

Laparoscopic transhiatal esophago-gastrectomy after corrosive injury

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Abstract Esophago-gastric necrosis is a surgical emergency associated with high morbidity and mortality. We report a laparoscopic transhiatal esophago-gastrectomy performed on a 43-year-old male, presenting two hours after hydrochloric acid ingestion. A gastroscopy showed several

oral mucosal ulcers, a significant edema of the pharynx and larynx, a necrosis of the middle and lower esophagus and of the gastric fundus and antrum. A conservative strategy with intensive care observation was initially followed. After a change of clinical signs, chest-abdominal computed tomography was realized and a pneumoperitoneum with free fluid in the left subphrenic space and bilateral pleural effusions was in evidence. A laparoscopic exploration was proposed to the patient, and confirmed the presence of free peritoneal fluid and necrosis with perforation of the upper part of the stomach. A laparoscopic total gastrectomy with subtotal esophagectomy was performed; the procedure finished with an esophagostomy on the left side of the neck and a laparoscopic feeding jejunostomy (video). Total operative time was 235 minutes. After six months a digestive reconstruction with esophagocoloplasty by laparotomy and cervicotomy was easily realized thanks to the advantages (few adhesions, bloodless, and simple colic mobilization) of the previous minimally invasive surgery.

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Caustic ingestion can occur accidentally or as the result of an attempted suicide, reported at an incidence of 59–67% and 33–41%, respectively [1–3]. The distribution of patients differs, with accidental ingestion occurring more frequently in children aged three months to 12 years [2, 4], while attempted suicide more frequently involves adults [2–3]. After ingestion, tissue destruction through liquefaction or coagulation reactions appears, with an intensity that depends on the type of corrosive agent, its concentration, time of contact, and the amount of substance ingested [1]. The concentration of the substance can vary

from fragments ingested and tablespoonfuls, with consequent different grades of tissue reactions to full-thickness necrosis and perforation of the viscera. The severity of the physical signs is related to the ingestion of a strong corrosive agent [5].

The most commonly ingested caustic agent is alkaline, reported in 34–52% of the cases, but acid (25–47%) and other agents (12–39%) can also be swallowed [2–7].

We report a laparoscopic transhiatal esophago-gastrectomy performed on a 43-year-old male admitted to the emergency unit after ingestion of hydrochloric acid.

Methods

Patient

A 43-year-old male was admitted to the emergency unit about two hours after hydrochloric acid ingestion, due to attempted suicide, with agonizing oral and epigastric pain, dilated abdomen, and metabolic acidosis. A gastroscopy showed several oral mucosal ulcers, a significant edema of the pharynx and larynx, and an extensive black necrosis of the middle and lower esophagus extending to the gastric fundus and antrum. A conservative strategy was initially followed and the patient was observed in the intensive care unit (ICU). After about 90 minutes the patient developed signs of peritonitis. A chest-abdominal computed tomography (CT) showed the presence of pneumoperitoneum with free fluid in the left subphrenic space and bilateral pleural effusions. An emergency laparoscopic approach was proposed to the patient.

Operative procedure

The patient was placed in the supine position with legs separated and head hyperextended and turned towards the right side. The surgeon stood between the patient's legs, the cameraman to the patient's right, the other assistant to his left, and the scrub nurse beside the patient's left leg. The patient was draped as to allow trocar placement in the abdomen and an incision along the left sterno-cleido-mastoid muscle in the neck. Five trocars were used: a 10-mm trocar 3 cm above the umbilicus, a 5-mm trocar on the mid-clavicular line under the left costal margin, a 12-mm trocar half-way between the first two trocars, a 12-mm trocar on the right mid-clavicular line under the right costal margin, and a 10-mm trocar under the xyphoid process. The laparoscopic exploration of the abdominal cavity showed the presence of free corrosive liquid below and bilaterally to the diaphragm. The upper part of the stomach appeared to be full-thickness necrotic and perforated. At

the beginning of the procedure, a lavage of the abdominal cavity by saline solution was carried out. The procedure started with dissection of the gastrocolic ligament reaching the angle of His. The dissection of the lesser omentum started to the left of the left gastric artery, reaching the right crus. Then dissection of the anterior sheet of the esophago-gastric and the phrenogastric ligament was carried out. The right pillar was dissected up to the edge of the aorta and dissection of the phrenogastric ligament reached the previous section of the gastrosplenic ligament. Subsequently the greater omentum was separated from the mesocolon in the direction of the duodenum. The stomach was pulled up and the retrogastric adherences were sectioned just below the antrum by the coagulating hook. A gentle passage above the pancreatic head and the gastroduodenal artery in the direction of the right of the hepatic pedicle was created. Another passage between the peritoneal sheet and the duodenum wall was performed. Firing of a linear stapler blue load divided the duodenum. The right gastric artery was sectioned using ultrasonic scissors and the rest of the lesser omentum opened until the previous dissection at the left side of the gastric vessels was reached. The left gastric vein and artery were isolated with the coagulating hook and divided between clips. Dissection ended along the abdominal aorta when the diaphragmatic pillars were reached. A vertical phrenotomy was achieved at the summit of the crural pillars. The esophagus was freed up to the mediastinum; no burn lesions of the peri-esophageal tissue were found. A partial opening of the esophagus allowed the introduction of the scope and the necrosis of the lower and middle part of viscera was confirmed. Hence a subtotal esophagectomy was decided upon. The middle part of the esophagus was freed using ultrasonic scissors as far as possible, anteriorly up to about 2 cm above the inferior pulmonary vein and posteriorly up to the transition between the aortic arch and the descending aorta. The esophagus was transected at the level of the esogastric junction by one firing of linear stapler blue load. The stomach was placed in a plastic bag and retrieved by the enlargement of the left 12-mm trocar. The procedure finished with a left cervicotomy. The patient remained in the gynecologic position and the pneumoperitoneum was deflated. An incision was performed medially to the left sternocleidomastoid muscle. The omohyoid muscle was identified and sectioned. The cleavage planes were easily found as they had already been started by the pneumo-mediastinum. The esophagus was mobilized until the surgeon inserted one hand into the posterior upper mediastinum, reaching the cervico-mediastinal space. The anterior face of the esophagus was separated from the tracheal membrane, reaching the previous intrathoracic dissection. Lifting of the esophagus was achieved under laparoscopic control. The esophagus was transected by

scissors and an esophagostomy was realized on the left side of the neck. Cervicotomy was closed in layers and a drain was left in that area. The procedure continued with a feeding jejunostomy realized by laparoscopy. After having identified the angle of Treitz, the small bowel was scrolled down and a running suture, at the left flank quadrant, between the abdominal wall and the small bowel, was performed. A catheter was inserted through the skin into the small bowel and pushed distally. The abdominal cavity was thoroughly cleaned and three drains were positioned, respectively, in the abdominal hiatus, near the spleen and duodenum. The trocar openings were closed in layers.

Results

The procedure was completely performed by laparoscopy. Total operative time was 235 minutes. The estimated blood loss was 50 cc. The pathology report evidenced necrosis of the esophageal mucosa and of the gastric mucosa and submucosa. During the postoperative course, the patient developed significant edema of the pharynx, larynx and trachea, without obvious necrosis. For the first 10 days the patient suffered from an acute pancreatitis, which was treated medically. Necrosis of the duodenum or upper intestine was ruled out. Jejunostomy feeding was started on the 10th postoperative day. The patient was followed up in the ICU for the first 25 days and discharged on the 34th postoperative day, with a feeding regimen of 1,500 kcal/day. After six months the patient was re-hospitalized and submitted to reconstructive surgery with an esophagocoloplasty by laparotomy and cervicotomy. The procedure appeared bloodless and with easier mobilization of the colon, thanks to the few peroperative adhesions due to laparoscopy.

Discussion

Early signs and symptoms after caustic ingestion are not consistent with the extent of damage, and the only reliable method to assess injury is endoscopy [8]. Upper endoscopy is not only a safe and reliable tool for diagnosis, but is also of crucial importance in the treatment and prognosis of these patients [6, 9]. Gastroscopy in our patient assessed the extent and severity of injury, showing a necrosis of the middle and lower esophagus and of the gastric fundus and antrum. These findings are in accordance with literature. Zargar reports on lesions after acids ingestion, where the esophagus, the stomach, and the duodenum are injured in 87.8, 85.4 and 34.1% of patients, respectively, and after alkalis ingestion in 100, 93.5, and 29.6% of the patients, respectively [9–10]. Only in the case of a hemodynamically

stable patient can a chest-abdominal CT be useful. However, in the case of an unstable patient urgent laparotomy is mandatory. In our case the chest-abdominal CT showed a pneumoperitoneum with free fluid in the left subphrenic space and bilateral pleural effusions. In this case early surgery reduces morbidity and mortality [3] and a prompt and aggressive treatment can improve long-term outcomes of these patients [8], limiting the extent of burns to the adjacent organs [11]. In the case of negative CT, early and close follow-up of the patient can be considered and surgery delayed until appearance of late complications, such as stenosis [12].

We firstly submitted the patient to a diagnostic laparoscopy, which allowed us a general view of the injury and to make a decision considering the successive treatment. Hence we decided to perform a laparoscopic transhiatal subtotal esophagectomy with total gastrectomy, and blunt esophageal stripping through a left cervicotomy. The mediastinal dissection was realized with no lesions of the peri-esophageal tissue, and laparoscopy allowed us to achieve a precise vision of the operative field. Peroperative endoscopic assessment of the level of the esophageal necrosis is mandatory in order to perform a correct but conservative resection and to avoid postoperative complications due to necrosis. The stomach was retrieved through the enlargement of the left 12-mm trocar and not through cervicotomy, avoiding a possible mediastinal contamination. Laparoscopy in these patients, unlike open surgery [7], lowers the possible morbidities while maintaining the advantages of minimally invasive surgery. One of these advantages seems to be the lower incidence of postoperative adhesions, as already described after other laparoscopic procedures [13–14]. Postoperative adhesions can sometimes compromise colonic vascularization, which is a critical factor during delayed digestive reconstruction. Another surgical option is stomach resection with esophagostomy and feeding jejunostomy, delaying the esophageal resection and digestive reconstruction until later [15].

In conclusion emergency transhiatal laparoscopic esophago-gastrectomy after ingestion of a corrosive agent is feasible, can complete diagnosis, and permits a faster subsequent digestive reconstruction.

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