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## CASE REPORT

INTERMEDIATE

## CLINICAL CASE

# An Esophagopleural Fistula Related to Cardiopulmonary Resuscitation



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## ABSTRACT

We describe a previously unreported and potentially fatal complication of esophageal perforation following cardiopulmonary resuscitation in a 74-year-old man with cardiac arrest subsequent to ventricular tachycardia caused by ischemic heart disease. We discuss the importance of searching for severe traumatic complications. This description emphasizes presenting complaints, early recognition, and management strategies of such cases (**Level of Difficulty: Intermediate**). (J Am Coll Cardiol Case Rep 2023;11:101769) © 2023 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## HISTORY OF PRESENTATION

A 74-year-old man presented with an out-of-hospital cardiac arrest (OHCA) subsequent to ventricular tachycardia with standard manual cardiopulmonary resuscitation (CPR) delivered by paramedics with a

no-flow time (from collapse to CPR) estimated to be 5 minutes and a low-flow time (from CPR to return of spontaneous circulation) of 15 minutes requiring 3 defibrillations. He underwent orotracheal intubation during ongoing CPR with no stilet or bougie, with only 1 attempt. A nasogastric tube was inserted at the same time without any reported difficulties. He required hemodynamic support with 2 mg/h (0.54 µg/kg/min) epinephrine during transport to the hospital. In the context of a left bundle branch block whose anteriority was unknown and a recent history of angioplasty, a coronary angiography was immediately performed upon admission, revealing neither stenosis at the recent right coronary stent nor significant stenosis of other arteries. Chest computed tomography (CT), performed to search for other causes of the OHCA, showed no cerebral hemorrhage or pulmonary

## LEARNING OBJECTIVES

- To understand the causes, clinical presentation, differential diagnosis, and management of pleural complications following cardiopulmonary resuscitation.
- To be aware of the possible occurrence of esophageal perforation, which is a rare but serious complication of cardiopulmonary resuscitation.

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The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the [Author Center](#).

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**ABBREVIATIONS  
AND ACRONYMS****CPR** = cardiopulmonary  
resuscitation**CT** = computed tomography**ICD** = implantable  
cardioverter-defibrillator**OHCA** = out-of-hospital  
cardiac arrest

embolism but did show fractures of the sternum and fourth right rib (Figure 1A) and right pleural effusion of high abundance with a CT density compatible with a hemothorax (mean: 50.1 HU) (Figure 1B).

He was transferred to the intensive care unit and presented with postresuscitation shock requiring norepinephrine support for 7 days after admission, with a maximal dose of 2.70  $\mu\text{g}/\text{kg}/\text{min}$ . A targeted temperature management was performed for 24 hours at 36 °C, and the curative anticoagulation was stopped. Enteral feeding through the nasogastric tube was initiated on day 2 after admission and was well tolerated. The right pleural effusion was drained on day 4, confirming an obvious macroscopic hemothorax. On day 6, he was awake and extubated; he ate normally on day 8, and the right thoracic tube could be removed, given the total regression of the hemothorax by chest x-ray film (Figure 2A) and the absence of debit through the tube. The curative anticoagulation was reintroduced on day 9 with unfractionated heparin. He was discharged to the cardiology department for insertion of an implantable cardioverter-defibrillator (ICD) on day 13 after the OHCA. The routine control chest x-ray film performed just after ICD insertion was unremarkable. Two days later, he presented with hypoxemic respiratory distress and hypotension. Transthoracic echography showed no hemopericardium but the recurrence of right pleural effusion. Chest x-ray film showed an abundant right pleuropneumothorax (Figure 2B), indicating a transfer to the intensive care unit. An axillary right pleural tube was

inserted, allowing the discharge of nearly 2,000 mL of a turbid exudative fluid (35g/L protein; 7,000 elements with a predominance of neutrophils) for which the definitive culture was positive for *Enterococcus faecalis* and *Streptococcus perosis*. The patient was treated with amoxicillin/clavulanic acid.

**PRIOR MEDICAL HISTORY**

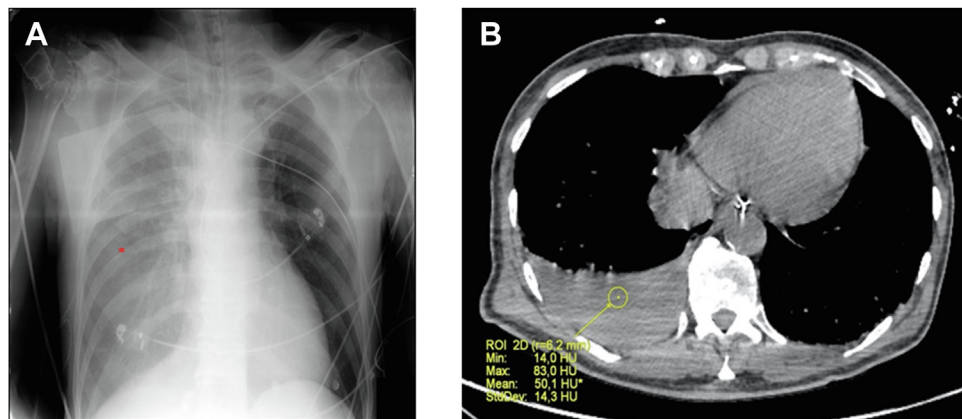
The patient had a history of ischemic heart disease, with angioplasty stenting of the right coronary artery 2 months before, and a residual left ventricular ejection fraction of 35% on the transthoracic echocardiography, with a dilated and hypokinetic left ventricle. His usual treatment included antiplatelet therapy with aspirin (once a day) and anticoagulation therapy with apixaban (twice a day for atrial fibrillation). He did not have any prior history of dysphagia, odynophagia, weight loss, or pleurisy.

**DIFFERENTIAL DIAGNOSIS**

Diagnostic considerations included complications such as pneumothorax, hemothorax, or purulent pleurisy after ICD insertion or the first pleural tube insertion. Given the multimicrobial pleural culture and the unusual localization of the *Enterococcus faecalis* in the pleural cavity, traumatic esophageal perforation was the most likely differential diagnosis.

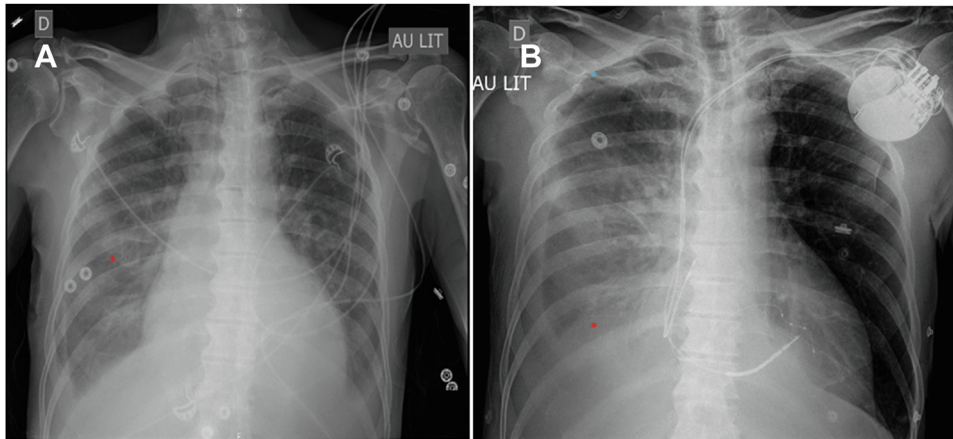
**INVESTIGATIONS**

We suspected an esophageal perforation with a fistula leading to the pleural cavity and performed chest CT

**FIGURE 1** Chest Imaging on Admission

(A) Chest x-ray film on admission: highly abundant right pleural effusion (red asterisk). (B) Chest computed tomography on admission: right pleural effusion with a density (mean: 50 HU) compatible with hemothorax (yellow legend).

**FIGURE 2** Chest X-Ray Film After Intensive Care Unit Stay



(A) Chest x-ray film on the day of discharge to the cardiology department showing total regression of the right pleural effusion (red asterisk).  
(B) Chest x-ray film performed 2 days after ICD insertion, at the time of respiratory distress, showing abundant right pleural effusion (red asterisk) and right apical pneumothorax (blue asterisk).

with contrast medium ingestion. It showed a leak to the right pleural cavity, confirming an esophagopleural fistula, without any evidence of contrast extravasation into the mediastinum or the left pleural cavity. The perforation was located in front of the T9 vertebral body, which presented a voluminous osteophyte (Figure 3) at the distal third of the esophagus, with the fistulous tract measuring 11 mm in length and 3 mm in width.

## MANAGEMENT

The patient underwent a surgical thoracotomy with debridement. A T tube was placed into the esophageal perforation; pleural drains and a jejunostomy feeding tube were added. Once the septic state appeared to be controlled, the esophageal T tube was removed on day 27 after the intervention (Figure 4A), and a covered metallic esophageal stent (24 × 120-mm Cousin Endosurg) was deployed under endoscopic guidance (Figure 4B). The fluoroscopic control showed the stent to be well placed. The patient was managed postoperatively with prolonged antibiotherapy.

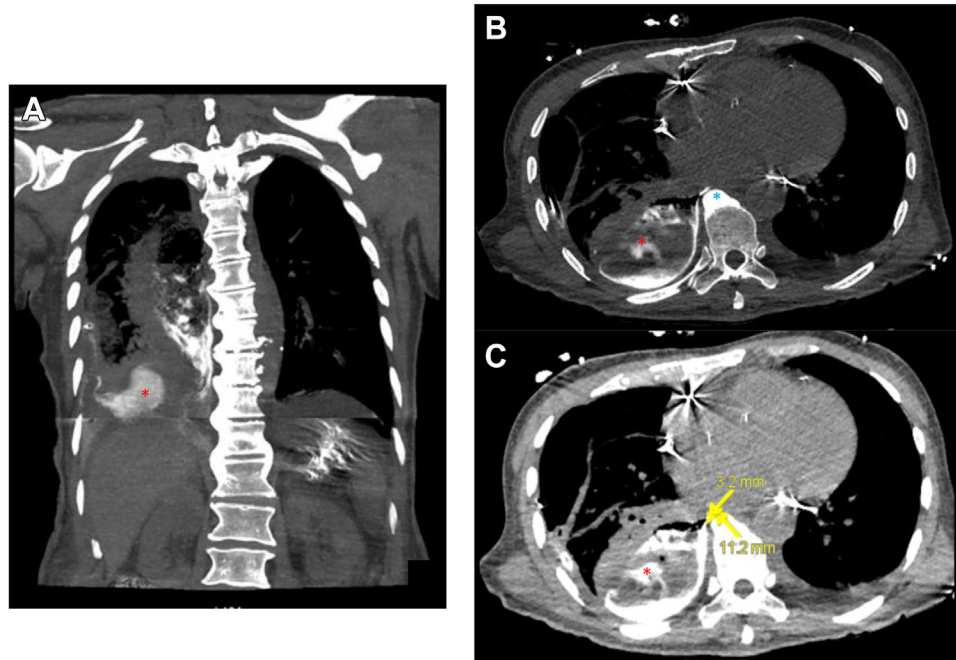
## DISCUSSION

Chest compression is the cornerstone of CPR in the management of cardiac arrest. This lifesaving maneuver is commonly associated with traumatic injuries, reported in 21% to 65% of cases.<sup>1</sup> Chest wall injuries with sternal and rib fractures have been

mostly described (13%-97%).<sup>2</sup> However, rare cases of deep organ injuries have been reported, such as liver, spleen, or stomach injuries.<sup>3-6</sup> Eldor et al<sup>7</sup> reported a fatal case of esophageal injury related to CPR subsequent to instrumental perforation of the esophagus by tracheal tube or nasogastric intubation.

Here, we describe an esophagopleural fistula located at the lower third of the esophagus. Development of a fistula between the esophagus and pleura is a rare condition, mostly arising subsequent to esophageal instrumentation, surgery, or the presence of a malignant lesion.<sup>8</sup> A few cases of spontaneous esophagopleural fistula have been previously reported and resulted from a sudden increase in intra-esophageal pressure associated with forceful vomiting or retching.<sup>9</sup> In our case, there were no reported issues during intubation or nasogastric tube placement. Hence, there is little probability of an iatrogenic instrumental injury. There was no history of dysphagia or weight loss, and the esophageal biopsy performed during endoscopy did not reveal any malignancy. The most likely explanation of the perforation is that it was caused by a combination of chest compression and an anatomic particularity of the patient. Indeed, given the mechanical pressure of chest compressions during CPR, the massive osteophyte on the body of the T9 vertebra could have perforated the esophageal wall and led to leaking of the esophageal content into the pleural cavity. Because it is an uncommon condition with no specific

**FIGURE 3** Computed Tomography Scan With Ingested Contrast Medium to Search for a Fistula Between the Esophagus and Pleural Cavity

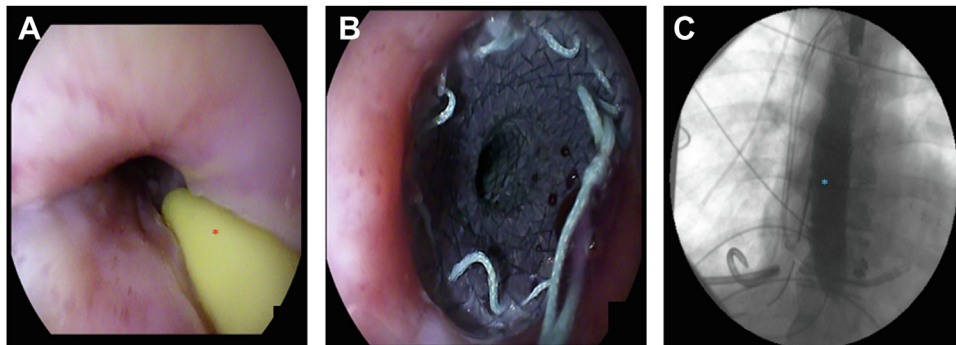


(A) Fistula with effusion of contrast medium to the pleural cavity (red asterisk). (B) Voluminous osteophyte on the vertebral body of T9 (blue asterisk) and effusion of contrast medium to the pleural cavity (red asterisk). (C) Esophagopleural fistula with a horizontal line measuring 11 mm in length and 3 mm in width (yellow arrow).

symptoms, the diagnosis of esophageal perforation is often delayed, resulting in continuing mediastinal and pleural sepsis, further increasing mortality. The treatment of esophageal perforation is based on

surgical repair or endoscopic esophageal stenting, with no difference in outcome in a recent multicenter study.<sup>10</sup> After a multidisciplinary discussion, the patient first underwent surgical debridement and

**FIGURE 4** Esophagogastroduodenoscopy



(A) T tube in place through the esophageal perforation, passing through the pleural cavity and externalizing to the chest wall (red asterisk). (B) Deployment of the metallic esophageal stent. (C) Fluoroscopic control showing the esophageal stent in place (blue asterisk).

drainage of the esophageal perforation followed by endoscopic esophageal stenting.

### FOLLOW-UP

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Despite a period of septic and hemodynamic stabilization after placement of the esophageal stent, multiple pleural drain replacements were necessary because of incomplete pleural drainage. Furthermore, the patient experienced several episodes of respiratory deterioration, with failure of weaning from ventilatory support, and developed acute kidney failure subsequent to the sepsis. He died 1 month after the surgery.

### CONCLUSIONS

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CPR measures may lead to a wide range of traumatic injuries, mainly sternal or rib fractures and more rarely profound organ damage. We describe a case of esophageal perforation with an esophagopleural fistula attributable to the presence of a voluminous

vertebral osteophyte that probably caused the esophageal perforation under the pressure of manual chest compressions. To our knowledge, this is the first reported case of esophageal perforation as a rare but potentially fatal complication of CPR.

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The authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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**KEY WORDS** cardiac arrest, cardiopulmonary resuscitation, esophageal perforation, esophageal-pleural fistula, mechanical chest compression, traumatic injuries