

CASE REPORT

Tension Pneumoperitoneum Following Upper Gastrointestinal Endoscopy

Tsung-Chien Lu, Shey-Ying Chen, Hsiu-Po Wang, Chien-Chang Lee,* Shyr-Chyr Chen

Tension pneumoperitoneum is a potentially lethal complication of numerous iatrogenic procedures, including upper gastrointestinal (UGI) endoscopy. We report a 69-year-old man with UGI bleeding who developed tension pneumoperitoneum and cardiac arrest after UGI endoscopy. He was successfully resuscitated with needle decompression. Emergency surgery revealed a perforated gastric ulcer, and subtotal gastrectomy with Billroth II anastomosis was performed. Recovery was smooth and he was discharged from the hospital 18 days later. Tension pneumoperitoneum should be suspected in all patients who develop circulatory collapse with acutely distended abdomen after UGI endoscopy. Early identification relies on a high index of suspicion. Prompt treatment with needle decompression should not be delayed for confirmatory radiography once the clinical diagnosis is made. [*J Formos Med Assoc* 2006;105(5):431-433]

Key Words: gastrointestinal endoscopy, perforated peptic ulcer, tension pneumoperitoneum

Tension pneumoperitoneum is a massive accumulation of intra-abdominal free air under pressure that causes hemodynamic instability and circulatory collapse. This condition is extremely rare and most often occurs after blunt trauma, gastrointestinal surgery, bag-valve-mask ventilation during resuscitation, and following an iatrogenic procedure.¹ The patient usually experiences marked abdominal fullness, and physical examination may reveal a barrel-shaped abdomen that is tympanic to percussion in all quadrants. If left untreated, the increasing air pressure may cause upward displacement of the diaphragm with respiratory compromise. There may also be diminished venous return due to compression of the inferior vena cava and even acute occlusion of the aorta.² Immediate intervention is necessary for this life-threatening complication, including needle decompression of the peritoneum followed by surgical exploration. We report a case of tension pneumoperitoneum with circulatory collapse and

pulseless electrical activity after upper gastrointestinal (UGI) endoscopy. Resuscitation with emergency needle decompression was performed with recovery of vital signs. The pathophysiology of tension pneumoperitoneum after UGI endoscopy and the related management strategy are discussed.

Case Report

A 69-year-old man without significant medical history presented to the emergency department (ED) after developing recurrent epigastralgia for 4 days, and a moderate amount of coffee-ground vomitus on the day of presentation. He had clear consciousness and stable vital signs. Physical examination revealed mild epigastric tenderness without muscle guarding or rebounding pain. Hemogram showed hemoglobin of 10.2 g/dL and mean corpuscular volume of 86 fL. Stool guaiac

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Department of Emergency Medicine, National Taiwan University Hospital, Taipei, Taiwan.

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*Correspondence to: Dr. Chien-Chang Lee, Department of Emergency Medicine, National Taiwan University Hospital, 7, Chung-Shan South Road, Taipei 100, Taiwan.
E-mail: chnchnlee@yahoo.com

test was strongly positive. Biochemistry studies were within reference limits. Initial upright chest radiograph showed no obvious abnormality or subphrenic free air. He was sent to the neighboring endoscopy room and UGI endoscopy was performed, but food debris and some blood clots obscured the view during passage through the esophagus and also obscured the view of the stomach. The abdomen became acutely distended after air insufflation, and shock developed with blood pressure (BP) dropping to 70/40 mmHg. The patient soon became unresponsive and cyanotic. Examination revealed decreased breath sounds, and his condition progressed to pulseless electrical activity. Immediate endotracheal tube (ETT) intubation and fluid resuscitation were carried out. The pulse was faintly palpable and the BP was 68/35 mmHg. Bag-valve-mask ventilation through the ETT was difficult to perform and the saturation remained at 88–92%. He was immediately transported back to the ED for further resuscitation.

Upon arrival at the ED, his body temperature was 37.2°C, heart rate was 130/min, BP was 72/43 mmHg, and respiratory rate was 30/min under mechanical ventilation in assisted-control mandatory ventilation mode. The patient appeared pale, with a pulse oxygen saturation of 92%. The jugular veins were engorged. His breath sounds were diminished but equally clear bilaterally. Heart tones were muffled and peripheral pulses were faint. Abdominal assessment revealed a ballooned and barrel-shaped abdomen that was tense and tympanic to percussion on all four quadrants.

Emergency chest radiograph showed massive sub-diaphragmatic free air with centralization of the abdominal organs (Figure). Tension pneumoperitoneum was diagnosed. An 18-gauge needle was used for decompression at the midline of the abdomen. The syringe drawn air was released and BP returned to 110/70 mmHg. Two liters of normal saline was administered. Emergency exploratory laparotomy disclosed an ulcer crater, 3 × 3 × 2 cm, with a 1-cm perforation on the posterior wall of the gastric antrum. Subtotal gastrectomy with Billroth II anastomosis was performed, and the surgical specimen did not show any evidence

of malignancy on pathologic examination. The patient was discharged from the hospital 18 days later after an uneventful recovery.

Discussion

Tension pneumoperitoneum is defined by the deleterious effects of intra-abdominal hypertension on the pulmonary, cardiovascular, splanchnic, urinary, and central nervous systems. The rapidly increased intra-abdominal pressure decreases cardiac output, alters ventilation-perfusion relationships, and decreases venous return, which may lead to cardiopulmonary arrest depending on the magnitude of the pressure. Numerous iatrogenic causes have been described, including colonoscopy, cardiopulmonary resuscitation, percutaneous endoscopic gastrostomy, and mechanical ventilation in patients with pleural-peritoneal shunts.^{1–8}

Although conventional plain film may not initially detect free peritoneal air in patients with

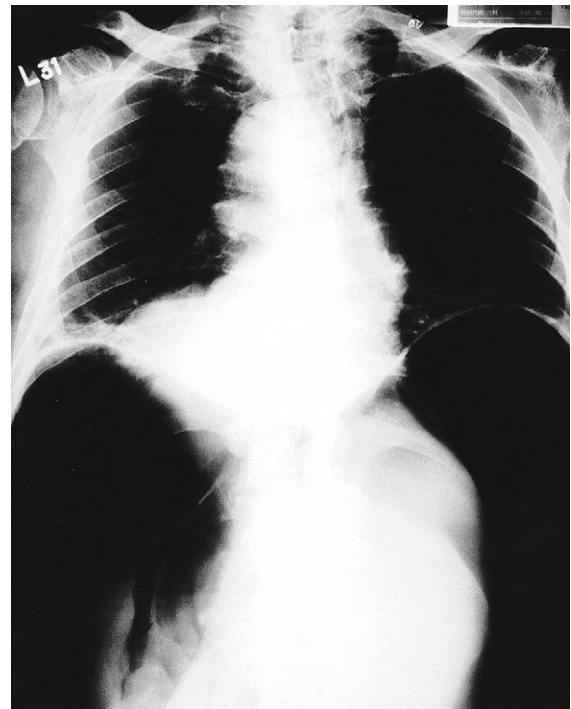


Figure. Chest radiograph shows massive sub-diaphragmatic air with centralized internal organs after upper gastrointestinal endoscopy.

gastroduodenal perforation,⁹ the cause of gastric perforation after endoscopy in this case was probably due to pneumatic perforation of the weakened ulcerated gastric wall that occurred when the insufflated intraluminal pressure exceeded the gastric wall tension limit. Other than ulcer disease, transmural inflammation such as inflammatory bowel disease, tumor or intussusception have also been reported to be associated with bowel wall perforation during procedures like colonoscopy or air reduction of intussusception that require air-filling.^{5,6} To avoid this rare complication of air pressure perforation, patients should be well prepared and fasted before endoscopic examination. Although food debris and blood clots are the most common causes of poor insufflation, great care and a light touch on the air button are indicated in poorly-prepared patients to avoid vigorous air insufflation and pneumatic perforation. It is also important to emphasize that endoscopy staff must be prepared to deal with any emergency during the procedure.

Prompt diagnosis relies on a high index of clinical suspicion in these procedures when the abdomen becomes acutely distended and tympanic on percussion in all areas. Once hemodynamic compromise develops, timely abdominal paracentesis is necessary to release the compressed vena cava, occluded aorta and improve respiratory exchange before laparotomy.^{2,8} As in tension pneumothorax, the diagnosis of tension pneumoperitoneum is based on clinical findings rather than waiting for the radiographic results. Neither needle decompression nor tube air drainage should be delayed for the sake of confirming examinations. When the diagnosis is in doubt and the patient's condition is critical, portable chest radiography may provide the definitive diagnosis. Care should also be taken to avoid internal organ injury during abdominal paracentesis, especially liver or spleen

injury, which may lead to severe internal hemorrhaging. After needle decompression, definite treatment depends on the pathophysiology of pneumoperitoneum.

In summary, tension pneumoperitoneum, although a rare entity, is a life-threatening and potentially reversible complication of UGI endoscopy, which is especially likely to develop in patients with an inflammatory or ulcerative bowel wall predisposing to perforation. Immediate needle decompression is the life-saving procedure and should not be delayed.

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