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Cardiac Arrest Caused by an Acute Intrathoracic Gastric Volvulus Treated With Percutaneous Gastrostomy



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During cardiopulmonary resuscitation, one of the first priorities after establishing basic and advanced life support is to identify the cause of the arrest. We present a rare case of cardiac arrest due to a decreased venous return from mediastinal shift caused by a paraesophageal hernia with an incarcerated thoracic gastric volvulus, which was treated by percutaneous gastrostomy. [Ann Emerg Med. 2021;77:249-252.]

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INTRODUCTION

During cardiopulmonary resuscitation (CPR), one of the first priorities after establishing basic and advanced life support is to identify the cause of the arrest. We present a rare case of cardiac arrest owing to a decreased venous return from mediastinal shift caused by a paraesophageal hernia with an incarcerated thoracic gastric volvulus, which was treated by percutaneous gastrostomy.

CASE REPORT

A 75-year-old woman with a history of a paraesophageal diaphragmatic hernia, cholecystectomy, and hysterectomy presented to the emergency department (ED) of our university hospital after being transferred from a local community hospital. There, she had presented with upper abdominal cramping pain, dyspnea, and repeated vomiting during the past 24 hours. A chest radiograph and contrast-enhanced computed tomographic (CT) scan showed a paraesophageal hernia with a substantially distended intrathoracic and intra-abdominal stomach (Figure 1). Crystalloid infusion was initiated and placement of a nasogastric tube was attempted but failed, after which she was referred to our hospital. Physical examination on arrival revealed a tender and distended abdomen, with absent bowel sounds. Oxygen saturation rate was 97% and blood pressure was 109/91 mm Hg. She had a sinus tachycardia of 120 beats/min despite having received 2,000 mL of crystalloids. Laboratory studies revealed a lactate level of 6.5 mmol/L. Point-of-care ultrasonography revealed a dilated

(2.2-cm) inferior vena cava without inspiratory collapse and significant compression of the inferior vena cava at the level of the diaphragm (Figure 2). As a result, the inferior vena cava–right atrial junction could not be fully visualized. Preparations were made for urgent endoscopic desufflation of the stomach and nasogastric tube placement before surgical treatment, when her blood pressure and pulse rate rapidly declined during a 5-minute period and she became pulseless in the ED. The presenting initial rhythm on the monitor was ventricular fibrillation. She was defibrillated once, after which the monitor showed pulseless electrical activity.

Advanced life support according to American Heart Association/ European Resuscitation Council guidelines was initiated, with intubation (no signs of aspiration of gastric contents) and administration of adrenaline every 4 minutes. Meanwhile, attempts to decompress the stomach by placing a large-bore nasogastric lavage tube to evacuate gastric contents failed, likely halting at the same obstruction as encountered in previous attempts. Because immediate gastroesophagoscopy was not available, percutaneous gastrostomy was performed of the abdominal part of the distended stomach. Because the ultrasonography machine was not imminently available, a landmark-based technique (percussion) was used to identify the appropriate location, and after disinfection, an 8-French paracentesis drain with a 60-mL Luer-lock syringe attached was inserted into the stomach. Gastric content was readily aspirated. After aspiration of 100 mL, the nasogastric tube was advanced and large amounts (>3,000 mL) of gastric contents were



Figure 1. Coronal reconstruction of contrast-enhanced CT. TS, Thoracic part of stomach; AS, abdominal part of stomach.

evacuated through the nasogastric tube. Immediately thereafter, return of spontaneous circulation was obtained, with an initial bradycardia and hypotension. A norepinephrine infusion was initiated.

After stabilization of the vital signs, the paraesophageal hernia with the incarcerated upside-down stomach was reduced in the operating room. A cruroplasty was performed after excision of the hernia sac and an open-abdomen negative-pressure therapy device was placed, after which the patient was admitted to the ICU. During repeated surgery 24 hours later, the distal part of the stomach, as well as part of the greater curvature, was found to be necrotic, and a subtotal gastrectomy with Billroth II reconstruction was performed.

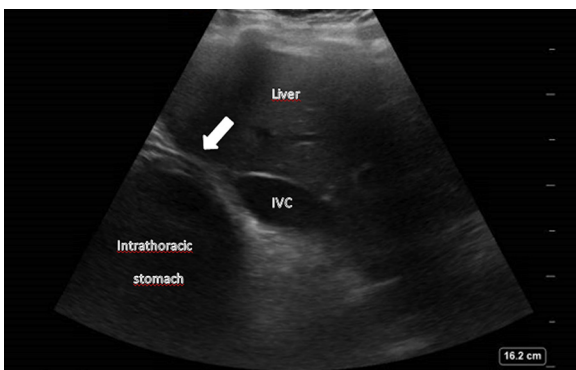


Figure 2. Ultrasonographic image demonstrating compression of the inferior vena cava by the intrathoracic part of the stomach. Arrow indicates the point of inferior vena cava compression by the intrathoracic part of stomach. IVC, inferior vena cava.

Normothermia was maintained in the ICU for the first 24 hours after the cardiac arrest. On day 5 after presentation, after cessation of sedation, the patient had mild aphasia and hemiparesis of her right arm because of a left-sided temporoparietal watershed infarction, for which she was rehabilitated in rehabilitation center.

DISCUSSION

We present the case of a patient in cardiac arrest owing to a decreased venous return resulting from a mediastinal shift caused by a paraesophageal hernia with an incarcerated gastric volvulus. Although cardiac arrest as a complication of a thoracic gastric volvulus has been described before,¹⁻³ to our knowledge percutaneous gastrostomy has never been described as a treatment.

An esophageal hiatal hernia can result in protrusion of abdominal organs (typically the stomach) into the (posterior) mediastinum. Upside-down stomach is the rarest type of hiatal hernia, occurring in less than 5% of all hernias,^{4,5} and is characterized by herniation of a large portion of the stomach into the chest, resulting in mechanically impaired gastric emptying. Its clinical manifestation is varied, including substernal pain, postprandial fullness, dysphagia, nausea, and vomiting. Upside-down stomach can be complicated by gastric volvulus or gastric incarceration.⁶ Acute intrathoracic gastric volvulus occurs when the stomach undergoes rotation in the chest. Most common is the organoaxial type, in which the stomach rotates 180 degrees along the longitudinal axis (Figure 3).⁷ It is a life-threatening condition because delayed diagnosis may result in necrosis and perforation of the stomach.

Furthermore, displacement of the stomach to the chest can cause a significant mediastinal shift. This may result in a significant inflow obstruction of the right atrium because of compression of the inferior vena cava.^{8,9} In addition, displacement of the heart may generate an outflow obstruction of the right ventricle. Together, this can ultimately result in cardiac arrest, usually of the pulseless electrical activity type.⁷⁻⁹ Immediate treatment should focus on relieving the distention of the stomach, thereby reducing the inflow obstruction and displacement of the heart. Decompression of the stomach by placement of a nasogastric tube to evacuate thoracic gastric contents should be considered as a first option. However, this is often difficult because a kinking stenosis of the cardia (caused by organoaxial rotation of the stomach) or a stenosis caused by the strangling diaphragm may be present, preventing passage of the tube into the stomach.⁵ Although intra-arrest esophagogastroscopy may be considered, it is seldom readily

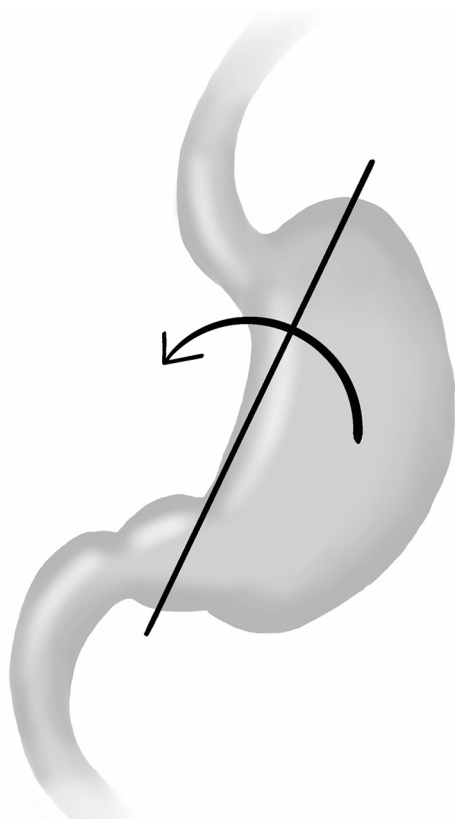


Figure 3. Gastric volvulus of the organoaxial type, in which the stomach rotates 180 degrees along the longitudinal axis.

available in the ED. In addition, it carries the risk of increased inflation of the thoracic part of the stomach, with further cardiac compromise.

This case highlights that percutaneous gastrostomy with concomitant placement of a large-bore nasogastric lavage tube may be a lifesaving procedure during resuscitation of patients with an acute intrathoracic gastric volvulus, and should be considered early when active CPR is ongoing. When available, ultrasonography should be used to determine the appropriate location of the percutaneous gastrostomy. Otherwise, percussion can be used to identify the landmarks. We used an 8-French paracentesis drain to perform the procedure. Because this resulted in successful passage of the nasogastric tube after aspiration of just 100 mL of (abdominal) gastric contents, it is most likely that aspiration not only reduced inferior vena cava pressure (and thereby increased preload) but also asserted a positive effect on the volvulus itself.

Percutaneous gastrostomy is not without risk: Accidental bowel perforation and gastric vascular injury may take place, spillage of gastric contents into the abdomen is a risk, and both local and systemic infection may occur. However,

it may be the only treatment available during cardiac arrest and hence lifesaving. Of equal importance is early recognition of the condition. A high index of suspicion is warranted in patients with a known diaphragmatic hernia, and, as this case report demonstrates, point-of-care ultrasonography may contribute to an expedited diagnosis and targeted treatment. When significant compression of the inferior vena cava at the level of the diaphragm is noted on ultrasonography in a patient with an intrathoracic stomach, cardiac arrest should be anticipated and expedited definitive treatment is warranted.

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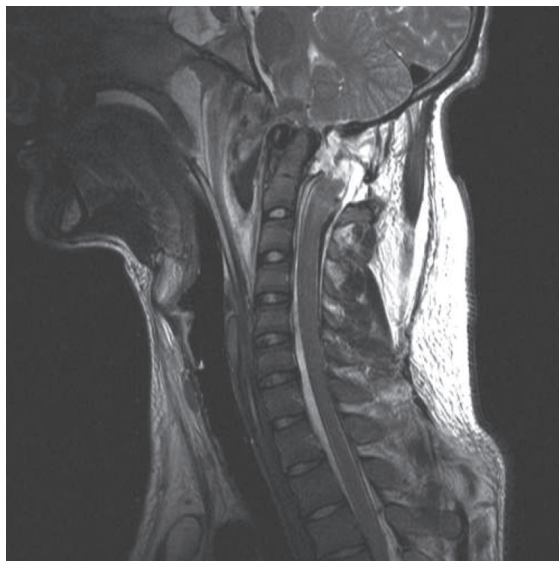
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