



International Journal of Gerontology

journal homepage: <http://www.sgecm.org.tw/ijge/>



Case Report

Tension Pneumoperitoneum Following Upper Gastrointestinal Endoscopy

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ARTICLE INFO

Accepted 26 March 2020

Keywords:

gastrointestinal endoscopy,
perforated peptic ulcer,
tension pneumoperitoneum

SUMMARY

Tension pneumoperitoneum (TPP) is a potentially lethal complication of numerous iatrogenic procedures, including upper gastrointestinal (UGI) endoscopy. This report details the case of a 78-year-old woman with abdominal pain who developed TPP and cardiac arrest after undergoing UGI endoscopy. She was successfully resuscitated with needle decompression. The patient underwent laparoscopic gastrorrhaphy for gastric ulcer perforation. Unfortunately, the patient developed a disseminated intravascular coagulation and multiple-organ failure, and died on postoperative day 5.

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1. Introduction

Tension pneumoperitoneum (TPP) is a massive accumulation of intra-abdominal free air under pressure, which 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, or 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 an upward displacement of the diaphragm with respiratory compromise. Diminished venous return due to compression of the inferior vena cava and even acute occlusion of the aorta may also occur.² Immediate intervention, including needle decompression of the peritoneum followed by surgical exploration, is necessary for this life-threatening complication.³

2. Case report

A 78-year-old woman presented to the emergency department with acute-onset epigastric pain and nausea, which had continued for 2 hours. She had clear consciousness and stable vital signs. Physical examination revealed mild epigastric tenderness without peritoneal signs. Laboratory data, electrocardiography, and imaging studies such as chest and plain radiographies revealed no anomalies. Abdominal ultrasonography revealed liver cirrhosis. UGI endoscopy was performed; however, some gastric contents may have obscured the visualization of the stomach after air insufflation. After UGI endoscopy, the patient became unresponsive and manifested re-

spiratory distress, cyanosis, and hypotension with a blood pressure (BP) of 70/40 mmHg. Physical examination revealed a barrel-shaped abdomen tympanic to percussion, and the skin of the lower limbs was mottled. Immediate endotracheal tube intubation and fluid resuscitation were performed. The patient's BP returned to 115/68 mmHg, and her heart rate was 126 beats/min. Contrast-enhanced abdominal computed tomography (CT) revealed a massive pneumoperitoneum compressing the abdominal viscera into a central mass with collapsed inferior vena cava and abdominal aorta (Figure 1), suggestive of TPP. Emergency needle decompression with an 18-gauge needle at the midline of the abdomen was performed, which gradually decreased the abdominal distension and dramatically alleviated the mottled skin of the patient's lower limbs. The patient underwent laparoscopic gastrorrhaphy for gastric ulcer perforation. Unfortunately, the patient developed a disseminated intravascular coagulation and multiple-organ failure, and died on postoperative day 5.

3. Discussion

TPP is defined as a deleterious effect of intra-abdominal hyper-

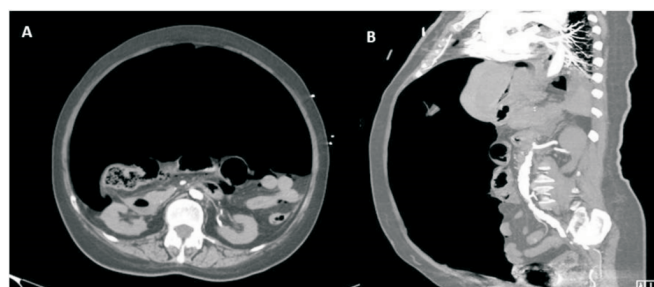


Figure 1. (A and B) Computed tomography image of the abdomen showing a massive pneumoperitoneum compressing the abdominal viscera into a central mass with collapsed inferior vena cava and abdominal aorta.

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tension 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.^{1,2} The overall complication rates in UGI endoscopy, colonoscopy, and polypectomy were low as compared with the published data (0.009%, 0.02%, and 0.36%, respectively). The perforation rates were 0.0009%, 0.005%, and 0.06%, respectively; the rates of significant hemorrhage were 0.002%, 0.001%, and 0.26%, respectively; and the mortality rates were 0.0009%, 0.001%, and 0.007%, respectively. The incidence rates of cardiorespiratory complications associated with UGI endoscopy and colonoscopy were 0.005% and 0.01%, respectively.⁴

TPP mostly occurs in cases of perforation of the gastrointestinal tract, permitting air to enter the peritoneal cavity while an overlying portion of the omentum acts as a one-way valve, allowing gas to attain a high pressure.⁵ Perforation can be spontaneous, as in peptic perforation, blunt abdominal trauma, or barotrauma from mechanical ventilation or scuba diving. It can also be iatrogenic following endoscopic procedures owing to the intraperitoneal escape of insufflating gas.⁶ 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 and occluded aorta, and to improve the respiratory exchange before emergency laparotomy.^{7,8}

Although conventional plain radiography may not initially detect free peritoneal air in patients with gastroduodenal perforation,⁹ the cause of gastric perforation after endoscopy in this case was probably the 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 such as colonoscopy or air reduction of intussusception that require air filling.¹⁰ CT images of TPP in the axial and sagittal planes demonstrated a large pneumoperitoneum compressing the abdominal viscera into a central mass, extending superiorly into the mediastinum and inferiorly into the scrotum.¹¹ We propose that gastric contents during UGI endoscopy may obscure visualization and increase the risk of perforation, stressing the importance of appropriate fasting before the procedure.

The present patient had TPP due to acute gastric perforation

following a gastroscopy. The gastric overdistension caused by inflation during endoscopy probably led to the elevated intragastric pressure that resulted in a perforation. This was followed by TPP, which caused cardiopulmonary compromise. In a previous study, after a diagnostic CT scan of the abdomen, needle decompression of the peritoneum resulted in immediate improvement of cardiopulmonary status,¹² as in our case. Unfortunately, our patient developed a disseminated intravascular coagulation and multiple-organ failure, and died on postoperative day 5.

In summary, TPP, although a rare entity, is a life-threatening and potentially reversible complication of UGI endoscopy. Acute TPP should be treated immediately with needle decompression of the peritoneum, even if the diagnosis has not been confirmed radiographically,⁸ followed by emergency laparotomy and repair of the gastric perforation.

Funding sources and related paper presentations

None.

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