

# Postoperative Bezoar Ileus After Early Enteral Feeding

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Postoperative enteral nutrition is a widely accepted route of application for nutrition formulas due to a low complication rate, a good acceptance by patients, and a favorable cost-effectiveness. We report three cases of bezoar ileus after early postoperative enteral nutrition, using a fine needle jejunostomy (FNJ) in two cases and a nasoduodenal tube in one case. A male patient who underwent gastric resection for a gastrointestinal stroma tumor and was nourished through an fine needle jejunostomy developed an acute abdomen on the seventh postoperative day. Surgical exploration revealed a mechanical ileus caused by denaturated nutrition formula distal to the catheter tip. The second case, a female patient, underwent gastric resection for a gastric cancer and on the fourth postoperative day developed acute onset of abdominal pain. Intraoperative findings were the same as described in the first case. The third case, a male patient with necrotizing cholecystitis, underwent open cholecystectomy. Postoperative enteral feeding was performed using a nasoduodenal tube. He developed a small bowel obstruction on the 17th postoperative day that was caused by an intraluminal bezoar. In conclusion, bezoar formation represents an underestimated complication of postoperative enteral feeding. Acute onset of abdominal pain and the development of small bowel obstruction are the main clinical symptoms of this severe complication. The pathogenesis of bezoar formation remains unclear. (J GASTROINTEST SURG 2006;10:123–127) © 2006 The Society for Surgery of the Alimentary Tract

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Malnutrition represents a well known risk factor that increases postoperative morbidity and mortality.<sup>1</sup> Therefore, early enteral nutrition is now widely used after major gastrointestinal (GI) surgery in many institutions.<sup>2</sup> Enteral nutrition represents the physiologic route of food application and is increasingly preferred due its low complication rate (e.g., no central line infections) and its favorable lower costs compared to parenteral nutrition.<sup>2–4</sup>

Whereas oral food application is often not possible after major surgery of the upper GI tract during the first postoperative days, postpyloric and jejunal feeding can easily be performed by either using naso-jejunal tubes or percutaneous catheter jejunostomy (FNJ).<sup>5</sup> The reported complication rates in the literature are very low, ranging in most series from 1.6 % to 2.7%.<sup>5–7</sup>

Enteral nutrition using a small-bored needle catheter jejunostomy (9 French, Freka FCJ; Fresenius Kabi

GmbH, Stans, Switzerland) is routinely performed after esophageal, gastric and pancreatic resections in our institution. Major advantages of the FNJ are the possibility of a prolonged administration of enteral nutrition over several weeks and that oral nutritional intake is not hampered by the presence of a nasoduodenal tube.

We report three cases of bezoar ileus after early postoperative enteral nutrition using an FNJ in two cases and a nasoduodenal tube in one case.

## CASE REPORTS

### Case 1

A 62-year-old male patient underwent gastric resection for a gastrointestinal stroma tumor. There were no preexisting comorbidities. After total gastrectomy and cholecystectomy, a Roux-en-Y reconstruction with end-to-side esophagojejunal pouch

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anastomosis and jejunojunal anastomosis was performed. The FNJ was inserted into the jejunum as described by Delany<sup>8</sup> around 50 cm distally to the jejunojunal anastomosis. As usual, localization and function of the FNJ were intraoperatively controlled by injecting clear fluid. The operative course was completely uneventful.

Early enteral nutrition using a standard formula containing 22 g fiber per liter (Novasource; Novartis Nutrition, Switzerland) was started 6 hours postoperatively with a flow rate of 20 ml/hr. From postoperative day one to 5, the flow rate could stepwise be increased from 20 ml/hr to 30 ml/hr, thus increasing the daily volume from 100 ml to 550 ml, respectively. The clinical course remained uneventful until postoperative day 7, when the patient developed acute pain and abdominal distention. The computed tomography scan confirmed the clinical suspicion of a mechanical ileus and revealed an acute small bowel obstruction with subsequent dilatation of the proximal jejunum. There were no pathologic findings reported relating to the FNJ.

Intraoperatively, we found a small bowel obstruction proximal to the insertion of the FNJ (Fig. 1). The jejunal lumen was completely obstructed by denaturated enteral nutrition formula. The feeding tube was firmly stuck in that intraluminal plug. After removal of the FNJ, the denaturated mass was evacuated through a longitudinal incision of the jejunum. The patient recovered without further problems,

whereby oral food intake was completely normalized when he was discharged from the hospital at postoperative day 18.

## Case 2

A 36-year-old pregnant female patient (23rd week of gestation) was admitted with increasing abdominal pain, nausea, and emesis. Ultrasonography showed a large ovarian tumor on the left side measuring 23 cm × 11 cm × 15 cm, whereas no pathologic findings of the pregnancy or other intra-abdominal lesions could be detected. The tumor was resected through a midline laparotomy. Histologic examination of the 2.5-kg specimen revealed a metastasis of a gastric cancer (Krukenberg tumor). The primary tumor could be confirmed by gastroscopy but no further metastasis was detected. The patient was then reoperated with abortive cesarean section, total gastrectomy with D2-lymphadenectomy, and cholecystectomy. A Roux-en-Y reconstruction with end-to-side esophagojejunal pouch anastomosis and jejunojunal anastomosis was performed. Finally, the FNJ was inserted into the jejunum 50 cm distal to the jejunojunal anastomosis.

Enteral nutrition was started 6 hours postoperatively using a standard formula containing 22 g fiber per liter (Novasource; Novartis Nutrition) with flow rate of 20 ml/hr (480 ml/day). The flow rate was steadily increased up to 40 ml/hr without any clinical disturbances (1000 ml/day) in the following days. On



**Fig. 1.** Complete obstruction of the jejunal lumen by denaturated enteral nutrition formula. The feeding tube is firmly stuck in the intraluminal plug.

postoperative day 4, the patient developed acute abdominal pain and peritoneal signs. Without further investigations, the patient underwent re-laparotomy at the same day. Intraoperatively, a distended and hemorrhagic small bowel was found that originated from a mechanical obstruction at the FNJ. The small bowel was paved with denaturated nutrition formula forming a firm intraluminal plug of 80 cm in length. The feeding tube could be removed and the proximal small bowel was cleared through a jejunotomy (Fig. 2). The postoperative course was uneventful, and the patient was discharged on postoperative day 20.

### Case 3

A 74-year-old male patient was referred with acute necrotizing cholecystitis and sepsis. A radical restorative cystectomy for bladder cancer T3 N0 with creation of a gastric pouch had been performed several years before. Except for chronic obstructive pulmonary disease, he had no other underlying diseases. Open cholecystectomy was performed immediately after admission. The postoperative course was complicated by cardiac and renal insufficiency. On the third postoperative day, parenteral nutrition was started (Nutriflex; B. Braun Medical AG, Sempach-Station, Switzerland). On postoperative day 8, a duodenal tube (16/9 French; Freka Trelumina; Fresenius Kabi GmbH) was inserted, and enteral feeding with a non-fiber-containing formula for renal insufficient patients (Nepro; Abbott Nutrition, Baar, Switzerland) was started at 10 ml/hr. Flow rate was increased

to 30 ml/hr the next day (800 ml/d). On postoperative day 15, the patient developed acute abdominal pain and peritoneal signs. Enteral nutrition was discontinued immediately, and computed tomography scan revealed a mechanical obstruction of the small bowel. The patient underwent re-laparotomy at the same day. Intraoperatively, a distended and hemorrhagic small bowel was found that originated from a mechanical obstruction distal to the duodenal tube. Through enterotomy, denaturated nutritional formula was evacuated. Unfortunately, the patient did not recover and died on postoperative day 38.

### DISCUSSION AND REVIEW OF THE LITERATURE

Early postoperative enteral nutrition is usually well tolerated and has significant benefits by reducing infectious complications. Different access for enteral nutrition can be used including nasogastric or nasoduodenal feeding tubes, percutaneous catheter feeding jejunostomy, and percutaneous endoscopic or surgical tube gastrostomy. Although tube gastrostomies are predominantly used for long-term nutritional support in patients with impaired swallowing, FNJ and nasoduodenal tubes are rather restricted to perioperative nutrition after major upper GI and pancreatic surgery. Intraoperatively, FNJ is placed through the abdominal wall and then inserted into a jejunal loop that has been attached to the abdominal wall. The reported morbidity in the literature for



Fig. 2. Evacuation of the intraluminal plug through a jejunotomy.



major complication ranges from 1.6% to 2.7%.<sup>5-7</sup> The most common complications are phlegmatous infections at the entry site of the FNJ at the abdominal wall, which are usually treated with antibiotics and local disinfection. Catheter obstruction can often be managed conservatively by flushing with liquid including antioxidants (e.g., vitamin C). Catheter dislodgment with subsequent infusion of nutrition into the abdominal cavity is a rare complication (1%) and requires reoperation. Mechanical bowel obstruction due to bowel necrosis and pneumatosis intestinalis have been reported only rarely.

By thoroughly reviewing the literature, we identified only four patients with small bowel obstruction due to bezoar formation after enteral feeding.<sup>9-11</sup> The incidence of this rare complication is unknown, because only few cases are reported. O'Neil et al.<sup>10</sup> reported a 79-year-old woman with gastric cancer undergoing subtotal gastrectomy with Roux-en-Y reconstruction. Isocaloric non-fiber-containing enteral nutrition formula was administered through a nasogastric tube with the tip distal to the gastrojejunal anastomosis. Enteral feeding was started on the first postoperative day with 10 ml/hr and gradually increased to 80 ml/hr over the next 48 hours. She developed acute crampy abdominal pain on postoperative day 7. Plain abdominal radiography revealed a complete small bowel ileus caused by a bezoar in the efferent limb of the jejunum. Enteral feeding was immediately stopped. The bezoar was managed conservatively by intraluminal filling of 50 ml papain containing normal saline every 6 hours. O'Malley et al.<sup>9</sup> reported a 39-year-old man who underwent subtotal gastrectomy for bleeding gastric ulcer. A feeding catheter jejunostomy was placed for postoperative enteral nutrition using isocaloric non-fiber-containing formula. Flow rate was started at 6 ml/hr and increased to 125 ml/hr by the fifth postoperative day. On day 7, he developed fever and acute abdominal pain. Radiology showed an intestinal mass obstructing the small bowel lumen. The patient was reoperated and precipitated nutrition formula that stuck in the jejunum lumen was found. In addition, the small bowel wall was necrotic, and a segmental resection was performed with an end-to-end anastomosis. McIvor et al.<sup>12</sup> reported a 45-year-old man with a serious thrombotic thrombocytopenic purpura. The patient needed prolonged mechanical ventilation due to respiratory failure, and enteral nutrition was started by nasogastric tube using a fiber-containing formula at a rate of 25 ml/hr and increased to 125 ml/hr within 10 hours. On the sixth day the abdomen became distended. Enteral nutrition was stopped and parenteral nutrition started. Surgical exploration 3 days later revealed a dilated cecum and

terminal ileum with inspissated stool. A right hemicolectomy and ileostomy were performed. Finally, Date et al.<sup>11</sup> described one patient with small bowel obstruction after gastrectomy as a result of precipitation of enteral feeding formula, but no further details were published.

In our patients, bezoar formation occurred after enteral nutrition with fiber-containing nutritional formula using an FNJ and nasoduodenal tube. This represents an incidence of 1% in our department; since we have used 200 FNJs during the four recent years. Similar to three of the four published cases, two of our patients also underwent gastrectomy, whereas the third patient had gastric pouch creation as urinary bladder replacement, and small bowel obstruction became clinically present after several days of enteral feeding. The pathogenesis of bezoar formation as a complication of enteral nutrition remains unclear. It has been assumed that both an impaired postoperative bowel motility and simultaneous overload with fiber-containing enteral nutrition are related to bezoar formation.<sup>10,12</sup> Disturbances of intraluminal pH levels may occur after gastrectomy due to the lack of acid secretion and could contribute to precipitation of fibers at the tip of the feeding tube. Furthermore, an increased flow rate may lead to intraluminal accumulation of enteral nutrition, and precipitation may then occur in the absence of intestinal fluid. The careful review of our cases failed to demonstrate any risk factors, such as use of opioids and diuretics, fluid substitution, and flow rate of enteral nutrition. We assume that bezoar formation might be attributed to intestinal acid-base levels. A suggested prevention could be dilution of the formula initially with water.<sup>7</sup> This might have a positive effect on concentration of fibers and the acid-base level inside the intestinal lumen.

In conclusion, bezoar formation represents a rare but serious complication of postoperative enteral feeding that may be underestimated. Acute onset of abdominal pain and the development of small bowel obstruction require immediate discontinuation of the enteral feeding and further investigations to rule out severe complications, such as bezoar formation. Due to its unknown pathogenesis, it remains unclear how this complication can be avoided.

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