Tension pneumoperitoneum: a very rare complication of acute gangrenous appendicitis

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ABSTRACT

Tension pneumoperitoneum is a very rare consequence of acute gangrenous appendicitis. We report a case of a 32-year-old woman who presented with abdominal pain, progressively increasing abdominal distension, profound hemodynamic instability and ventilatory compromise. The diagnosis of tension pneumoperitoneum was confirmed by computed tomography, which showed compression of the intra-abdominal viscera and liver (saddlebag sign) by a large volume of intraperitoneal free air. Urgent needle decompression was done as an emergency measure. Exploratory laparotomy, planned due to persistent peritonitis, revealed gangrenous appendicitis with perforation near its base. Appendectomy with excision of gangrenous portion of caecum was performed.

The purpose of the reporting this case is to highlight that the tension pneumoperitoneum can be, very rarely, associated with gangrenous appendicitis and timely diagnosis is very important for the emergency management of this deadly condition.

KEYWORDS

Pneumoperitoneum – Gangrene – Appendicitis – Tomography

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Introduction

Tension pneumoperitoneum is described as an extreme form of pneumoperitoneum in which a large volume of free intraperitoneal air attains a high pressure, requiring urgent intervention.¹ It is usually caused by intra-abdominal hollow visceral perforation during endoscopy, bariatric surgery, blunt trauma or barotrauma during mechanical ventilation.²

Tension pneumoperitoneum in gangrenous appendicitis is very rare and a high index of suspicion is required for early recognition of this potentially life-threatening condition, as it may be easily confused with shock due to an intra-abdominal sepsis in gangrenous appendicitis. Thus, it is important to keep this complication in mind, as immediate intervention is often life-saving in these circumstances. We report this rare complication of appendicitis which, to the best of our knowledge, has not been previously described in the literature.

Case report

A 32-year-old woman was referred to the accident and emergency department with progressively increasing abdominal pain for 4 days and severe respiratory distress accompanied by abdominal distension for 2 hours. On initial evaluation, she was lethargic with dyspnoea (respiratory rate 35 breaths/minute), tachycardia (heart rate 104 beats/minute), fever (103°F), hypotension (blood pressure 96/

70mmHg). An arterial blood gas analysis showed metabolic acidosis with decreased partial pressure of oxygen. Her abdomen was markedly distended and tympanitic, with features of peritonitis. Baseline blood parameters revealed leucocytosis with dyselethrolytaemia.

Following thorough resuscitation with intravenous fluids, high-flow oxygen and nasogastric tube decompression, the patient optimized haemodynamically. Considering the diagnostic dilemma and unavailability of facilities for diagnostic laparoscopy, computed tomography (CT) was planned for a better guide to surgical approach. The CT scan revealed a large quantity of intraperitoneal gas causing massive pneumoperitoneum compressing the intra-abdominal viscera with saddlebag sign (Fig 1).

An urgent needle decompression of tension pneumoperitoneum was performed using a 16G cannula through the abdominal wall, as a temporary measure. Following the procedure, the patient's symptoms and haemodynamic status improved. However, persisting peritonitis mandated an exploratory laparotomy. The abdomen was accessed through a midline approach. The appendix, together with part of the caecum, were found to be gangrenous, with a 2cm × 3cm unhealthy perforation near the appendicular base. Appendectomy with resection of the gangrenous part of the caecum was performed. An end-ileostomy with colonic mucous fistula was created for diversion. The patient had a prolonged post-operative period, and needed elective ventilation for pulmonary atelectasis. There was surgical site infection, which necessitated repeated debridement and dressings.

Figure 1 Coronal computed tomography shows a large volume of intraperitoneal free air has displaced the abdominal viscera

Histopathological examination of the resected specimen showed mucosal ulceration with necroinflammatory reactions and infiltration of inflammatory cells near the margin of perforation. The aetiology was considered to be an ongoing infective endarteritis involving the branches of ileocolic artery.

Discussion

Tension pneumoperitoneum is a rare form of abdominal compartment syndrome that results from entrapment of large volume of free intraperitoneal air, which causes sufficiently high intra-abdominal pressure to compress the inferior vena cava and decrease venous return to the heart and splinting of diaphragm, resulting in compromised ventilation. It also causes poor intra-abdominal visceral perfusion, including of the kidneys, resulting in low glomerular filtration rate and oliguria.²

Tension pneumoperitoneum is mostly seen in cases of perforation in the gastrointestinal tract permitting air to enter the peritoneal cavity while an overlying portion of omentum acts as 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 intraperitoneal escape of insufflating gas.²

Tension pneumoperitoneum can be associated with tension pneumothorax, either due to an associated

diaphragmatic eventration or air entry through perivascular connective tissue.³ Tension pneumoperitoneum due to acute appendicular perforation in gangrenous appendicitis has not been reported in the literature previously. Common complications of acute appendicitis are perforation, peritonitis and abscess formation. Some unusual complications are portal vein thrombosis⁴ and superior mesenteric vein thrombosis.⁵

Patients with tension pneumoperitoneum usually present with distended abdomen, respiratory distress and all the features of cardiovascular collapse, including hypotension and tachycardia. Tenderness is minimum unless peritonitis is also present. Sometimes other signs of increased intra-abdominal pressure, such as rectal prolapse, lower extremity oedema and genital oedema may be present. Lower-limb arterial insufficiency, shock, cyanosis and cardiorespiratory arrest may occur at later course of the disease.¹

Prompt clinical suspicion is crucial in the management of this condition. Diagnosis may be confirmed by plain erect x-ray of the abdomen and contrast enhanced CT scan, which shows a large volume of free intraperitoneal air. Usually, on CT scan, a large volume of air is seen to compress the viscera and an inferior and medial displacement of the liver can also be observed occasionally (saddlebag sign; Fig 2).⁵

Tension pneumoperitoneum is a surgical emergency. Urgent needle decompression is required to improve hemodynamic stability and ventilatory compliance, which is usually followed by close monitoring. An exploratory laparotomy is planned only if peritonitis is present, for identification and

Figure 2 Contrast enhanced axial computed tomography showing evidence of tension pneumoperitoneum with compression of the intra-abdominal viscera and displacement of the liver (saddlebag sign)

definitive management of the intraabdominal cause of tension pneumoperitoneum.^{1,2}

Conclusions

Our patient presented with tension pneumoperitoneum as a very rare complication of acute gangrenous appendicitis. A high index of suspicion is necessary for timely diagnosis of this potentially life-threatening situation, which is usually confirmed by x-ray and CT scans. Urgent needle decompression followed by close monitoring or emergency surgical intervention is the mainstay of treatment in these cases.

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