

Spontaneous pneumoperitoneum as an uncommon presentation of COVID-19 pneumonia. A case report.

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Case Report

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BACKGROUND. Pneumoperitoneum is described as the presence of free air in the abdominal cavity. It's a common entity, which leads to numerous emergency surgical interventions; most of which are justified, while others may be unnecessary. We report a case of a 59-year-old man, with no pathological history, admitted under the diagnosis of SARS-CoV-2 pneumonia, requiring invasive mechanical ventilation, who presented pneumoperitoneum and intestinal pneumatosis. A diagnostic laparoscopy was performed, with no intraoperative findings that could explained it. He had a satisfactory evolution after surgery. The thoracic origin of pneumoperitoneum is mainly related to invasive mechanical ventilation; therefore, during the new pandemic of COVID-19, this radiological finding could appear in patients with positive-pressure ventilation management. When having a patient with SARS-CoV-2, the decision of perform a surgical procedure should be carefully considered. Consequently, surgeons should choose carefully those emergency procedures who need surgical intervention in association with this pathology.

KEY WORDS: COVID-19, SARS-CoV-2, pneumoperitoneum

Introduction

Pneumoperitoneum is described as the presence of free air in the abdominal cavity. It's a common entity, which leads to numerous emergency surgical interventions; most of which are justified, while others may be unnecessary. Perforated hollow viscus account for 90% of all cases of pneumoperitoneum; however, 10% may be spontaneous or idiopathic, representing a diagnostic challenge and turning it into a condition that may be managed in a conservative way in order to decrease iatrogenic practices (1).

Some cases of pneumoperitoneum, as well as intestinal pneumatosis, had been described in patients suffering from COVID-19, without evidence of perforated hollow viscus (2). The leading causes of pneumoperitoneum are abdominal, whereas thoracic causes come in second place, including barotrauma due to invasive mechanical ventilation (1).

We report a case of a 59-year-old man, with no pathological history, admitted under the diagnosis of SARS-CoV-2 pneumonia, requiring invasive mechanical ventilation, who presented pneumoperitoneum and intestinal pneumatosis. A diagnostic laparoscopy was performed, with no

intraoperative findings that could explained it. He had a satisfactory evolution after surgery.

Case report

A 59-year-old male with a history of gastroesophageal reflux disease diagnosed in 2015, untreated. Eleven days prior to his hospital admission, he referred positive screening test for SARS-CoV2; four days later, asthenia, adynamia, non-productive coughing spells, non cyanotizing, were added. He consulted a physician who prescribed "Oseltamivir, Ribavirin, Methylprednisolone" and supplemental oxygen at 2 liters/minute without improvement. Later on, he attended the emergency department with blood pressure: 100/60 mmHg, heart rate 134 bpm, respiratory rate 28 rpm, temperature 38 °C, oxygen saturation: 89%, Glasgow Coma Scale/Score 15 points, on chest examination: decreased thoracic wall movements, decreased vesicular breath sounds, bilateral basal crackles; paraclinical tests were performed showing high white blood cells count (18.2x10³/ul), neutrophils 16. 9x10³/ul, sodium 134 mEq/L, LDH 996 IU/L, CRP 28.4 mg/dl, ferritin 1150.4 ng/ml, chest CT scan with evidence of findings

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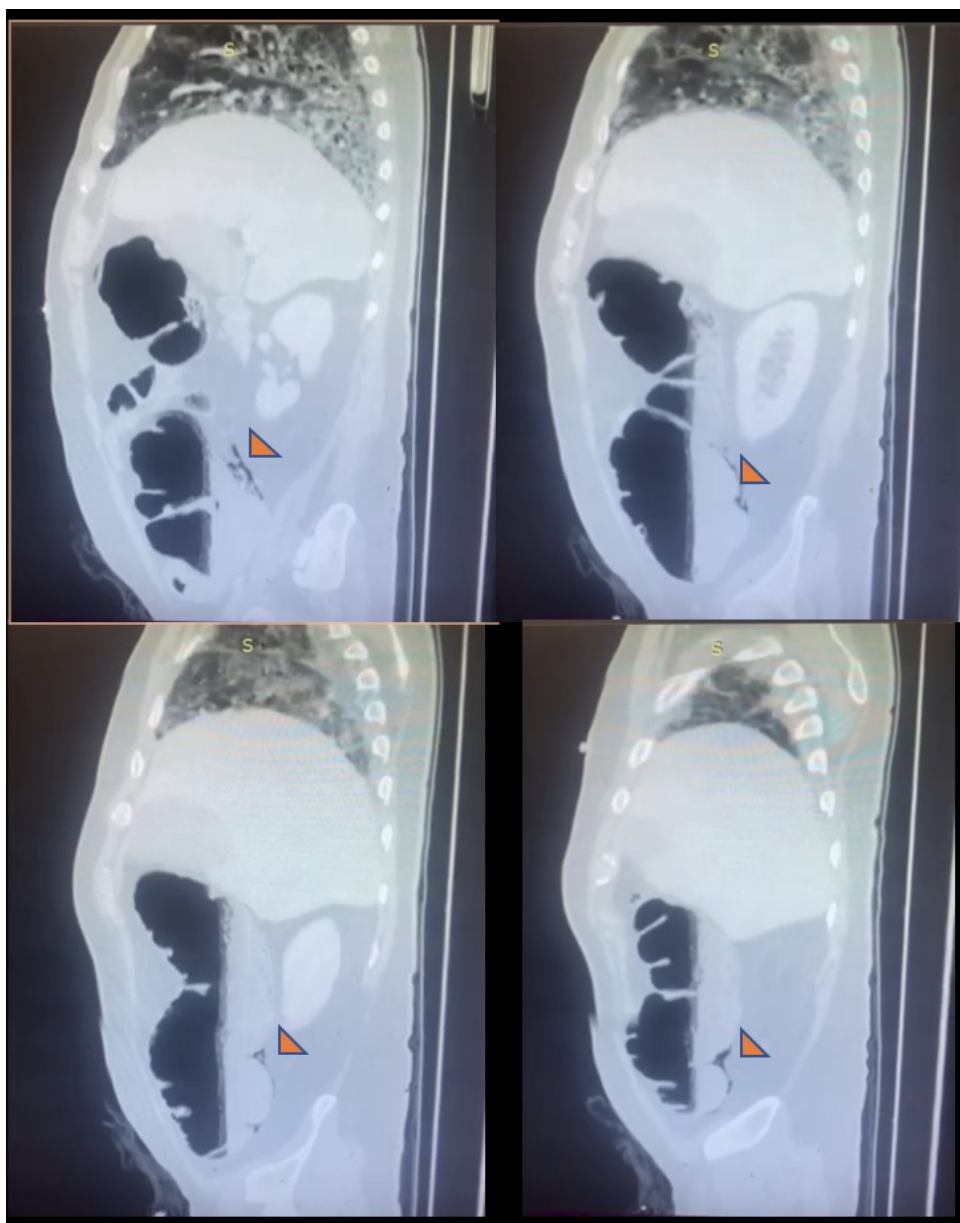


Figure 1. Continuous sagittal planes showing dilated ascending colon. The arrows point to air corpuscles adjacent to its wall.

associated with COVID 19 pneumonia, multiple areas of ground-glass opacities, which led to a diagnosis of Severe Acute Respiratory [EB1] Distress Syndrome, atypical pneumonia due to SARS-Cov2, hydroelectrolytic disorders and acid-base imbalance. He was admitted to the shock area as priority I, sedation, aminergic support, and advanced airway management were started. Four days after admission, *Klebsiella pneumoniae* producing ESBLs (Extended-spectrum β -lactamases) was isolated in bronchial secretions, therefore, management with Carbapenems was initiated. Seven days after admission the inflammatory response increased, so a new bronchial secretion culture and blood culture were performed and empirical treatment with ceftazidime 2 g IV every 8 hours was started due to suspicion of Ventilator-associated pneumonia. Three days later, negative culture results were obtained and empirical treatment continued. Three weeks after admission he developed

abdominal bloating and increased intra-abdominal pressure, biochemical parameters persisted with an inflammatory response (white blood cell count 16.6 103/l and neutrophilia 78.4%, CRP 19.524 mg/dl) along with lipase elevation twice its baseline level, therefore, the general surgery department was consulted. Physical examination showed decreased peristalsis and abdominal distension, pain no assessable due to neurological status of the patient. Abdominal computed tomography is performed, showing large intestine with up to 8.5 cm of dilatation. CT scan of ascending colon reveals air corpuscles adjacent to the bowel's wall along with intestinal pneumatosis in the ascending colon. We concluded intestinal pneumatosis and free air within the peritoneal cavity due to perforation of the hollow viscera (fig. 1); therefore the patient was sent to the operating room where a diagnostic laparoscopy was performed with the following intraoperative findings:

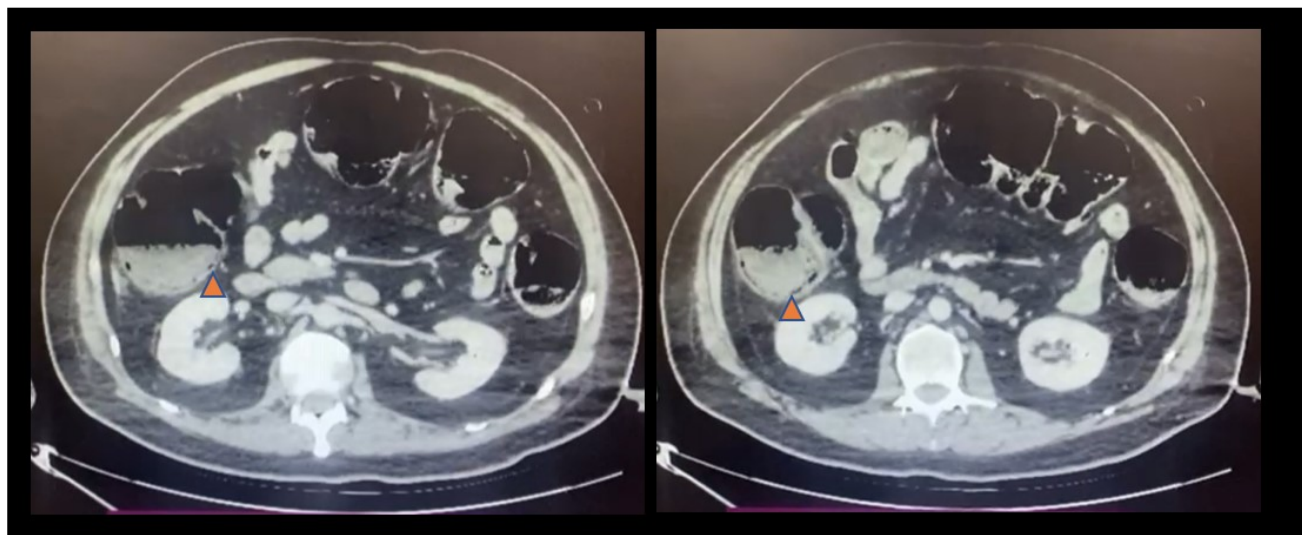


Figure 2. Axial plane. Study concludes findings suggestive intestinal pneumatosis and free air within the peritoneal cavity, probably due to perforation of hollow viscus.

no presence of fluid or pus in abdominal cavity, strong adhesions between omentum and abdominal wall in right flank; appendix, cecum, ascending, transverse, descending colon without alterations, dilated sigmoid colon without macroscopic findings, no changes in liver's morphology and color, gallbladder without signs of acute inflammation with firm adherence of omentum to its anterior face, collapsed stomach without alterations, small bowel loops intact, digital rectal examination with abundant fecal matter. Subsequently presents adequate postoperative evolution with enteral tolerance and remains under surveillance. However, the patient suffered multiple hospital-acquired infections, keeping an unsteady evolution during a long period of time. Two weeks after the surgical procedure he showed progressive clinical improvement, ventilatory and aminergic support was stopped, he received rehabilitation therapy and was discharged after 5 months of hospitalization. Currently in outpatient follow-up.

Discussion

Spontaneous pneumoperitoneum may have a thoracic, abdominal, gynecological or iatrogenic origin (3). It is essential to emphasize that thoracic causes are the second most common, just behind abdominal causes (for example due to cystic intestinal pneumatosis and endoscopic procedures) (1). The thoracic origin of pneumoperitoneum is mainly related to invasive mechanical ventilation; however, due to the new pandemic of COVID-19, this radiological finding could appear in patients with positive-pressure ventilation management. In addition, many physicians with little experience in the management of mechanical ventilation devices are currently treating these patients (4-5). The theory behind this pathology

is the rupture of subcortical and perivascular alveoli, with air crossing into the abdominal cavity through trans-mediastinal or transdiaphragmatic routes (3,6), two different pathways for the entry of air from the thoracic cavity. For the first, classically described, air flows into the mediastinum through the perivascular connective tissue to the retroperitoneum and finally to the peritoneum; on the second pathway air passes through pleural and diaphragmatic defects (7), this applies to our patient where no evidence of pneumomediastinum was found at the time of diagnosis.

Nevertheless, air leakage in COVID-19 can develop spontaneously, i.e., without positive pressure ventilation, high transpulmonary pressures or other risk factors such as previous respiratory disease or smoking (8).

On the other hand, in the scenario of a patient without abdominal manifestations and without inflammatory response, non-surgical causes of pneumoperitoneum should be considered (3,4). However, this becomes complicated when facing an intubated patient with an inflammatory response secondary to this viral infection (COVID-19). Thus, the diagnosis of spontaneous non-surgical pneumoperitoneum is very controversial and presents a dilemma for the surgeon, mainly when the abdominal symptoms are doubtful or the patient is sedated. Performing the proper diagnosis requires an accurate clinical, radiological and analytical assessment (1,9). Therefore, CT scan with oral and rectal contrast is highly recommended to complement the evaluation. In case of incongruence between these three entities previously mentioned, it is recommended to perform an exploratory laparotomy (1,9,10) such as the case presented.

In patients with COVID-19, there's an 18% prevalence of gastrointestinal symptoms including nausea, vomiting, diarrhea and abdominal pain; 16% of patients may only present these kind of symptoms. Till the date, there have been some studies reported on the literature regarding abdominal findings in these patients, such as thickening of abdominal wall, pneumoperitoneum, intestinal pneumatosis, intussusception, and ascites. All of these findings can be explained because of the endothelial and mucosal damage that COVID causes due to the abundant expression of angiotensin-converting *enzyme 2* (ACE-2) receptors for SARS-CoV-2 in the intestinal walls (11, 12).

In the setting of a SARS-CoV-2 patient, the decision of whether to perform a surgical procedure should be carefully considered. Recently Lei et al.(13) reported that scheduled surgery in COVID-19 positive patients significantly increased symptomatology exacerbation, resulting in increased morbidity and mortality, which can reach 20.5%.

Due to the fact that patients with COVID-19 infection may require prolonged periods of invasive mechanical ventilation under high pressure, this will be a common scenario that we may encounter more frequently in the coming months.

Conclusion

The specific reaction to SARS-CoV-2 infection is not yet fully understood and there is not enough information about this patients' reaction to surgical intervention. Therefore, surgeons should choose carefully those emergency procedures who need surgical intervention in association with this pathology.

During the COVID-19 pandemic, other similar cases could appear due to the increase in infections in our country, related to severe disease which requires invasive mechanical ventilation. We aim to warn surgeons of this.

Conflicts of interests

There was no conflict of interest during the study, and it was not funded by any organization

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