Cardiac Tamponade Caused by Gastrointestinal Obstruction—A Rare Complication in Esophagectomy Patients

Sarayna S. McGuire, MD, Jeremy J. Thaden, MD, Deepi G. Goyal, MD, and
Tobias Kummer, MD, *Rochester, Minnesota*

INTRODUCTION

Rapid recognition of cardiac tamponade is crucial for physicians caring for critically ill patients. Classic tamponade occurs when fluid accumulates within the pericardial sac, causing extrinsic pressure on the heart, leading to decreased cardiac output and hemodynamic compromise.[1] Symptoms are often nonspecific, but patients frequently present with dyspnea and chest pain.[2] Other clinical signs include hypotension, tachycardia, tachypnea, elevated jugular venous pressure, pulsus paradoxus, and muffled heart sounds on cardiac auscultation.

In cases where tamponade is suspected based on history or physical exam, echocardiography at the point of care is the ideal tool for rapid assessment and diagnosis and can also be utilized during subsequent pericardiocentesis. Key echocardiography findings include a pericardial effusion, exaggerated respirophasic variation of the mitral and tricuspid valve in-flow velocities, invagination of the right atrial wall during systole and diastolic right ventricular collapse, a plethoric inferior vena cava (IVC) with minimal respiratory variation, and diastolic hepatic vein flow reversal during expiration.[3,4]

We present a unique case of cardiac tamponade in a patient status post–Ivor Lewis esophagectomy. While he was found to have a pericardial effusion on echocardiogram, the primary tamponade physiology was caused by extrinsic compression resulting from the patient's obstructed mediastinal gastrointestinal (GI) tract.

CASE PRESENTATION

A 64-year-old man with a history of metastatic adenocarcinoma of the gastroesophageal junction, status post–Ivor Lewis esophagectomy (Figure 1) 3 years prior, presented to the emergency department (ED) due to hypotension. He had a history of cardiac tamponade 10 months earlier, requiring emergent pericardiocentesis, and had

undergone computed tomography (CT) chest angiography 7 days before presenting to the ED that revealed a moderate (10-20 mm or 100-500 mL) pericardial effusion.[5] This finding, however, was deemed chronic and unchanged from previous imaging. The patient reported 3-4 days of GI obstruction, with subsequent bulging of his surgically rerouted GI tract (jejunum in the mediastinum) from his left upper neck, which was easily identified on physical exam. Due to his obstruction, he had presented to the gastroenterology outpatient clinic for a scheduled upper GI endoscopy but was referred to the ED without decompression after he was found to be hypotensive with a systolic blood pressure (SBP) of 80 mm Hg.

Upon arrival to the ED, the patient was hypotensive with an SBP of 90 mm Hg but not tachycardic. He reported chronic dyspnea and chest pain associated with his surgical procedures that had not acutely worsened. A focused, noncomprehensive transthoracic echocardiogram (TTE) using a Philips EPIQ 7 ultrasound machine at the point of care was urgently performed and revealed a large heterogeneous collection in the anterior mediastinum that was likely to correspond to the patient's known dilated jejunum (Videos 1 and 2). Figure 2 shows a parasternal long-axis view during the ED presentation (Figure 2A) compared with a study done 1 year prior (Figure 2B). The collection appeared to cause extrinsic compression of the right ventricle and outflow tract with subsequent enlarged IVC size with reduced inspiratory collapse (<50%; Video 3). There was a 20% decrease in peak mitral valve inflow velocities (Figure 3) during inspiration and evidence of hepatic vein flow reversal (Figure 4) with a blunted superior vena cava respiratory variation. In addition, a small pericardial effusion (<100 mL) was visualized with the largest pocket apically and along the right ventricular margin. Given the visible mass effect of the bowel loop on the right heart, the cause of tamponade physiology was likely primarily due to the patient's dilated GI tract in the mediastinum rather than the pericardial effusion. Repeat CT chest angiography was obtained and showed a markedly dilated mediastinal and upper abdominal jejunum, which was causing extrinsic compression of the right heart and severely restricting diastolic filling of the right ventricle as well as the left atrium and left ventricle (Figures 5 and 6). Due to right heart dysfunction, the right atrium was dilated with contrast reflux into the IVC. On this repeat CT imaging, the pericardial effusion was determined to have decreased in size compared with imaging 7 days prior.

Given these findings, the decision was made to forgo a pericardiocentesis in favor of endoscopic decompression by gastroenterology after fluid resuscitation. During this procedure, nearly 3 L of food debris were removed, followed by nasojejunal tube placement under fluoroscopic guidance, which led to hemodynamic improvement and a rise in SBP to 135 mm Hg. Following decompression, a multidisciplinary discussion was held among the patient, his family, and his care team. It was determined that he would not benefit from further surgical interventions given his complex disease, and he was ultimately discharged home to hospice care.

DISCUSSION

Cardiac tamponade is commonly defined and taught to be secondary to fluid accumulation within the pericardial sac leading to external pressure on the heart and impaired cardiac filling.[1-3,6] While this is true for the majority of cases, it is essential to remember that any extrinsic pressure on the heart will ultimately lead to the common pathway of tamponade physiology by inhibiting cardiac filling and decreasing output.[7,8] This is the case in other rare etiologies such as pneumopericardium[9] and this case of GI tract–associated tamponade. As modern medicine continues to develop new procedures and interventions to improve and prolong patients' lives, clinicians must also recognize that distorted anatomy will redefine prior teachings of long-standing disease pathology.

Intrathoracic GI organs, either iatrogenic or due to diaphragmatic herniation, present unique challenges for the echocardiographer. First, structures in the anterior mediastinum, as seen after an Ivor Lewis procedure, can significantly limit standard echocardiographic windows, especially in obstruction with air-fluid levels. Gastrointestinal contents can also mimic cardiac or other intrathoracic masses.[10] In cases of an unknown structure on echocardiography, oral echo contrast such as carbonated beverages can be used to reveal GI anatomy.[11] However, in this case, the patient had obvious signs of GI obstruction, which precluded oral intake. Our case highlights the fact that patients with surgically altered anatomy can have unique presentations of diseases that do not follow textbook principles. In this case, a blind pericardiocentesis without echocardiographic guidance may have caused significant complications and potentially been life-threatening.

Equally as important, this case demonstrates the value of readily available echocardiographic imaging at the point of care to expedite diagnosis, treatment, and disposition of critically ill patients. Although this patient had clinical signs of cardiac tamponade with a history of a significant pericardial effusion requiring emergent pericardiocentesis, echocardiographic and CT imaging was crucial. While the patient had a persistent effusion, which likely exacerbated the extrinsic cardiac compression on the right heart, the obvious deformity seen on imaging of the right ventricular free wall caused by the dilated jejunum was the most likely primary contributor to this patient's critical condition.
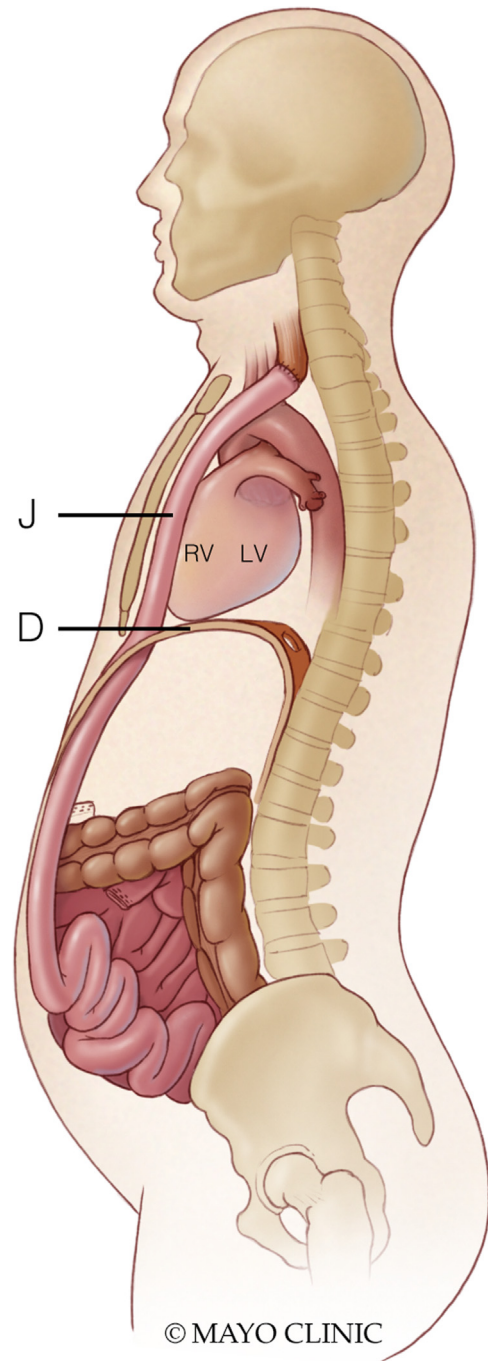

Figure 1 Anatomical changes after Ivor Lewis esophagectomy. The jejunum (J) is rerouted through the diaphragm (D) and is now in close proximity to the right ventricle (RV). Used with permission of Mayo Foundation for Medical Education and Research, all rights reserved. *LV*, Left ventricle.

CONCLUSION

Cardiac tamponade is a life-threatening condition caused by extrinsic compression of the heart, leading to impaired cardiac filling and
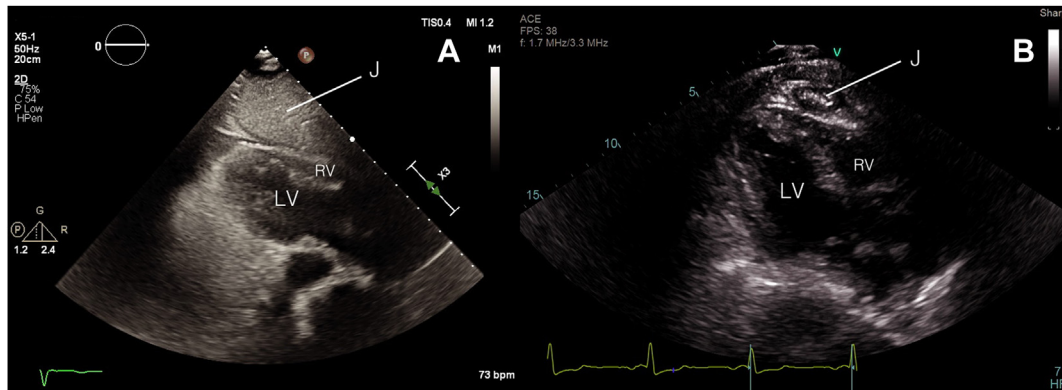
Figure 2 Parasternal long-axis view on TTE during the ED presentation **(A)** compared with a prior study **(B)**. **(A)** The dilated jejunum (J) is now causing a near-total collapse of the right ventricle (RV). **(B)** Normally, the undilated J can be found as a multilayered tubular structure anterior to the RV. *LV*, Left ventricle.
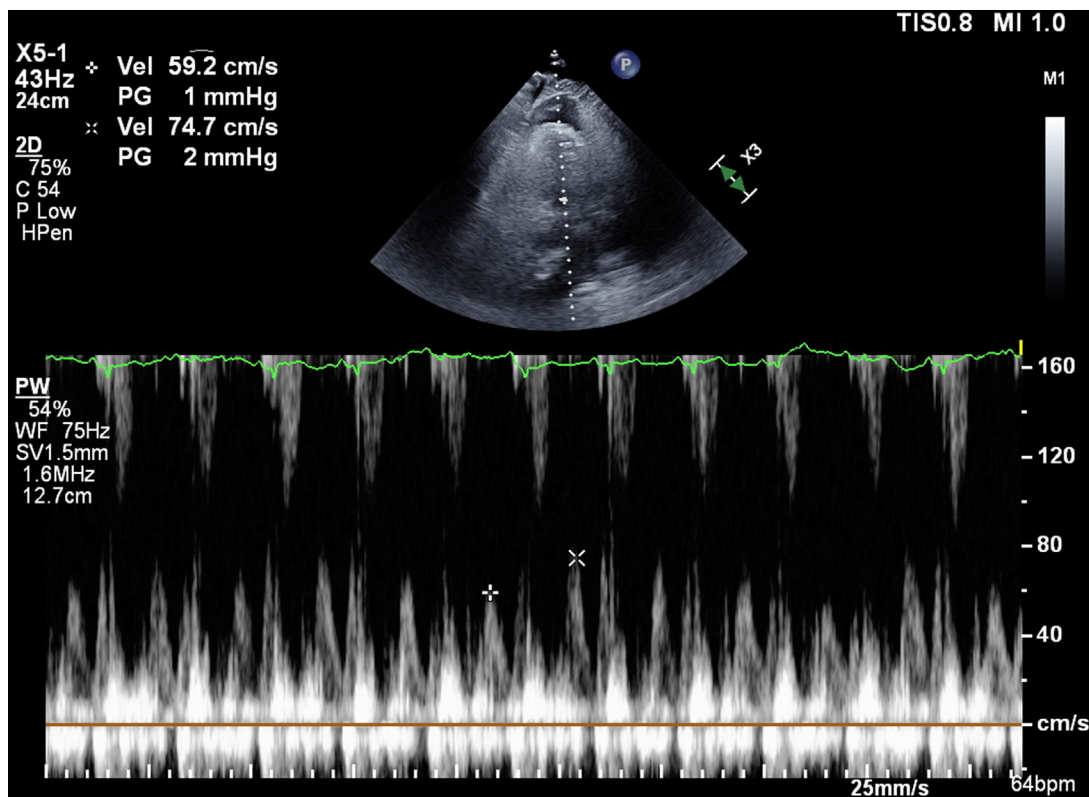

Figure 3 Apical four-chamber view on TTE. Pulsed-wave Doppler shows a 20% decrease in peak mitral E wave inflow velocities between inspiration (+) and expiration (x).

subsequent decrease in cardiac output and cardiogenic shock. While by far the most common etiology is due to the accumulation of fluid in the pericardial sac, which is routinely treated with pericardiocentesis, any mass effect on the heart will lead to tamponade physiology. In this report, we describe a case of cardiac tamponade caused by a GI obstruction that was successfully treated with esophagogastroduodenoscopy. Clinicians should be cognizant of anatomical changes resulting from thoracic procedures. When cardiac tamponade is suspected, our case illustrates the critically valuable role that echocardiography provides as both a diagnostic tool for these unusual etiologies as well as a guide offering the safest approach to pericardiocentesis.

SUPPLEMENTARY DATA

Supplementary data related to this article can be found at https://doi.org/10.1016/j.case.2022.01.011.
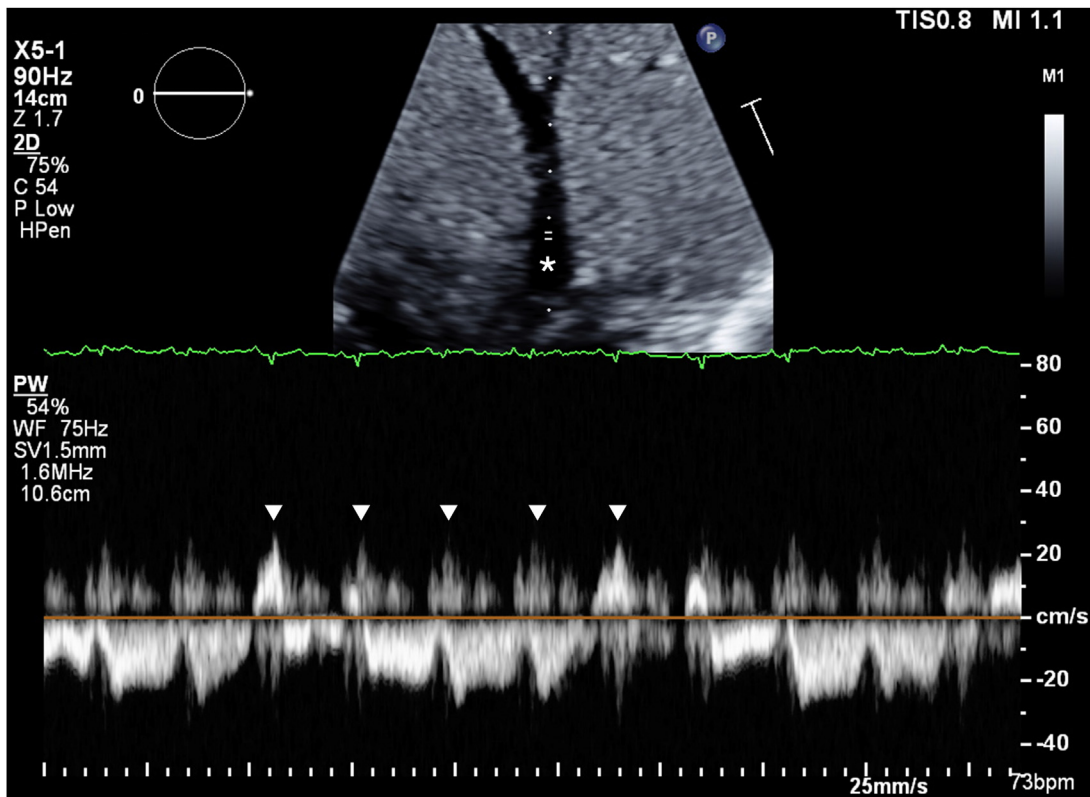
Figure 4 Subcostal view on TTE of the hepatic vein insertion (*) into the IVC using pulsed-wave Doppler shows evidence of venous flow reversal (*arrows*).

Figure 5 Coronal plane view from the CT chest study demonstrating markedly dilated jejunum (J) in the anterior mediastinum and neck with herniation through a sternal defect. *D*, Diaphragm; *T*, trachea.

Figure 6 Axial plane view from CT chest angiography study demonstrating markedly dilated jejunum (J) in the anterior mediastinum with distended bowel causing extrinsic compression of the right ventricle (RV). Additional images in this series revealed severe restriction of diastolic filling of the RV as well as the left atrium and left ventricle (LV).

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