PNEUMOPERITONEUM DUE TO GASTRIC PERFORATION AFTER CARDIOPULMONARY RESUSCITATION: CASE REPORT

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Background
Pneumoperitoneum after cardiopulmonary resuscitation may be due to mediastinal air tracking into the peritoneal cavity via the diaphragmatic hiatus or to gastric perforation.

Case Report
A 79-year-old woman received Advanced Cardiac Life Support measures in the intensive care unit. Chest compressions and endotracheal intubation were performed; a stable cardiac rhythm and perfusion were restored. A chest radiograph after resuscitation revealed pneumoperitoneum without pneumomediastinum. The patient underwent laparotomy; a 6-cm perforation of the posterior gastric wall along the lesser curve was detected and repaired.

Conclusion
Gastric perforation after cardiopulmonary resuscitation should be suspected when chest radiographs obtained after resuscitation show pneumoperitoneum without pneumomediastinum. Prompt laparotomy allows detection of gastric perforations and decreases the morbidity associated with rupture of a hollow organ. The incidence of gastric perforation after cardiopulmonary resuscitation may be decreased with early endotracheal intubation, avoidance of esophageal intubation, and expeditious placement of an orogastric tube. (American Journal of Critical Care. 2008;17:388,386-387)

Common injuries sustained during cardiopulmonary resuscitation (CPR) include rib and sternal fractures, pneumothoraces, cardiac contusion, and gastric mucosal lacerations. Pneumoperitoneum after CPR has been described but is uncommon. Often such pneumoperitoneum has a nonsurgical origin; it may be due to mediastinal air tracking through the diaphragmatic hiatus into the peritoneal cavity or to pulmonary barotrauma. Surgical causes of pneumoperitoneum are rare and include gastric perforation. We present a case of gastric perforation in an elderly woman who had been receiving bilevel positive airway pressure mechanical ventilation 2 days before cardiopulmonary arrest.

Continued on page 386
Case Report

A 79-year-old woman had an exacerbation of chronic obstructive pulmonary disease. At admission, acute renal failure, hepatic failure with hyperbilirubinemia and coagulopathy, and atrial fibrillation with a left ventricular ejection fraction of 25% also were noted. She was admitted to the intensive care unit, and bilevel positive airway pressure ventilatory support was started. Forty-eight hours later, bradycardia developed and rapidly deteriorated to asystole. Inadvertent esophageal intubation occurred before successful endotracheal intubation; closed chest compressions and Advanced Cardiac Life Support measures were initiated. An orogastric tube was placed during the resuscitative efforts. Blood pressure, heart rate, and pulse were restored after administration of epinephrine. A chest radiograph obtained after intubation showed subdiaphragmatic free air. An abdominal radiograph showed pneumoperitoneum. On physical examination, the patient’s abdomen was markedly distended and tympanic to percussion. She was taken to an operating room for emergent exploratory laparotomy; a 6-cm laceration was found along the lesser curvature of the posterior gastric wall (see Figure). A stapled repair was done with a linear stapler, and the peritoneal cavity was copiously irrigated.

Discussion

Complications involving the abdominal viscera due to CPR occur in about 30% of patients. Common intra-abdominal sequelae of CPR include gastric dilatation and liver and spleen injuries, and patients sustain gastric rupture at a rate of 1 in 1000. At autopsy, gastric mucosal laceration has been found in 10% to 12% of patients who undergo CPR. Full-thickness laceration of the gastric wall has been reported but is much less frequent. The adult stomach can withstand pressures of up to 120 to 150 mm Hg before gastric perforation occurs.

In a review of English-language publications, we found reports of 22 confirmed cases and 2 presumed cases of gastric perforation after CPR in the past 4 decades. In 95% of these cases, chest compressions had been performed. A total of 52% of patients had undergone mouth-to-mouth resuscitation by bystanders or emergency medical services personnel. In 4 patients, mouth-to-mouth resuscitation was the only ventilatory support performed and was the sole cause of the gastric perforation. Esophageal intubation occurred at least once in 24% of patients with subsequent gastric perforation before a definitive endotracheal airway was obtained. In 2 patients who had abdominal distention after CPR, a contrast radiographic swallowing study was done after the patient’s condition had stabilized. However, in both cases, the swallowing study did not show a perforation. One of these patients later had laparotomy; the other died, and an autopsy showed a gastric perforation. In each of these cases, the perforation occurred along the lesser curvature of the stomach.

Most patients (67%) who sustain gastric perforation after CPR were taken to the operating room for laparotomy, where gastric perforation along the lesser curvature of the stomach was found. In 5 patients who were not taken for laparotomy, the gastric perforation was detected at autopsy. All but 1 perforation was along the lesser curvature. An anterior gastric perforation was noted at autopsy in a 5-month-old girl whose death was later attributed to sudden infant death syndrome.
The predominant site of gastric perforation from CPR is along the lesser curvature of the stomach, possibly because of the decreased number of mucosal folds in this region of the stomach. A total of 62% of the patients with reported gastric perforation after CPR survived their injuries; 92% of those had surgical intervention. One case report described a patient who survived nonoperative treatment of gastric perforation after successful CPR. In our case, gastric distention could be attributed to the use of bilevel positive airway pressure before CPR as well as to inadvertent esophageal intubation; the perforation ultimately occurred during the transient increased intragastric pressures sustained during chest compressions. Likewise, gastric decompression was delayed via placement of an orogastric tube after intubation.

**Conclusion**

Although rare, gastric injury may occur after chest compressions and must be recognized early to ensure timely surgical intervention. Early endotracheal intubation, avoidance of esophageal intubation, and prompt placement of an orogastric or nasogastric tube are all important considerations to decrease the unnecessary morbidity that occurs after inadvertent gastric perforation. Basic imaging studies such as chest and abdominal radiographs provide timely and accurate information, whereas contrast radiographic swallowing studies in patients in stable condition may not pinpoint the diagnosis of gastric perforation. Many patients have a poor overall prognosis before an initial cardiopulmonary arrest. Additionally, a perforated viscus after chest compressions, in patients with multisystem organ failure (cardiac, pulmonary, hepatic, and renal), most likely would result in death. Not unexpectedly, operating on patients who have sustained cardiopulmonary arrest just before laparotomy markedly increases surgical morbidity and mortality.

**ACKNOWLEDGMENTS**

All research was performed at Dwight D Eisenhower Army Medical Center, Fort Gordon, Georgia. The opinions and assertions contained herein are the private views of the authors and are not to be construed as official or as reflecting the views of the Department of Defense. Use of or mention of any commercial product in this manuscript does not imply endorsement by the United States Government.

**FINANCIAL DISCLOSURES**

None reported.

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Am J Crit Care 2008;17 388-390
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