Early oral feeding in patients undergoing elective colonic anastomosis

Ayman El Nakeeb, Amir Fikry, Teto El Metwally, Elyamani Fouda, Mohamed Youssef, Hosam Ghazy, Sabry Badr, Wael Khafagy, Mohamed Farid

Mansoura University Hospital, General Surgery Department, Colorectal Unit, Mansoura, Egypt

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Abstract
Background: This study assesses the safety outcome of early oral feeding and reports on the factors affecting early postoperative feeding after colorectal procedures.

Patients and methods: Between June 2005 and April 2008, 120 consecutive patients underwent elective colonic anastomosis and were then randomized into two groups. The early feeding group began fluids on the first postoperative day while the regular feeding group was managed in the traditional way—nothing by mouth until the resolution of ileus.

Results: The majority of patients (75%) tolerated the early feeding. The times to first passage of flatus (3.3 ± 0.9 days vs 4.2 ± 1.2 days) and stool (4.1 ± 1.2 days vs 4.9 ± 1.2 days) were significantly quicker in group 1. Hospital stay was also significantly shorter in the early feeding group (6.2 ± 0.2 days vs 6.9 ± 0.5 days). Operative time and amount of blood loss had an impact on the tolerability of early feeding while age, gender, type of operation and previous abdominal operation had no such impact.

Conclusion: Early oral feeding after colorectal surgery is safe and tolerated by the majority of patients. Operative time and amount of blood loss do, however, have an impact on the tolerability of early feeding.

1. Introduction
Adequate nutrition has always been a major goal of postoperative care. However, because of ileus, early oral feeding after abdominal surgery is usually avoided and routine nasogastric decompression has been used instead. Traditionally, after abdominal surgery, the passage of flatus or bowel movements, which indicates the resolution of postoperative ileus, was the clinical evidence required for starting an oral diet. However, studies have shown that the routine use of a nasogastric tube after elective abdominal surgery and colorectal surgery may not be necessary.

With the advent of laparoscopic colectomy, patients have been fed routinely by postoperative day 2 which has been safely tolerated by the majority of patients. Recent evidence, however, seems to indicate that immediate postoperative feeding is actually feasible and safe after either laparoscopic surgery or laparotomy, including gastrointestinal tract surgery. Early enteral feeding in surgical patients has the advantage of reducing septic complications and overall morbidity when compared with parenteral nutrition.

Multimodal or fast track programmes have been widely reported to accelerate patient recovery and shorten hospital stays. Kehlet and others have shown that medium postoperative stays of 2–3 days following colonic surgery may be achieved without increases in complications. This is done using a combination of preoperative patient information, avoidance of fluid overload, epidural catheter, preemptive analgia, early enteral feeding and ambulation.

Therefore, the aim of this study was to assess the safety and tolerability outcomes of early oral feeding and to highlight factors affecting early postoperative feeding after elective open abdominal colorectal procedures.

2. Patients and methods
Between June 2005 and April 2008, 120 consecutive patients undergoing elective open colonic anastomosis at the Colorectal Surgery Unit, Mansoura University Hospital, Egypt, were entered into this study. Patients who had chronic liver disease, who underwent emergency laparotomy, who had a stoma created for them or those with metastasis were excluded from the study.

All patients were subjected to a thorough personal history assessment and clinical examination; blood samples were taken for routine laboratory investigation (CBC, liver function, renal function), electrolyte and tumor marker tests. The patients were also
assessed radiologically by barium enema, abdominal ultrasound, pelvic and abdominal CT, bone survey and chest X-ray in addition to colonoscopy and biopsy for diagnosis of colorectal cancer.

The patients were then randomized into two groups. Randomization was achieved using sealed envelopes. After carefully explaining the purpose of the study, informed consent was taken from every patient.

Group 1 (early feeding): 60 patients began fluids on the first postoperative day and advanced to a regular diet within the next 24–48 h, as tolerated (indicated by the absence of vomiting or abdominal distension).

Group 2 (regular feeding): 60 patients were managed in the traditional way—nothing by mouth until the resolution of ileus, then a fluid diet, followed by a regular diet.

Chemical and mechanical bowel preparation was done for all patients preoperatively. A nasogastric tube was inserted in all patients during surgery. The tube was removed immediately after surgery. The patients were monitored for vomiting, abdominal distension, length of ileus, tolerance of regular diet, length of hospitalization and complications. The nasogastric tube was reinserted after two episodes of vomiting in the absence of any bowel movements; this was resolved when bowel movements occurred in the absence of vomiting and abdominal distension ileus. Postoperative pain management was similar in both groups.

Those suffering from an anastomotic leak were subjected to treatments such as anti-infective treatment, nutritional support or colostomy.

Patients in both groups were eligible for discharge when they were self-caring, were tolerating oral fluid and diet, had bowel function, and were independently mobile.

Follow-up was carried out on the patients at 10–14 days postoperatively in the form of clinical, laboratory and radiological evaluations.

Statistical analysis of data in this study was performed using SPSS version 10. For continuous variables, descriptive statistics were calculated and reported as mean ± SD. Categorical variables were described using frequency distributions. The Student’s t-test for paired samples was used to detect differences in the means of continuous variables and the chi-square test was used in cases with low expected frequencies (a P-value < 0.05 was considered to be significant).

3. Results

Between June 2005 and April 2008, 144 patients presented for possible excision for cancer at the Colorectal Surgery Unit, Mansoura University Hospital, Egypt. Twenty-four patients were excluded (12 patients had metastatic disease, five patients had a stoma created for them, four patients had liver disease and another three patients were unfit for surgery) leaving 120 consecutive patients undergoing elective open colorectal surgery being entered into this study. The patients were then randomized into two groups; group 1 (early feeding group) included 60 patients, 39 males (65%) and 21 females (35%) with a mean age of 52.3 ± 12.5 years (range 21–70 years) while group 2 (traditional feeding group) included 60 patients, 42 males (70%) and 18 females (30%) with a mean age 56.3 ± 11.6 years (range 25–69 years). The groups were matched for surgical procedures as shown in Table 1.

The majority of patients in group 1 (75%) tolerated the early feeding. Vomiting was more common in the early feeding group than the traditional group (15 (25%) and 10 (16.66%) respectively) but did not reach a statistically significant level (Table 2).

The time to first passage of flatus was seen on postoperative day 3.3 ± 0.9 (2–8) in the early feeding group and on day 4.2 ± 1.2 (2–9) in the traditional group (P = 0.04). The first defecation was sooner in the early feeding group (postoperative day 4.1 ± 1.2) than the traditional group (postoperative day 4.9 ± 1.2, P-value 0.005). The postoperative stays for the early feeding and traditional groups were 6.2 ± 0.2 days (3–11) and 6.9 ± 0.5 days (3–12), respectively (P-value 0.05). Forty-five patients (75%) were satisfied after early feeding and 47 patients (78.33%) were satisfied in the traditional group (no statistical difference) (Table 2).

Three patients were readmitted in the early feeding group versus four patients in the traditional group. The readmission was due to abdominal distension, vomiting and anastomotic leak, as shown in Table 2.

Postoperative complications for the early feeding and traditional groups occurred in 14 and 22 cases, respectively. Wound complication occurred in 10% (early feeding) vs 11.67% (traditional), P-value = 0.78. Three cases had a burst abdomen in the two groups which necessitated surgical interference. Abnormal serum electrolyte was 8.33% in the early feeding group vs 10% in the traditional group (no statistical difference). Anastomotic leakage was 1.66% in

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group 1: early feeding group</th>
<th>Group 2: traditional feeding</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tolerated early feeding (%)</td>
<td>45 (75)</td>
<td>10 (16.66)</td>
<td>0.05</td>
</tr>
<tr>
<td>Vomiting (%)</td>
<td>15 (25)</td>
<td>4 (6.66)</td>
<td>0.25</td>
</tr>
<tr>
<td>Nasogastric tube reinsertion (%)</td>
<td>4 (6.66)</td>
<td>5 (8.33)</td>
<td>0.24</td>
</tr>
<tr>
<td>Time to first passage of flatus (days)</td>
<td>3.3 ± 0.9 (2–8)</td>
<td>4.2 ± 1.2 (2–9)</td>
<td>0.04</td>
</tr>
<tr>
<td>Time to first passage of stool (days)</td>
<td>4.1 ± 1.2</td>
<td>4.9 ± 1.2</td>
<td>0.005</td>
</tr>
<tr>
<td>Hospital stay (days)</td>
<td>6.2 ± 0.2 (3–11)</td>
<td>6.9 ± 0.5 (3–12)</td>
<td>0.05</td>
</tr>
<tr>
<td>Patients satisfaction (%)</td>
<td>45 (75)</td>
<td>47 (78.33)</td>
<td>0.24</td>
</tr>
<tr>
<td>Readmission (%)</td>
<td>3 (5)</td>
<td>4 (6.66)</td>
<td>0.273</td>
</tr>
<tr>
<td>Distended abdomen (%)</td>
<td>2 (3.33)</td>
<td>2 (3.33)</td>
<td></td>
</tr>
<tr>
<td>Anastomotic leak (%)</td>
<td>0</td>
<td>1 (166)</td>
<td></td>
</tr>
<tr>
<td>Vomiting (%)</td>
<td>1 (166)</td>
<td>1 (166)</td>
<td></td>
</tr>
</tbody>
</table>

Table 2
Comparison of the results between both groups.
the early feeding group vs 3.33% in the traditional group (where symptoms such as fever and leakage of intestinal contents were diagnosed as anastomotic leakage). Three cases suffered from leakage in the two groups. All the leakages occurred after low anterior resection of a tumor located in the lower rectum and healed after conservative measures; hence, surgical interference was not needed (Table 3).

Pulmonary infections occurred significantly more in the traditional group than in the early feeding group (11.67% vs 3.33%, Table 4).

Fifteen patients failed to tolerate early feeding and this presented as recurrent vomiting with abdominal distension without intestinal sound. The mean age of these patients was 51.5 ± 12.6 years, younger than that of the tolerant group, but the difference did not reach statistical significance. The mean operative time was significantly longer in the intolerant group than the tolerant group (179 ± 19.5 min vs 185 ± 16 min, P = 0.05). Intraoperative blood loss was significantly different between the tolerant and intolerant groups, P-value = 0.03. Age, gender, type of operation and previous abdominal operation had no impact on the tolerability of early feeding (Table 3).

### 4. Discussion

Use of a nasogastric tube, fasting and intravenous solution were traditional methods in abdominal surgery postoperative management. However, there has been a trend toward earlier feeding in postabdominal surgery patients in recent decades. The routine nasogastric tube decompression after abdominal and colorectal surgery has already been refuted.36,1

The gastrointestinal tract motility of patients undergoing abdominal surgery is transiently impaired (postoperative ileus, POI).17–19 Multiple factors are thought to contribute to the pathogenesis of POI, including physical manipulation of the bowel, surgical stress, inflammatory mediators, changes in electrolyte, neural reflux, pharmacologic agents such as inhalation anesthetics, and use of opioids for postoperative analgesia.20,21

Traditionally, tolerance of oral feeding is based on the passage of flatus. However, the physiology of postoperative ileus suggested that such an approach is excessively conservative. It has been shown that paralysis of the small bowel is transient; the gastric paralyisis lasts 24 h, and paralysis of the colon lasts 48–72 h.22

Our study has been conducted to evaluate the safety and tolerability outcomes of early oral feeding and to show the factors that affect early postoperative feeding after elective open abdominal colorectal procedures.

In our study, 45 patients (75%) tolerated early oral feeding while 15 patients (25%) failed to tolerate early feeding and presented with recurrent vomiting and abdominal distension without intestinal sound. In our study, the increased operative time and intraoperative blood loss had a significant impact on tolerance of early oral feeding. Age, gender, type of operation and previous abdominal operation had no impact on the tolerability of early feeding.

Difronzo et al.5 prospectively analyzed 200 patients during a 5-year period and demonstrated that >80% of patients tolerated early oral feeding after colonic surgery. In that series, multivariate analysis showed that being male and undergoing a total colectomy were associated with early oral feeding intolerance; this could have been caused by an increased oral intake by male patients or prolonged ileus from retroperitoneal dissection after abdominal colectomy.5

Nicholas et al.25 reported that 73% of his patients tolerated early oral feeding without sequelae. He also showed that being male had no effect on the tolerability of oral feeding, but that the estimated amount of blood loss had a role in intolerance of early feeding; this may be related to the volume required to replenish the blood loss leading to an increase in third space fluid content which in turn may lead to bowel wall edema and prolongation of ileus.25

In our study, the time to first passage of flatus (P = 0.04) and the time to first defecation (P = 0.005) were sooner in the early feeding group than the traditional group. The postoperative stays for the early feeding and traditional groups were 6.2 ± 0.2 days (3–11) and 6.9 ± 0.5 days (3–12), respectively, as reported by Tong et al.24 Hjort et al.26 revealed that the medium hospital stay was 2 days after early feeding while after conventional feeding it was 8 days. Petchia et al.27 reported that early feeding did not affect the length of ileus and did not significantly shorten the length of hospitalization. Early oral feeding within 24 h after gastrointestinal surgery is safe, well tolerated, may improve postoperative gastrointestinal motility, and plays an important role in enhanced recovery and outcome.23

Villalba et al.16 reported that many prospective randomized studies show that early feeding decreases postoperative ileus duration and hospital stay without increasing morbidity or mortality. Early feeding also reduces all risks of infection, as well as any anastomotic risk.

In our study, pulmonary infections occurred significantly more in the traditional group than in the early feeding group (11.67% vs 8.33% in the traditional group and 3.33% in the early feeding group, P = 0.05).

### Table 3

Factors affecting early feeding tolerability.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Tolerated (45)</th>
<th>Failed (15)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>53.5 ± 11.5</td>
<td>51.5 ± 12.6</td>
<td>0.45</td>
</tr>
<tr>
<td>Sex (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>30 (66.67)</td>
<td>9 (60)</td>
<td>0.27</td>
</tr>
<tr>
<td>Female</td>
<td>15 (33.33)</td>
<td>6 (40)</td>
<td></td>
</tr>
<tr>
<td>Co-morbid medical illness (diabetes or heart diseases) (%)</td>
<td>6 (13.2)</td>
<td>2 (13.33)</td>
<td>0.41</td>
</tr>
<tr>
<td>Operating time (min)</td>
<td>179 ± 19.5</td>
<td>185 ± 16</td>
<td>0.05</td>
</tr>
<tr>
<td>Surgery site (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>15 (33.33)</td>
<td>6 (40)</td>
<td>0.25</td>
</tr>
<tr>
<td>Left</td>
<td>30 (66.67)</td>
<td>9 (60)</td>
<td></td>
</tr>
<tr>
<td>Previous abdominal surgery (%)</td>
<td>3 (6.66)</td>
<td>2 (13.33)</td>
<td>0.08</td>
</tr>
<tr>
<td>Intraoperative blood loss &lt;500 ml (%)</td>
<td>35 (77.78)</td>
<td>6 (40)</td>
<td>0.03</td>
</tr>
<tr>
<td>&gt;500 ml (%)</td>
<td>10 (22.22)</td>
<td>9 (60)</td>
<td></td>
</tr>
</tbody>
</table>

### Table 4

Complications in both groups.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group 1: early feeding group (%)</th>
<th>Group 2: traditional feeding (%)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wound complication</td>
<td>6 (10)</td>
<td>7 (11.67)</td>
<td>0.78</td>
</tr>
<tr>
<td>Infection</td>
<td>5 (8.33)</td>
<td>5 (8.33)</td>
<td></td>
</tr>
<tr>
<td>Burst abdomen</td>
<td>1 (1.66)</td>
<td>2 (3.33)</td>
<td>0.35</td>
</tr>
<tr>
<td>Anastomotic leakage</td>
<td>1 (1.66)</td>
<td>2 (3.33)</td>
<td></td>
</tr>
<tr>
<td>Abnormal serum electrolyte</td>
<td>5 (8.33)</td>
<td>6 (10)</td>
<td>0.45</td>
</tr>
<tr>
<td>Pulmonary infection</td>
<td>2 (3.33)</td>
<td>7 (11.67)</td>
<td>0.05</td>
</tr>
<tr>
<td>Mortality</td>
<td>0</td>
<td>1 (1.66)</td>
<td></td>
</tr>
</tbody>
</table>
3.33%). This can be explained by fluid infusion causing a significant and persistent deterioration of pulmonary function.27 The incidence of anastomotic leakage was less in the early oral feeding group than in the traditional group. Petachia et al.28 reported that evidence of anastomotic leakage was less in the early oral feeding as compared to aspiration. However, on the contrary, in our study the early postoperative pulmonary complication occurred in a patient in the regular feed group. Nicholas et al.25 reported that early oral feeding in fast track programmes after colorectal surgery decreased general complications from 20–30% to below 10%, while postoperative hospital stay was reduced from 10 days to 2–5 days. De Aguilar Nascimento et al.29 suggested that early oral feeding in patients submitted to intestinal anastomosis is not only safe but is not associated with the occurrence of anastomotic dehiscence, and moreover, is related to quicker resolution of ileus.

Early oral feeding after elective colorectal surgery is safe and can be tolerated by the majority of patients. It lowered general and local complications and reduced the duration of hospital stay. Thus, it may become a routine feature of postoperative management. Length of operation and amount of blood loss, however, do have an impact on the tolerability of early feeding.

Conflict of interest statement
None to declare.

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Ethical approval
None.

References