Simple Diversion by Duodenojejunostomy for a Retroperitoneal Perforation of the Second Portion of the Duodenal Diverticulum

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We herein describe that a Roux-en-Y duodenojejunostomy is a simple and secure procedure for perforated diverticulum in the second portion of the duodenum. The surgical technique for perforated duodenal diverticulum can be adaptable when it is difficult to achieve closure of the perforated site easily. Patients who undergo the operation may be able to eat meals, even if duodenal fistula occurs in the postoperative course.

Key words: Duodenojejunostomy – Duodenal diverticulum – Retroperitoneum

Duodenal diverticula are a relatively common condition. Usually asymptomatic, they may become clinically evident only upon perforation, inflammation, or bleeding. Perforation is a very rare complication, and carries a high mortality of up to 20%.^{1,2} As the perforation is usually open to the retroperitoneum, it is possible there will be no sign of peritonitis. After that, a perforated duodenal

diverticulum usually leads to retroperitoneal abscess formation and sepsis. The clinical presentation is nonspecific; therefore, it is often difficult to diagnose until the condition of the disease deteriorates.

Recently, case reports about successful nonoperative management of the perforated duodenal diverticulum have increased.^{3,4} In Thorson's review

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article, 14 of 61 patients underwent successful nonoperative management.⁵ Nonoperative management can be performed only in limited cases. Although no surgical guidelines have been published for perforated duodenal diverticulum,⁴ it was demonstrated that operative treatment must be performed in case of deterioration or diagnostic uncertainty.⁵ Surgical procedures depend on the clinical situation and intraoperative findings. If inflammation permits, the treatment of choice is diverticulectomy with single or double-layer duodenal closure. On the other hand, when there is substantial inflammation of the duodenum, it is difficult to achieve closure of the perforated site, and the optimal surgical procedure has been not established.

In this article, we report a simple and secure procedure for perforated diverticulum in the second portion of the duodenum. Our simple surgical technique for perforated duodenal diverticulum is the application of Critchlow's method to the pancreaticobiliary complications of duodenal diverticulum.⁶

Patient and Technique

A 69-year-old man was admitted to our hospital with right hypochondriac pain, nausea, vomiting, and pyrexia. His white blood cell count was 25,200/mm³, and C-reactive protein concentration was 11.38 mg/dL. On diagnostic imaging, no collection of free air or fluid in the abdominal cavity was observed. Conservative management with fasting and antibiotics was performed. Two days after hospitalization, pyrexia continued, even though rebound tenderness was weak. Abdominal computed tomography images showed the presence of free intraperitoneal and retroperitoneal gas. Although the perforated site was unclear, we diagnosed gastrointestinal perforation and decided on a laparotomy.

Operative Procedures - Figure 1

At laparotomy, a periduodenal phlegmon and retroperitoneal abscess were found. As the second portion of the duodenum was mobilized from its retroperitoneal attachments, we found that the duodenal diverticulum was perforated and decompressed. The duodenal wall surrounding the perforation was extremely friable. As a result, we considered that it would be difficult to achieve

closure of the perforated site easily, and difficult to resect. The duodenum was dissected from the surrounding tissue and pancreaticoduodenal vessels beginning 2 to 3 cm distal to the pylorus for a distance of approximately 2 cm. A Roux-en-Y loop of the jejunum was brought through a rent in the transverse mesocolon. The duodenum was then transected and the distal stump oversewn. The Roux-en-Y of the jejunum was then anastomosed end-to-end to the duodenum and a jejunojejunostomy was created 40 cm distal to the duodenojejunostomy. The mesentery was then carefully closed about the jejunum. The perforation was tentatively closed with sutures. In addition, his gallbladder was removed (Fig. 1).

An abdominal drainage tube was placed near the perforated site.

The patient tolerated the operation well. He was started on a liquid diet on postoperative day 8. Postoperatively, duodenal fistula occurred on the perforated site, but it did not affect the general condition at all. It was naturally closed by postoperative day 40, and the patient was discharged from our hospital in good condition.

Discussion

Once a perforated duodenal diverticulum has been diagnosed, traditional management has been surgical. Surgical procedures depend on the clinical situation and intraoperative findings. If inflammation permits, the treatment of choice is diverticulectomy with single or double-layer duodenal closure of the duodenum and drainage of the retroperitoneal space.^{5,7} On the other hand, when the duodenal wall is substantially inflamed and friable, primary closure of the perforation is not always safe or feasible, and the optimal surgical procedure has been not established.

In order to remove the perforated duodenum and the surrounding necrotic tissue completely, Whipple procedures may be the most effective. However, sometimes the patient's condition deteriorates due to progressive sepsis, so we should avoid excessive invasive operations such as Whipple procedures.

Miller *et al* recommended diversion of gastric and biliary flow away from the duodenum.⁸ This can be accomplished by stapling or suturing, closing the distal pyloric channel, decompression of the biliary tree with an externally draining common bile duct T-tube, and the creation of an externalized tube duodenostomy. Gastrointestinal continuity can be

Fig. 1 The image shows the findings after reconstruction and drainage. The second portion of the duodenum is mobilized from its retroperitoneal attachments, and a perforated site is identified. Reconstruction is achieved by applying Crichtlow's method to the pancreaticobiliary complications of the duodenal diverticulum. The Roux limb is brought through the mesocolon, the duodenojejunostomy completed, and the mesentery closed. The gallbladder is removed. A drainage tube is placed near the perforated site.

restored with a gastrojejunostomy. However, this procedure is rather complicated.

Our surgical procedure was originally performed to remove recurrent cholangitis and pancreatitis caused by food stasis in the duodenal diverticulum, without having to excise the diverticulum or perform a gastrectomy and vagotomy.⁸ But to our knowledge, our report is the first to the application of this procedure for a patient with perforated duodenal diverticulum.

Our method's advantage is that we can avoid complex procedures such as decompression of the biliary tree and the tube duodenostomy. Use of our

simple technique prevents gastric juice flows into the perforated duodenum. As a result, a patient may be able to start eating meals sooner postoperatively, regardless of whether the perforated site is healed. In addition, when the perforated diverticulum is in close proximity to the papilla, attempted repair could result in injury to the ampulla, pancreatic, or biliary ducts.⁹ In our method, complete closure of the perforated site is not necessarily required, so it is possible to avoid inadvertent suturing of the ampulla of Vater.

On the other hand, the disadvantage is that the perforated site may be less likely to be healed, and

that a duodenal fistula may more easily develop. However, as long as a drainage tube is set up properly near the perforated site in the abdominal cavity, major complications will hardly occur. In our case, the patient's general condition was stable after surgery and oral intake could be started early, although it took more than 1 month to achieve duodenal fistula closure.

In conclusion, our method is simple and it can avoid long-term fasting and serious complications such as sepsis.

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