

Pain was assessed on a visual analogue scale during rest, walking, and coughing, beginning preoperatively and then daily until discharge (0=no pain, 100=worst imaginable pain).

Nausea and vomiting were assessed on a four point-scale where 3, 2, 1 and 0 indicated severe, moderate, mild, and no symptoms, respectively. Time until resumption of flatus or defecation was recorded. Body weight was measured preoperatively and on the day of discharge.

Statistic analysis

Statistical analysis was performed with the Wilcoxon’s rank sum test for paired data. Statistical significance was assigned to any p<0.05.

Results

The median pain scores on the first postoperative day were 4 at rest, 14 during walking, and 52 during coughing, and decreasing thereafter (Fig. 1). Overall, the pain relief at rest was good and most had only slight pain on walking, which allowed early mobilization. Greater than 80% of the markers had been emptied in 39% of the patients (7/18) by the first postoperative afternoon, and cumulatively in 78% of the patients (14/18) by the second postoperative morning (Fig. 2). The median time to 80% gastric emptying of markers followed by an oral diet and resumption of bowel function was 39 h, which was significantly shorter than the time to flatus (P=0.0007) or defecation (P<0.0001), 56 h and 70 h, respectively (Fig. 3). There was a significant difference in body weight
Fig. 1. Median pain scores assessed on a visual analogue scale at rest, during walking and coughing.

Fig. 2. Time course of gastric emptying of 20 radiopaque markers which were administered orally on the first postoperative morning. A dotted line shows the level of 80% of the markers, which we regarded as the resolution of gastric ileus in this study.

preoperatively (median, 53.30 kg) and at the day of discharge (median, 53.25 kg) \( (P=0.0075) \).

None of the patients had nasogastric tubes. Five patients suffered from slight intermittent nausea (score 1), but the nausea disappeared within 24 h. One patient had moderate nausea (score 2) for 48 h and vomited on the first postoperative day (score 1) due to side effects from the morphine epidural. The remaining 17 patients did not vomit. Two patients reported abdominal distention and pain 5 and 6 days, respectively, after their operations, but improved without the placement of a nasogastric tube. None of the patients had
Fig. 3. Postoperative time to 80% gastric emptying of markers followed by an oral diet and resumption of bowel function.

bars, median; \*P<0.01 versus Flatus

Discussion

A dynamic ileus after abdominal surgery is characterized by the absence of motility due to neuromuscular inhibition with symptomatic overactivity. It occurs following abdominal procedures. Small intestinal motility followed by gastric motility has been shown to return earlier than colonic motility.\textsuperscript{14, 15} Postponement of oral feeding until after the resolution of colonic ileus has been a subject for debate. Several prospective studies have shown that early feeding after elective colectomy is safe and tolerated by the majority of patients.\textsuperscript{8, 10, 12, 13} While early postoperative feeding does not make any difference to the clinical outcome in terms of mortality, it has increased the patient morbidity in those fed early by inducing vomiting during the postoperative days. Approximately 27% of those patients required the placement of a nasogastric tube. Vomiting may cause pneumonia due to aspiration during attempts to force oral intake against an ileus.

Vomiting may have no correlation, however, with the duration of postoperative ileus. The patients who vomited may have had some delay in gastric ileus, while colonic function progressed and recovered in a timely manner. If a patient's recovery in gastric ileus is explored, a proper diet for the early postoperative period could be determined. As was demonstrated in this study, all patients who were fed following the gastric emptying of markers tolerated the gradual dietary advancement without vomiting before their first postoperative flatus or defecation. Resumption of oral feeding occurred in 39% of patients on the first postoperative day, and cumulatively in 78% within two days following the operation.

To date, the techniques used for measuring gastric emptying have been serial X-ray
evaluations of radiopaque solids\textsuperscript{16,17}, external $\gamma$-ray scintigraphy of consumed radiolabeled indigestible material\textsuperscript{18}, and monitoring changes in the antral area with the use of ultrasound\textsuperscript{19,20}. Of these techniques, $\gamma$-ray scintigraphy is a costly examination and intraabdominal air introduced after laparotomy may impede accurate ultrasound imaging. Radiopaque markers provide a simple and safe method for measuring gastric emptying of indigestible solids in humans\textsuperscript{14,16}. Materials and equipment for this technique are also widely available. Hence, we applied this method in the present study.

We did encounter difficulties interpreting films imaged from the stomach region. In approximately 10\% of films, it was uncertain whether a marker or a group of markers resided in the stomach or in the proximal duodenum. Nevertheless, we provisionally regarded 80\% gastric emptying of markers as having gastric motility returned, and most patients did not vomit. Further studies are required to confirm these findings.

It is unclear whether this method using non-digestible particles can reflect gastric emptying accurately. A comparative study showed that gastric emptying of nondigestible particles was faster than that of digestible solids\textsuperscript{17}. Another study reported the converse\textsuperscript{16}. In both studies, emptying of liquids was faster than either pellets or digestible solids\textsuperscript{16,17}. Postoperative gastric emptying may have to be evaluated with liquids, because liquid meals are generally the first to be taken postoperatively.

The benefit of earlier postoperative feeding is to permit earlier hospital discharge and a more comfortable recovery at home. Traditionally, the meal has been gradually advanced postoperatively from rice-water to the usual boiled rice in the majority of the hospitals in Japan. This takes about five days. Hospital stays, which averaged nine days in the present study, could become reduced if the meal was advanced more quickly. Another potential advantage, although difficult for quantitative measurement, is the feeling of well-being in those patients who are orally fed. The positive psychological impact of feeding after surgery may have an important role in the recovery process.

In conclusion, early oral feeding following the resolution of gastric ileus is safe and feasible without vomiting in patients undergoing elective colonic surgery.

References

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Oral Feeding after Recovery from Gastric Ileus


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