


Case Report

Cardiopulmonary arrest secondary to compression of the heart owing to esophageal hiatal hernia: a case report

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Background: Esophageal hiatal hernia is commonly encountered in clinical practice. We describe a case of cardiac compression caused by an esophageal hiatal hernia that resulted in circulatory failure and cardiac arrest.

Case Presentation: An 82-year-old woman presented to our hospital with vomiting, which progressed to cardiac arrest in the emergency room after computed tomography (CT) imaging. CT revealed gastric herniation into the mediastinum, with marked cardiac compression. Cardiopulmonary resuscitation was performed, and a nasogastric tube was inserted for gastric decompression, which resulted in the return of spontaneous circulation and subsequent hemodynamic stabilization. However, the patient died of aspiration pneumonia 4 days later.

Conclusion: Gastric decompression can lead to rapid improvements in respiration and circulation in patients with an esophageal hiatal hernia. Nonetheless, to prevent complications, such as those observed in our patient, definitive surgical treatment is warranted.

Key words: Circulatory failure, diaphragmatic hernia, esophageal hiatal hernia, tension gastrothorax, upside-down stomach

INTRODUCTION

AN ESOPHAGEAL HIATAL hernia is a relatively common condition; however, when it occurs in the elderly, presentation is complicated by the presence of comorbidities and an inability to perform activities of daily living (ADLs). Further, significant gastric herniation into the mediastinum can compress the lungs and heart, which can negatively affect respiration and circulation and further reduce the capacity to perform ADLs. Herein, we describe the case of a patient in whom the entire stomach had prolapsed into the mediastinum and had turned craniocaudal, with axial torsion; this led to significant compression of the heart, which ultimately resulted in cardiac arrest.

CASE

AN 82-year-old woman presented to our hospital emergency department because of repeated vomiting that

persisted for 2 days without induction. She had a history of cerebral infarction, hypertension, dementia, and surgery for a perforated sigmoid diverticulum. An upper gastrointestinal endoscopy had been performed at another hospital a month ago, but no abnormalities were noted. A physical examination revealed consciousness corresponding to the Glasgow Coma Scale score of 12 (E4V3M5), blood pressure of 98/71 mmHg, pulse of 119/min, temperature of 36.5°C, tachypnea (≥ 30 times/min), and 85% oxygen saturation (on room air), with diminished breath sounds on the left side. Chest X-ray revealed a large gastric bubble in the left chest cavity, with the mediastinum strongly displaced to the right side (Fig. 1A). Oxygen at 5 L/min improved the oxygen saturation (SpO₂) to 92%, but tachypnea and tachycardia persisted. We speculated that a worsening esophageal hiatal hernia was probably responsible for the deterioration in respiration and circulation. Computed tomography (CT) performed for a definitive diagnosis showed that the entire stomach had escaped into the mediastinum and that it was craniocaudally inverted with axial torsion. In addition, the mediastinum had undergone a remarkable shift to the right owing to the presence of the dilated stomach; other structures, such as the left lung, heart, and inferior vena cava, were also highly displaced. There was no evidence of pneumonia (Fig. 2). Her condition deteriorated to agonal respiration with worsening tachycardia (120–150 times/min) when

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she returned to the emergency room after the CT scan, and assisted ventilation was immediately initiated. Subsequently, she developed pulseless electrical activity. Cardiopulmonary resuscitation was immediately initiated. CT findings suggested that the dilated stomach, along with the esophageal hiatal hernia, was strongly pressing on the heart, thereby disrupting circulation. Therefore, a gastric tube was used to decompress the stomach through which 1,400 mL of gastric fluid was aspirated. A spontaneous heartbeat resumed immediately, with stable circulation. Chest X-ray performed after the gastric tube insertion revealed normal mediastinal structures and the absence of the previously present giant gastric bubble in the mediastinum (Fig. 1B). Subsequently, the correction of dehydration by infusion stabilized both the blood pressure and tachycardia; however, because she developed aspiration pneumonia, her respiratory status did not improve and she died on the fourth hospital day (Fig. 3).

DISCUSSION

AN ESOPHAGEAL HIATAL hernia is a commonly encountered condition that often requires follow-up. Age and an increased body mass index are considered the key risk factors for this condition. Hernias that become symptomatic or manifest with gastric reflux require definitive treatment; for example, gastric reflux can be mitigated using antacids, proton pump inhibitors, or histamine-2-receptor blockers. However, the significant movement of abdominal structures into the chest cavity demands surgical correction. Esophagectomy is associated with postoperative

morbidity; by contrast, minimally invasive laparoscopy affords better visualization of the hernia and entails fewer postoperative complications.^{1,2}

Allen *et al.*³ have described their observations in a case series wherein 119 of 147 patients with an intrathoracic stomach underwent surgery. They state that patients with an intrathoracic craniocaudal stomach who have obstructive symptoms at the initial presentation should undergo surgical repair and that elective surgery is both safe and effective. In high-risk patients, endoscopic repositioning and gastropexy can be performed, but the risk of recurrence after endoscopic treatment is unknown. Incidentally, Toyota *et al.*⁴ have reported a case of recurrent upside-down stomach despite endoscopic therapy; this case serves as an example of the limits of endoscopic treatment and risk of recurrence. Nevertheless, surgical treatment is not indicated in all patients diagnosed with an upside-down stomach because of the risk of developing severe complications.

Symptomatic improvements in respiratory function can be seen in all patients after esophageal hiatal hernia repair. Further, as an esophageal hiatal hernia can adversely affect the subjective and objective respiratory status, surgical repair can result in significant improvements in dyspnea and pulmonary function scores, independent of preoperative pulmonary diseases.⁵ Heart failure owing to the esophageal hiatal hernia displacing the heart^{6,7} and tension gastrothorax in patients with obstructive shock due to a significant displacement of the heart by an expanded stomach have also been reported. Interestingly, all reports of tension gastrothorax describe patients in shock or cardiopulmonary arrest

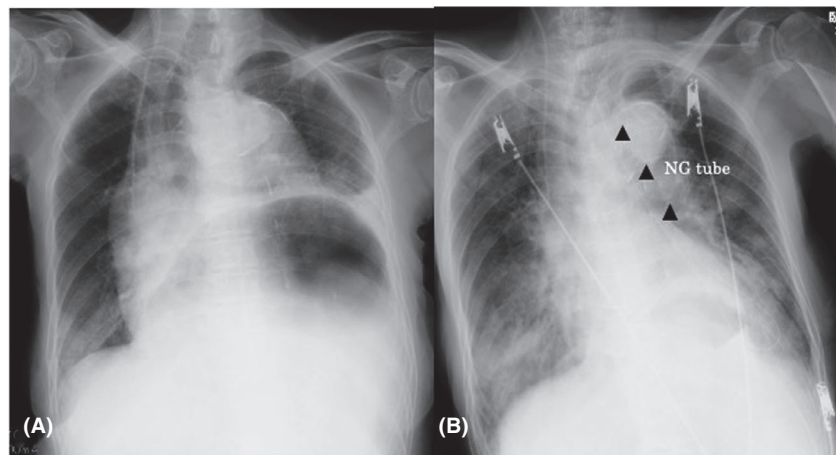


Fig. 1. Chest radiograph showing (A) excessive gastrointestinal gas in the mediastinum or the left side of the chest cavity. A marked right-sided displacement of the mediastinal shadow is observed. In addition, a marked right-sided displacement of the trachea can be seen. (B) The expanded stomach was decompressed by the insertion of a nasogastric (NG) tube, which led to the reversal of the mediastinal displacement.

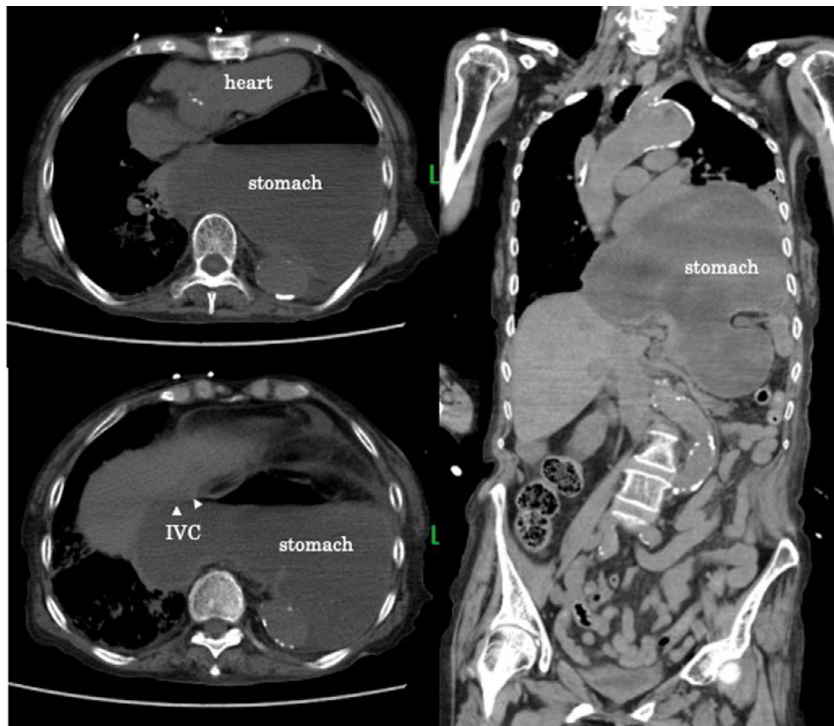


Fig. 2. Chest and abdominal computed tomography scans (plain films) showing a significantly dilated stomach incarcerated within the mediastinum. A marked displacement of the heart and the left lung can be observed. Craniocaudal inversion of the incarcerated stomach, leading to an “upside-down stomach,” can also be visualized. IVC, inferior vena cava.

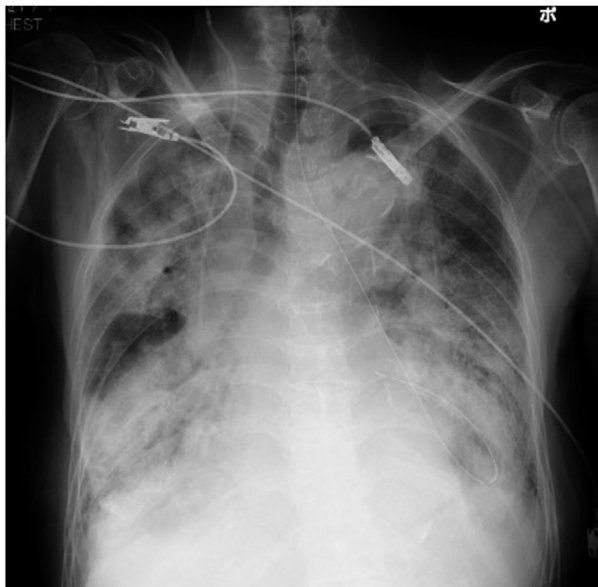


Fig. 3. Chest radiograph on the second day of hospitalization reveals no stomach dilation within the mediastinum or mediastinal displacement; however, extensive infiltrative shadows are seen in both lung fields, suggesting severe pneumonia.

who were diagnosed by CT imaging and attempted to decompress with a gastric tube.^{8–10} Shoji *et al.*¹⁰ authored the eight previously reported cases, and only two cases involved hiatal hernia without trauma. In all of these reports, insertion of a gastric tube was attempted; however, in some cases, the insertion was unsuccessful and return of spontaneous circulation was achieved with volume resuscitation and cardiopulmonary resuscitation. Stomach drainage, by either endoscopy or thoracentesis, was employed to further stabilize circulation. There have been no reports of direct return of spontaneous circulation after insertion of a gastric tube, as in this case. Furthermore, in all reported cases, hiatal hernia was noted on initial examination. In this case, there was no esophageal hiatal hernia detected by performing endoscopy 1 month earlier. The patient had developed unprovoked vomiting, and it was difficult to achieve differential diagnosis until imaging studies were performed.

In our patient, surgery was not recommended immediately because her history of esophageal hiatal hernia had not been provided. In addition, her presentation was complicated by the presence of dementia and the inability to adequately perform ADLs.

Although we recognized a severe esophageal hiatal hernia on the chest X-ray, circulatory insufficiency due to the hernia pressing on the heart and inferior vena cava, which mainly caused the cardiac arrest, could be confirmed by CT. Furthermore, the strong exclusion of the left lung also decreased oxygenation and further promoted the deterioration of the patient's condition. Thus, if this possibility had been explored earlier based on the chest X-ray findings, it might have been possible to prevent cardiac arrest by immediately decompressing the stomach.

Ideally, surgical repair should be performed if the patient has a previously diagnosed hiatal hernia or if the patient's general condition is stable after gastric decompression. However, as most patients are often elderly, it is necessary to properly evaluate and manage the general condition of the patient and even then select only management strategies that prevent excessive surgical intervention.

CONCLUSION

WE DESCRIBE A case of cardiopulmonary arrest secondary to cardiac compression due to a severe hiatal hernia. The unpredictability of an esophageal hiatal hernia progressing to a complete gastric craniocaudal hernia in the mediastinum, affecting both breathing and circulation, can be fatal. Although decompression of the stomach may be one of the initial treatments for a hiatal hernia that results in respiratory and circulatory insufficiency, we wanted to evaluate the patient's general condition before recommending a management approach with minimal invasiveness.

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DISCLOSURE

Approval of the research protocol: N/A.

Informed Consent: As the patient is dead, we have carefully deidentified the patient's information. The patient's family has consented to the submission of the case report for

publication in the journal. We have not involved the Ethics Committee because we did not carry out invasive treatment or tests for research purposes.

Registry and the Registration No. of the study/Trial: N/A.

Animal Studies: N/A.

Conflict of Interest: None declared.

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