Radiologic evaluation of postoperative gastropericardial fistula

Jeffrey S. Chen, Hassan M. Hal, and Rafel F. R. Tappouni

Laparoscopic Nissen fundoplication is the current standard surgical option for complicated GERD and symptomatic hiatal hernia. Though comparable in safety, short-term efficacy, and patient satisfaction when compared with open operation, laparoscopic Nissen fundoplication has demonstrated shorter hospital stays and recuperative times. Commonly reported complications include gastric or esophageal injury, splenic injury, pneumothorax, bleeding, pneumonia, fever, wound infections, and dysphagia. We present an unusual case of gastropericardial fistula that developed as a late complication of laparoscopic Nissen fundoplication performed 4 years earlier.

Case report

A 73-year-old Caucasian female presented to the emergency department after waking up with an acute onset of dyspnea and chest pressure accompanied by nausea and diaphoresis. Initial workup for myocardial infarction was negative, but an outside-hospital chest radiograph (Fig. 1) and computed tomography (CT) of the chest revealed a large pneumopericardium. The patient had previously been in a normal state of health. Significant medical history included hypothyroidism, hiatal hernia, GERD, and hypertension. Included in her surgical history were a laparoscopic Nissen fundoplication for hiatal hernia repair four years ago for severe gastroesophageal reflux, and a colectomy via lower midline incision. Physical exam revealed that the patient was afebrile with heart rate 85 beats/min, blood pressure 104/64 mmHg, respiratory rate 23 breaths/min, and oxygen saturations 99% on 4.0 L/m FIO2. She was hemodynamically stable, and the rest of the physical exam was unremarkable. At the time of the initial physical examination, the only complaint was mild chest discomfort.

An X-ray water-soluble swallow study revealed an outpouching of the gastric fundus overlying the air-filled pericardium (Fig. 2). There was no obvious contrast seeping...
into the pericardium; however, there was a suspicion of a gastropericardial fistula, and CT of the chest was recommended. A followup CT of the chest without contrast confirmed a large pneumopericardium with focal outpouching of contrast and air extending from the superior aspect of the gastric fundus through the left hemidiaphragm and abutting the surface of the posteroinferior pericardium (Figs. 3, 4). In addition, there was a small focus of hyperdensity in the dependent portion of the pericardial sac, suggestive of extravasated enteric contrast from the recent water-soluble swallow study, and a gastropericardial fistula (Fig. 5).

Upper gastrointestinal (GI) endoscopy with gastric biopsies showed that the Nissen fundoplication wrap was intact without any esophageal or GE junction abnormalities. Further inspection revealed a mucosal abnormality in the fundus of the stomach extending towards the pericardium. When the mucus was irrigated out, a defect into the pericardium could be seen. The right ventricle could be visualized through the gastric fundus (Fig. 6). The heart was not adherent to the stomach, and there was no significant pericardial fluid. The borders of the fistula were mildly inflamed with no obvious evidence of malignancy. Biopsies of the fistula revealed mild chronic active gastritis and fibrino-
Radiologic evaluation of postoperative gastropericardial fistula

inflammatory exudate compatible with the erosion site but negative for malignancy. The patient became hypotensive and nauseated one hour after the endoscope procedure. Despite administration of 500mL of Ringer’s lactate and antibiotics (Zosyn, vancomycin, diflucan), the patient became unresponsive and asystolic. IV fluids were pushed, resulting in a slow return of rhythm, pulse, and responsiveness. It was suspected that the syncope resulted from pericardial tamponade of gastric contents caused by nausea and retching. A pericardial drain was successfully placed, immediately removing 10 cc of yellow fluid. Fluid cultures returned negative for fungus and anerobic bacteria. Echocardiography revealed only a small pericardial effusion.

Three days later, an upper midline laparotomy was performed involving a takedown of the gastropericardial fistula and Nissen wrap, primary repair of the stomach, transdiaphragmatic drainage of the pericardial space following irrigation, and modified antireflux repair from below. The patient progressed well postoperatively, and PO intake was slowly increased. Physical Therapy (PT), Occupational Therapy (OT), and social services found her to be a good candidate for discharge to home with PT services. The patient was discharged four days later on a full liquid diet and Zosyn prescription. On followup, vital signs remained stable, laboratory values were within acceptable limits, and the patient demonstrated independence in activities of daily living.

Discussion

Etiology & demographics

The mortality associated with gastropericardial fistulae is greater than 50 percent; however, its rarity precludes a calculation of its true incidence (1, 2). The procedures and pathologies most commonly associated with gastrocardial fistulae include intrathoracic stomach resection, laparoscopic Nissen fundoplication, refractory gastric ulcers, and esophagogastric cancers (3, 4). In the current case, the gastropericardial fistula presenting 4 years after a laparoscopic Nissen fundoplication suggests the main cause to be postoperative refractory gastric ulcers. These are, by definition, ulcerative lesions failing to heal after 8 to 12 weeks of conventional therapy prescribed for gastric ulcers (5, 6). These types of ulcers are mainly caused by abnormal motility and decreased blood flow in the gastric mucosa, rather than hyperacidity (7).

In general, the pathogenesis of refractory gastric ulcers in patients with laparoscopic Nissen fundoplication can be attributed to several possible mechanisms. Scar tissue formed after fundoplication surgery could prevent normal mucosal motility and circulation. The gastric fundus could also have adhered to the pericardium, offering a pathway for benign ulcers to erode into the adjacent organ (5). Another possible mechanism is that the disruption of the normal angulation and curvature of the stomach (due to recurrent herniation) predisposes to a mechanical issue of chronic irritation from the right crus (8). Interestingly, the patient in this case was a nonsmoker, was negative for H. pylori, and did not regularly take NSAIDs, all of which are common risk factors for peptic ulcer disease. This may explain the delay in presentation of the gastropericardial fistula after laparoscopic Nissen fundoplication. Patients who have a Nissen fundoplication and are diagnosed with a gastric ulcer should be strongly counseled to avoid ulcer-inducing risk factors, as well as informed of the possible detrimental and fatal complications of penetrating gastric ulcers if unsatisfactorily treated.
Radiologic evaluation of postoperative gastropericardial fistula

Clinical & Imaging Findings

The classic presentation of gastropericardial fistula involves referred pain in the left shoulder due to diaphragmatic or pericardial irritation, along with radiological findings of pneumopericardium or hydropneumopericardium (9). Additional presentations include heartburn, epigastric tenderness, shoulder pain, dyspnea, and tachycardia. Occasionally, cardiac tamponade will present with Beck’s triad (hypotension, jugular venous distension, and muffled heart sounds). Hypovolemic shock may also follow as a result of gastropericardial fistula.

Pneumopericardium can be diagnosed by chest radiography, and shows a sharply outlined pericardium due to air density within the pericardial sac and air within the surrounding lungs (9). In gastropericardial fistulae, the heart may be partially or completely surrounded by air. Esophageal/gastric ulcers, esophageal/gastric perforation, and hiatal hernias can be diagnosed by a water-soluble swallow study. In addition, CT of the chest may be used to diagnose a gastropericardial fistula, and may require scanning the patient in the prone position, so that water-soluble enteric contrast can more readily enter the pericardial sac in this position.

Treatment & Prognosis

Surgery is the main treatment, as patients rarely survive with conservative management. Only two cases have been reported to survive after conservative treatment with pericardiocentesis and antibiotics (10, 11). Emergency management consists mainly of two actions: early detection of cardiac tamponade and pericardial decompression (9). Surgery is the definitive management of pneumopericardium, irrespective of cause and location (3, 9). Surgery includes resection of the fistula, repair of the diaphragmatic defect, and dealing with the primary pathology of the stomach. Adequate exposure and effective repair of the diaphragmatic defect may require splenectomy (12). The overall mortality of this disease is 85%.

Differential Diagnosis

Causes of pneumopericardium include thoracic surgery/pericardial fluid drainage, penetrating trauma, blunt trauma, infectious pericarditis involving gas-producing organisms, and fistula between the pericardium and an adjacent air-containing organ such as the stomach or esophagus.

Conclusion

Gastropericardial fistula is a rare and often fatal condition that requires a high index of suspicion if pneumopericardium is observed on chest radiography. Its manifestation as a late complication of laparoscopic Nissen fundoplication should be considered, especially with high risk factors for ulcerative disease and indications of postoperative refractory gastric ulcers, with focus on early diagnosis and prompt surgical treatment.

References

1. Rodriguez D, Heller MT. Pneumopericardium due to gastropericardial fistula: a delayed, rare complication of gastric bypass surgery. Emerg Radiol 2013;20(4):333-5. [PubMed]
2. Letoguerat JP, Fasquel JL, L’Huillier JP, Babatasi G, Gruel Y, Lauvin R, Mambrini A. Gastropericardial fistula: review of the literature apropos of a original case. J Chir (Paris) 1990;127(1):6-12. [PubMed]
3. Chinnaian KM, Ali MI, Gunarantnam NT. Gastric cancer presenting as gastropericardial fistula in a patient with familial adenomatous polyposis syndrome. J Clin Gastroenterol 2004;38(3):298. [PubMed]
4. Chauhan A, Perry I, Veitch A, Li P, Rattehalli D, Brookes MJ. Gastropericardial fistula: a potential role for conservative treatment. Eur J Gastroenterol Hepatol 2012;24(11):1341-3. [PubMed]
5. Park S, Kim JH, Lee YC, Chung JB. Gastropericardial fistula as a complication in a refractory gastric ulcer after esophagogastrectomy with gastric pull-up. Yonsei Med J 2010;51(2):270-272. [PubMed]
6. Shih SC, Tseng KW, Lin SC, Kao CR, Chou SY, Wang HY, Chang WH, Chu CH, Wang TE, Chien CL. Expression patterns of transforming growth factor-beta and its receptors in gastric mucosa of patients with refractory gastric ulcer. World J Gastroenterol 2005;11(1):136-41. [PubMed]
7. Clarke DL, Thomson SR. Attenuated gastric mucosal blood flow predicts non-healing of benign gastric ulcers. Eur Surg Res 2002;34(6):432-6. [PubMed]
8. Murthy S, Looney J, Jaklitsch MT. Gastropericardial fistula after laparoscopic surgery for reflux disease. N Engl J Med 2002;346:328-332. [PubMed]
9. Grandhi TM, Rawlings D, Morran CG. Gastropericardial fistula: a case report and review of literature. Emerg Med J 2004;21:644-645. [PubMed]
10. Chapman PR, Boals JR. Pneumopericardium caused by giant gastric ulcer. AJR Am J Roentgenol 1998;171:1669-70. [PubMed]
11. Hall MN, Little JM Jr. Penetration of the pericardium by a gastric ulcer-survival after pericardiocentesis. J Am Board Fam Pract 1990;3:289-91. [PubMed]
12. Liu DH, Crastnopol P, Phillips W. Perforation of a gastrojejunal ulcer into the pericardium. Arch Surg 1967;94:294-8. [PubMed]