Case Report

Laparoscopic Repair of Esophageal Hiatal Hernia with Cholestasis Secondary to Pancreatic Prolapse

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Abstract
The patient was an 81-year-old man who was found to have a giant hiatal hernia during detailed examination for hepatic dysfunction. Computed tomography showed prolapse of the entire stomach, head of the pancreas, and transverse colon, and part of the small bowel into the mediastinum, and magnetic resonance cholangiopancreatography showed bile duct displacement and dilatation. The patient underwent elective laparoscopic surgery for repair of the esophageal hiatal hernia. Suture closure of the hernial orifice, mesh reinforcement, and a Nissen fundoplication were performed. The postoperative clinical course has been favorable and no recurrence has occurred during the 1-year postoperative period.

Key words: esophageal hiatal hernia, cholestasis

Introduction
Esophageal hiatal hernias occur at a relatively high frequency. The stomach usually prolapses into the mediastinum, but type IV esophageal hiatal hernias exhibiting prolapse of organs other than the stomach are considered to be rare.

In this report, we describe an extremely rare case in which prolapse of the entire stomach, head of the pancreas, and duodenum caused cholestasis.
Esophageal hiatal hernia causing cholestasis

Magnetic resonance cholangiopancreatography (MRCP): Dilatation of the intrahepatic bile duct observed, but there was narrowing of the common bile duct as a result of being drawn superiorly (Fig. 2).

Upper gastrointestinal (GI) endoscopy: A giant hiatal hernia was observed with Grade C reflux esophagitis.

Based on the findings above, we made a diagnosis of a giant esophageal hiatal hernia, causing cranial traction to the common bile duct, resulting in cholestasis, which in turn caused hepatic dysfunction. The patient was diagnosed with a type IV esophageal hiatal hernia, and elective surgery was performed on hospital day 26.

Surgical findings: Surgery was performed laparoscopically. During surgery, the patient was placed...
in the supine position with the legs spread; we performed laparoscopic gastrectomy using a 5-port arrangement and a Nathanson liver retractor. The hernial orifice, which was the esophageal hiatus, was enlarged and prolapse of part of the stomach, the greater omentum, and small bowel was observed, although we were unable to confirm prolapse of the head of the pancreas. Some of the hernial contents returned into the peritoneal cavity because of positive pressure ventilation, but reduction was achieved when the omentum was returned into the abdominal cavity. The diaphragmatic crus was exposed while the stomach was drawn caudally, and the esophagus was encircled and taped while taking precautions to avoid injury to the vagus nerve. We clipped the short gastric vessels and dissected them using laparoscopic coagulating shears. The enlarged esophageal hiatus was closed by means of reefing, starting dorsally, using continuous sutures made with a 2–0 non-absorbable barbed continuous suture thread (V-loc Wound Closure Device®; Covidien-Medtronic, Minneapolis, MN). To shorten the operative time and disperse the tension of the tissue, the diaphragm was apposed using continuous suturing, and triple knot sutures were added to reinforce the stitched area. The orifice was large, but the ventral side was arcuate. We sutured the diaphragm from the dorsal side and did not close the ventral side.

The diaphragmatic crus was sufficiently fragile to allow the opening of a pinhole, so we created a concave shape using a biodegradable coating mesh (Bard® Ventralight™ ST; Davol Inc., Warwick, RI) and reinforced the reefed hernial orifice. We used a hernia stapler (Endo Universal™ 65° stapler; Covidien-Medtronic) to secure the mesh and performed stapling to prevent migration of the mesh. We used staples instead of tacks to avoid complications such as pneumothorax. Paying careful attention to the vasculature of the diaphragm when using the hernia stapler, we also stapled the edges of the mesh and fixed several sites. To avoid stenosis, we also performed Nissen fundoplication after inserting an oral endoscope and secured the diaphragm and mesh using a wrap; we then ended the surgery (Fig. 3). The duration of surgery was 251 min and the total volume of blood loss was negligible (Fig. 4).

**Postoperative clinical course:** Oral intake started on postoperative day (POD) 4. There were no symptoms of reflux or stenosis and oral intake was favorable; the patient was discharged on POD 12. Blood tests 1 month postoperatively showed that the levels of hepatobiliary enzymes had all normalized. At the time of this publication, 1 year has elapsed since the surgery, but there has been no recurrence and hepatobiliary enzyme levels have remained normal. Upper GI endoscopy showed that the gastroesophageal reflux disease (GERD) has also improved.

**Discussion**

Esophageal hiatal hernia is a type of diaphragmatic hernia caused by increased intraabdominal pressure...
due to factors such as obesity, weakness of the dia-
phragmatic sphincter muscle associated with ad-
vancing age, and enlargement of the hiatal orifice
due to age-related kyphosis. Approximately 90% of
patients with this condition have the type I (slid-
ing type), 9% have type II (mixed type), and the re-
main ing 1% have type III (paraesophageal type) and
type IV (complex type: prolapse of organs other than
the stomach)\(^1\). In an investigation of 17 cases of
type IV esophageal hiatal hernia with pancreatic
prolapse by Takeyama et al., the head of the pancre-
as prolapsed in 9 cases and caused cholestasis in
only 3 cases\(^3\). We performed a search of “Igaku
Chuo Zasshi” (ICHUSHI) for the keywords “esopha-
geal hiatal hernia” between 1983 and 2016 and found
only 3 cases of type IV esophageal hiatal hernia in
which cholestasis was caused by prolapse of the
head of the pancreas; our case is the fourth. Among
the 3 cases reported to date, 1 case was complicated
by gastric ulcer, I case had an upside-down stomach
associated with axis rotation, and the entire stom-
ach prolapsed into the mediastinum in all 3 cases\(^5\).
In addition, in another reported case, there was no
prolapse of the head of the pancreas but prolapse of
the entire upside-down stomach into the mediasti-
num was complicated by a common bile duct stone\(^6\).

During the management of esophageal hiatal her-
nias, no treatment is required if a type I case is as-
symptomatic, but if such a case is complicated by re-
flux esophagitis, then proton pump inhibitors and
histamine-2 receptor antagonists are administered.
Surgery is performed if symptoms are poorly con-
trolled on drug treatment or if ulceration or stenosis
occurs. In type II and type III cases, the indication
for surgery should be determined based on the
symptoms. However, there is the potential for se-
vere complications such as impaction, strangulation,
hemorrhage, or perforation associated with enlarge-
Surgical treatment for esophageal hiatal hernia involves the following: reduction of prolapsed organs other than the stomach occurs in type IV cases; therefore, surgical treatment is indicated as a rule. In the present case, there was dilatation of the intrahepatic bile ducts and narrowing of the common bile duct. The resulting cholestasis caused hepatic dysfunction and this was why we performed surgery.

Surgical treatment for esophageal hiatal hernia involves the following: reduction of prolapsed organs, exposure of both diaphragmatic crura, removal of the hernial sac and preservation of the vagus nerve, reefing of the hernial orifice, closure of the hernial orifice using a mesh, additional fundoplication, and fixation of the stomach to the diaphragm hernial orifice using a mesh, additional fundoplication, and fixation of the stomach to the diaphragm hernial orifice using a mesh, additional fundoplication, and fixation of the stomach to the diaphragm hernial orifice using a mesh. In 1991, Dallemagne et al. reported their initial experience with laparoscopic Nissen surgery. Since then, the number of reports of laparoscopic surgery have increased and favorable outcomes have also been reported in Japan. As with other forms of laparoscopic surgery, benefits include shorter duration of postoperative hospital stay and reduced need for postoperative analgesia, although longer duration of surgery and an increased degree of surgical difficulty have been identified. Opinions differ on the pros and cons of mesh use, and no definite indications have been established. However, the presence of a giant hernial orifice, such as in the present case, is a good indication for surgery because strong tension is applied during reefing and the diaphragmatic muscles are fragile. Mesh serves to prevent reexpansion of a reeved esophageal hiatus, which is usually secured such that it reinforces parts of the reeved diaphragmatic crus. The mesh that is usually used is made from either polyester and coated with a collagen film to prevent adhesions, or from polytetrafluoroethylene. In our case, we used Ventralight™ sculpted into a concave shape, which reinforced the diaphragmatic crus and left the ventral half of the esophageal hiatus was mesh-free.

Some reports state that fundoplication is usually unnecessary in cases without preoperative GERD. However, reflux may occur for the first time postoperatively in cases with giant hernia, and some reports recommend that additional fundoplication should be performed in cases without preoperative reflux symptoms. Fundoplication was performed in the present case due to the presence of preoperative reflux esophagitis and the size of the giant hernia (6.9 × 4.8 cm). The most common fundoplication techniques are the circumferential Nissen technique and the non-circumferential Toupet technique. The Toupet method is associated with reduced incidence of postoperative dysphagia, although according to the GERD treatment guidelines, the Nissen method is indicated because it offers more protective effects against reflux. Therefore, we performed a modified Nissen fundoplication in the present case, which involved securing a wrap to the diaphragm and mesh using four sutures. This method was devised to prevent escape into the mediastinum. Surgery was performed in all reported cases with cholestasis, and of those, 1 was operated on laparoscopically. Reefing of the hernial orifice was performed in 2 cases with additional reinforcement using a mesh. Additional fundoplication was not performed in 2 cases, and 1 case underwent a Toupet fundoplication. Laparoscopic reefing of the hernial orifice and reinforcement using a mesh and additional Nissen fundoplication were all performed in the present case.

With regard to fundoplication, intrathoracic migration of the wrap occurs in about 7% of cases. This exerts stress on the diaphragm, resulting in features such as early postoperative vomiting and giant hernia. In addition, there have been reports of wrap breakdown, the so-called telescope phenomenon, in which the proximal part of the stomach slips through the wrap, and dysphagia occurs due to stenosis. For gigantic esophageal hiatal hernia in which more than half of the stomach herniates, it has been reported that prolapse of the hernia gate reoccurs in 42% of cases following simple laparoscopic closure. However, if the esophagus is too short and does not extend to within the abdominal cavity, we think that the herniated aspect of the stomach can substitute for the abdominal esophagus. An esophagus-like gastric tube can then be constructed by incising the stomach from the angle of His to the caudal side and by using a linear stapler.

We believe it is essential to consider the severity of the hernia, the presence of reflux symptoms, and patient background factors including age, body type, and medical history, and to institute flexible management on a case-by-case basis when deciding whether to use mesh, perform additional fundoplication, or use a laparoscopic approach.

In conclusion, we encountered a type IV esophageal...
Esophageal hiatus hernia causing cholestasis

gal hiatus hernia with prolapse of the head of the pancreas, which caused cholestasis. We performed laparoscopic repair and the clinical course was favorable. We believe it is important to select the surgical technique based on the pathological condition.

Conflict of interest: None.

References