Brief Reports

Subsegmental Bowel Enteral Nutrition Infusion and Succus Entericus Reinfusion in Patients with Severe Acute Pancreatitis Complicated with Multiple Enteric Fistulae: A Successful Experience

Severe acute pancreatitis (SAP) is a serious condition with mortality rates ranging from 16.1 to 40 per cent. In addition, 4 to 42 per cent of patients with SAP have complications with enteric fistulae. Few patients have been described with postoperative SAP complicated by multiple enteric fistulae (MEF). To date, no consensus has been reached on the implementation of enteral nutrition for patients with SAP complicated with enteric fistulae, especially MEF.

Key aspects of nursing these patients include the implementation of enteral nutrition as soon as possible and the prevention and treatment of associated complications. To date, subbowel enteral nutrition infusion and succus entericus reinfusion (SER) have not been used to treat patients with SAP complicated by MEF. We describe here the successful treatment with subbowel enteral nutrition infusion and SER of a patient with SAP complicated by MEF.

A 41-year-old man was admitted to the surgical intensive care unit of our hospital because of persistent and progressive distending pain in the upper abdomen accompanied by nausea and vomiting. SAP was diagnosed by computed tomography. During treatment, his SAP was complicated by multiple organ dysfunction syndrome, abdominal hemorrhage six times, and eight enteric fistulae.

During the first five days after admission, this patient received total parenteral nutrition. On the sixth day, an enteral nutrition channel was successfully established by percutaneous endoscopic gastrostomy (PEG) or jejunostomy. The amino acid enteral nutrition formulation Vive (1 kcal/mL; Novartis Pharmaceutical Co., Ltd.) was infused at a rate of 20 mL/hour for a total of 500 mL/day through the PEJ catheter. The rate was gradually increased to a targeted feeding amount of 30 kcal/kg/day with parenteral nutrition prescribed when enteral nutrition was unable to meet the energy requirement. On Day 24 after admission, necrotic pancreatic tissue was removed and the pancreas was drained. During the procedure, two transverse colon fistulae were found, and a terminal ileostomy was performed. The abdominal cavity was kept open. The next day, gallbladder puncture and drainage were performed, and bile was collected and reinfused into the jejunum.

The method of succus entericus collection and reinfusion using a self-designed precision drainage bag (Fig. 1A) consisted of the addition of collected bile to the enteral nutrition using a Y-type tube of a nutrition infusion pump. Subsequently, they were infused together through the PEJ catheter at the set speed. On Day 35 after admission, a distal jejunal fistula occurred (Fig. 2), and we inserted a Foley urethral catheter along the fistula port. Enteral nutrition was infused through both the PEJ and the distal jejunal fistula port at the same time with 500 mL/day Vive and bile infused through the PEJ and 35 kcal/kg/day NutrisonFibre, an enteral nutrition formulation containing dietary fiber (1 kcal/mL; Nutricia Pharmaceuticals [Wuxi] Co., Ltd.) was infused through the jejunal fistula port. On Day 45, two duodenal fistulae were observed, through which we also collected succus entericus and bile and reinfused them through the PEJ. On Day 63, a proximal jejunal fistula and an ileal fistula occurred. We therefore removed the proximal jejunal fistula port and performed a jejunostomy. We also shortened the intestinal canal approximately 5 cm proximal to the ileal fistula, removed the proximal end, performed an ileostomy (Fig. 2), and closed the distal end.

The method of succus entericus collection and reinfusion using an enclosed ostomy bag (Fig. 1B) consisted of connecting a Coloplast 5900 type ostomy bag to the jejunal fistula port and infusing the succus entericus in the ostomy bag and the enteral nutrition into the jejunal ostomy bag.
fistula port using a Y-type catheter. On Day 84, a new lip-shaped jejunal fistula (Fig. 2) occurred above the jejunal fistula port. On Day 90, we stopped infusing enteral nutrition through the PEJ. We inserted a Foley urethral catheter into the jejunal fistula port, through which we continued to infuse the 500 mL/day Vive and the succus entericus collected from the duodenal fistula port.

On Day 94, the bleeding stopped. On Day 192, too much fluid, approximately 1000 mL/day, leaked from the ileal fistula port; we therefore decreased the nutrition droplet speed from 100 mL/hour to 50 mL/hour. We also changed the nutrition infused through the jejunal fistula port from NutrisonFibre to Vive, which had less dependence on digestive juice, and increased the speed of succus entericus reinfusion. Through Day 207, the fluid from the ileal fistula port gradually became normal.

From Day 6 to Day 305 after admission, the patient was treated with continual infusion of enteral nutrition and reinfusion of succus entericus. Throughout this period, we ensured that the nutrition fluid was infused smoothly, and we assessed both nutrition and metabolism. On Day 306, the patient underwent definitive surgery, including abdominal adhesiolysis, enteric fistula resection and end-to-side anastomosis, colonic segmental resection, ileum–sigmoid side-to-side anastomosis, gastroduodenal decompression and drainage, gastrojejunostomy placation, abdominal irrigation, and drainage by double catheterization cannula. After surgery, the patient continued to be treated with enteral nutrition and functional exercise until discharge on Day 366. One year later, the patient showed full recovery without any complications.

Throughout the course of treatment, the patient performed functional exercises to enhance the absorption of nutrients and to maintain muscle tone. On Day 150, the patient’s serum albumin and precursor protein concentrations became near normal. The patient, who weighed 35 kg on Day 45 after admission, weighed 47 kg on Day 180. The patient’s nutritive index was monitored dynamically by full-time nutritional nurses.

SAP complicated by MEF after surgery, especially in patients with both high and low MEF, is difficult to treat and nurse. Patients lose considerable body weight with both SAP and enteric fistulae causing severe abdominal infection, further increasing the difficulty of administering enteral nutrition. The presence of a fistula port increases the loss of enteral nutrition and digestive juice, because nutritional fluid cannot be absorbed by the intestinal canal. This can result in severe malnutrition, exacerbating SAP and enteric fistulae. Parenteral nutrition alone, however, cannot meet a patient’s energy requirements. Moreover, because parenteral nutrition has several disadvantages, enteral nutrition is the first choice for these patients.3

Our patient received both subsegmental bowel infusion of enteral nutrition and succus entericus reinfusion. Patients with a functional digestive system should receive infusions of enteral nutrition; however, we also collected the succus entericus from the upper intestinal canals and then reinfused it into distal intestinal canals. These strategies ensured the integrity and continuity of the enteron and promoted the digestion and absorption of nutritional fluid. In addition, moderate functional exercise provided benefit to this patient. Taken together, all of these measures established a foundation for one-time fistula repair surgery. Moreover, to ensure that these nutrients could be used and stored better by the patient’s body, we formulated a reasonable individualized functional exercise plan.
and encouraged the patient to perform these exercises, thus helping the patient to recover better and faster.\textsuperscript{4}

Homeostasis and nutritional status are difficult to maintain in patients with SAP complicated by MEF because of daily losses of succus entericus. Enteral nutrition helps maintain the structure and function of the intestinal mucosa, reduces the translocation of the intestinal flora, and improves nutritional status.

Succus entericus reinfusion is an effective, economical, and easy strategy to improve the absorption of enteral nutrients and to reduce the loss of succus entericus, thereby maintaining homeostasis. Furthermore, succus entericus reinfusion can maintain the structure and function of the intestinal mucosa, protect the intestinal mucosal barrier, and reduce enterogenic infection.

Functional exercise provides many benefits to patients, including enhancing nutrient absorption, helping to convert these nutrients into lean body mass, and promoting bowel movements, resulting in faster recovery of intestinal function. Moreover, functional exercise can help improve the function of a patient’s respiratory muscles, facilitating coughing and sputum excretion, reducing the likelihood of pulmonary complications.

The treatment method we described had several limitations. Methods of functional exercise need to be improved during bleeding, perhaps using physiotherapy equipment. Moreover, because the results of bacterial culture of the succus entericus is always delayed, reinfusion of succus entericus must be delayed. However, preliminary results can be obtained from bacterial smears followed by selective reinfusion of succus entericus. We can even infuse sterile bile drained from other patients before culture results.

A nursing plan consisting of subsegmental bowel enteral nutrition and succus entericus reinfusion, together with exercise, may be effective during rehabilitation in patients with SAP complicated by MEF.

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