May 2nd, 12:00 AM

Case Report: Pneumoperitoneum in the Setting of Altered Mental Status

Aloysius C. Ibe
Jefferson Health NJ

Neelesh Parikh
Jefferson Health NJ

Robin Lahr
Jefferson Health NJ

Case Report: Pneumoperitoneum in the Setting of Altered Mental Status

Aloysius C. Ibe DO, Neelesh Parikh DO, Robin Lahr DO

Department of Emergency Medicine and EM Residency Program, Jefferson Health New Jersey

Abstract:

We report a case of an 80-year-old female who presented to the emergency department as altered mental status and diagnosed with pneumoperitoneum requiring immediate surgical intervention. The differential for altered mental status is vast but for a patient who initially hypoglycemic on ED arrival, suspected drug overdose was at the forefront until the patient was intubated for airway protection and chest radiograph for confirmatory endotracheal tube placement showed pneumoperitoneum.

Case Presentation:

An 80-year-old female with a past medical history of diabetes, Parkinson's dementia, and hypertension initially presented to the emergency department via EMS for altered mental status. As per patient's daughter, the patient had been suffering from decreased appetite, nausea, vomiting, and right sided abdominal pain for approximately 3 days with no reports of fall or trauma to the abdomen. While being evaluated in the ambulance bay, the patient's pulse was weak, she had a syncopal episode, and a medical alert was activated.

The patient was taken to the resuscitation bay and on repeat examination was found to have decreased respiration, did not follow commands, nor withdrawing from noxious stimuli (e.g. sternal chest rub or pinching all four extremities). Due to patient's low Glasgow coma scale, the patient was ultimately intubated for airway protection, placed on cardiac monitor, and had two large bore 18g IVs placed.

Patient's initial blood pressure was 63/28 mmHg, respiratory rate 8 breaths/min, SpO2 87%, and point-of-care glucose was low 30s. So, prior to intubating the patient was given 1L normal saline and an amp of d50 to get vital signs to a safe range prior to intubation. After intubation, norepinephrine was started peripherally and repeat vital signs were: BP 135/58 mmHg, HR 85 beats/min, temp 96.5F, respiratory rate 19 breaths/min, and SpO2 99%

Lab result in the ED showed the following abnormal values: lactate= 10.4 mmol/L, ABG (pH= 7.09, PCO2=42 mmHg, PO2= 238 mmHg, CO2= 13 mmol/L), BMP (BUN= 50 mg/dL, Cr=2.26 mg/dL, eGFR= 21, Ca= 6.9), coagulation studies (prolonged PT= 18.2s), LFT (AST= 98 U/L, ALT= 43 U/L, albumin =1.8 g/dL, protein= 3.5 g/dL), and CBC with differential (WBC= 10.7 cells/uL, Hgb= 8.5 g/dL, relative bands= 24%, neutrophil= 8.9 cells/uL)

During resuscitation period, patient's repeat blood sugar continued to be low requiring multiple doses of D50 and ultimately dextrose drip. Confirmatory chest x-ray for endotracheal tube placement showed right-sided pneumoperitoneum which was better visualized and confirmed by radiologist on CT abdomen. Patient was placed on vancomycin and Zosyn for broad spectrum antibiotic coverage, central line was placed for continued norepinephrine requirement, and patient was emergently taken to the OR for repair.

Patient was admitted to the ICU post-op with open abdomen and wound vacuum in place due to surgery team not finding site of perforation, and plans for re-exploration the following day. Infectious disease was consulted and recommend the patient be started on meropenem and eraxis due to positive blood cultures growing Bacteroides Fragilis, Staphylococcus Hominis, gram negative rods, and gram positive cocci. Due to guarded prognosis from advanced age, acidosis, and shock the patient's family chose to make the patient DNR/DNI. Code blue was called later that evening due to asystole seen on cardiac monitor and the patient was pronounced dead.

Discussion:

Incidence of pneumoperitoneum:

A study done by the Department of Radiology of Fujimi-Kogen Hospital in 2020 found that out of ~18000 abdominal CT exams, free air was found in 253 exams in 182 cases (source 3). Follow-up CT exams were performed to track hospital clinical course in the 182 cases and found that extraluminal free air was still present in 57 follow-up exams. Of the now 196 examinations of 182 cases (excluding the 57 follow-up examinations) iatrogenic air was detected in 109 examinations. The majority of iatrogenic air came after laparotomy, followed by endoscopy, and then various therapeutic procedures (source 3).

Another study done performed by Brandon C. Chapman MD et al in 2015 looked at the incidence of pneumoperitoneum in a retrospective cohort study for patients who had abdominal CT imaging within 30 days of abdominal surgery (source 5). The results showed that among 344 patients, pneumoperitoneum was seen in 135 patients. Of that 135 patients, pneumoperitoneum was seen in 53% POD 0-6, 41% POD 7-13, 23% POD 14-20, 13% POD 21-27, and 0% POD 28-30. They concluded that post-op pneumoperitoneum was seen in 23% of patients in a 30 day period but on 6% required further intervention (source 5).

Figure 1: chest radiograph of pneumoperitoneum visualized under the right diaphragm

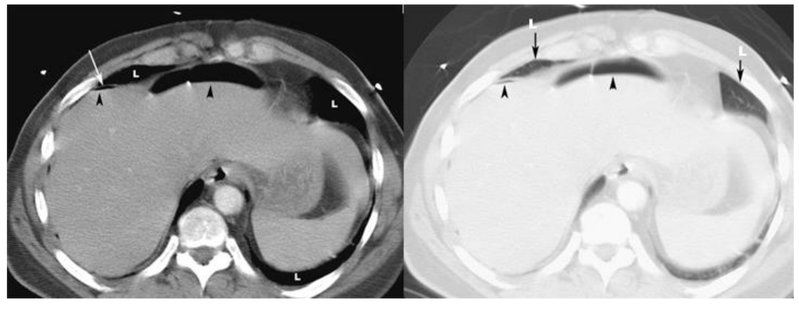

Figure 2: CT scan pneumoperitoneum

References:

Available on request

Discussion (cont.):

Pathophysiology:

The peritoneum is a thin and serous membrane that lines the abdominal cavity and is formed by two layers: parietal and visceral layers. Parietal layer lines the abdominal wall while the visceral layer covers the abdominal organs directly (source 1). Pneumoperitoneum if free air within the abdomen that can be classified as Surgical and Non-surgical Pneumoperitoneum.

Surgical pneumoperitoneum accounts for 85-90% of all cases of pneumoperitoneum while non-surgical form accounts for 5-15% (source 1). A study done by Source 1 found that the most common cause of perforation was inflammation followed by trauma (16.8%), vascular (9.9%), post-operative leak (6.9%), and neoplastic (6.1%) (source 1).

Inflammatory causes of surgical pneumoperitoneum occurred in the gastro-duodenal area (42%), in large bowel (31.3%), in small bowel (21.4%), and miscellaneous (e.g. perforated appendix, peptic ulcer, diverticulitis) (source 1). Traumatic causes of perforation can be due to direct external trauma or iatrogenic (e.g. unintended bowel perforation during ex-lap) as well as post-operative leak. Ischemia due to thrombo-embolism or strangulation can cause perforation. Neoplastic causes of perforation can be caused by direct invasion or bowel rupture due to obstruction (source 1).

The other/less common category of pneumoperitoneum is non-surgical or spontaneous which is usually an incidental radiologic finding rather than clinical manifestation that results from thoracic, abdominal, or gynecological causes. Any cause of increased intra-thoracic pressure can produce pneumoperitoneum In females there is a natural communication between the fallopian tubes and peritoneum, which may predispose to non-surgical pneumoperitoneum. In the abdomen, air may retain normally after surgeries for longer periods from 3-6 days, up to 4 weeks, while in laparoscopy the current preferred gas in insufflation is Carbon dioxide, which is rapidly absorbed, than room air entered during laparotomy.

Presentation of pneumoperitoneum:

Common signs and symptoms are abdominal pain, vomiting, abdominal distension, constipation, fever, diarrhea, tachycardia (pulse >110/min), hypotension (systolic blood pressure <100 mmHg), urine output (<30 mL/h), and tachypnea (respiratory rate >20/min). The clinical presentation of the patients varies according to the site of perforation. Patients with duodenal ulcer perforation usually have a short history of epigastric pain, generalized tenderness and guarding, and a history of NSAID use. Patients with small bowel perforation may present with a prolonged history of fever followed by lower abdominal pain. Appendicular perforations usually have a classical history of pain starting in the periumbilical area that migrates to the right lower quadrant (source 2).

Perforations of the proximal gastrointestinal tract are more common in India, in contrast to findings from studies in developed countries where distal gastrointestinal tract perforations are more common (source 2).

Laboratory studies:

Increased inflammatory markers, leukocytosis, and SIRS criteria can be associated with pneumoperitoneum, however, it is not mandatory as pneumoperitoneum is diagnosed by imaging.

Imaging:

Upright chest x-ray film may be enough to diagnose pneumoperitoneum. Chest x-ray can show air under diaphragm, or abdominal radiograph can show air in the superior portion. Plain x-ray imaging is quick, simple, low cost, non-invasive and efficient tool of investigation in the emergency department (source 1).

CT is more sensitive than radiograph in terms of diagnosis pneumoperitoneum. CT shows the presence of air and fluids, identify area of perforation, assess the wall thickening, mucosal integrity, and view fat stranding, pneumatosis intestinalis, gas in portal venous system (source 1).

Management:

The cause of pneumoperitoneum and signs of peritonitis (e.g. rebound tenderness or guarding on abdominal physical exam) requires prompt surgical intervention for washout of the abdominal cavity of possible enteric/gastric content that can irritate and infect various organs located with the abdomen leading to end organ failure or sepsis. If pneumoperitoneum is found on imaging but there are no signs of peritonitis on physical exam than conservative treatment modalities can be considered for management (source 1).

Surgical treatment:

Exploratory laparotomy, abdominal washout of enteric contents, wound vacuum placement, and abdominal closure.

Conclusions:

Pneumoperitoneum can be lethal depending on how much free air is present within the abdominal cavity. Here we described an 80-year-old female who presented with altered mental status and unstable vital signs after several days of right-sided abdominal pain that showed free air under the diaphragm. It is crucial to diagnose pneumoperitoneum promptly in order to quickly mobilize the OR for exploratory laparotomy.