

CASE REPORT 3

Spontaneous pneumoperitoneum in an older adult with uncomplicated COVID-19: A case report

SILVA FHDS^{1,2} , KIRUSHANTH C²

¹Department of Medicine, Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka

²University Medical Unit, Colombo South Teaching Hospital, Sri Lanka

Address correspondence to: FHDS Silva

Email: dshehans@sjp.ac.lk

ORCID: <https://orcid.org/0000-0002-7348-4830>

Abstract

Pneumoperitoneum typically signifies gastrointestinal perforation and warrants urgent surgical intervention. However, spontaneous pneumoperitoneum (free intraperitoneal air without a clear cause) is an uncommon clinical entity. In the context of COVID-19, pneumoperitoneum is most frequently reported among patients receiving mechanical ventilation, typically due to barotrauma. Pneumoperitoneum in nonventilated, clinically stable patients is exceedingly rare.

We report a case of a 75-year-old man with well-controlled diabetes mellitus who presented with mild COVID-19 symptoms, managed as an outpatient. He later developed acute abdominal distension and pain. Clinical evaluation revealed mild diffuse tenderness without peritonitis. An erect abdominal X-ray demonstrated free subdiaphragmatic air consistent with pneumoperitoneum, but no signs of bowel obstruction, such as multiple air-fluid levels or significant bowel dilatation. Conservative management was initiated in the absence of peritoneal signs or hemodynamic instability. The patient remained stable, and symptoms resolved without surgical intervention. Follow-up imaging and endoscopic evaluation revealed no abnormalities.

This case highlights a rare presentation of spontaneous pneumoperitoneum in a non-intubated, oxygen-independent patient with COVID-19. Proposed mechanisms include viral-induced mucosal disruption, microthrombi-related ischaemia, and air translocation across fascial planes. The absence of obstructive radiographic features supported conservative management. Plain radiography played a central role in diagnosis and monitoring. Spontaneous pneumoperitoneum may occur in patients with mild COVID-19 without barotrauma or perforation. In the absence of clinical deterioration or obstructive features, conservative management guided by imaging is a safe and effective approach. Awareness of this entity is crucial to avoid unnecessary surgical interventions.

Keywords: COVID-19, pneumoperitoneum, spontaneous pneumoperitoneum

Introduction

COVID-19 infection caused by the SARS-CoV-2 pathogen is widely recognised to affect the respiratory system. However, extrapulmonary complications have been reported, such as thrombotic, cardiac, neurological and gastrointestinal manifestations. Widely known

gastrointestinal involvement may result in nausea, vomiting, diarrhoea, and even vague or generalised abdominal pain. This is generally explained by the viral entry via angiotensin-converting enzyme 2 (ACE2) receptors in the gastrointestinal system [1]. Going beyond these symptoms, serious complications such as gastrointestinal bleeding, colitis, bowel ischaemia, and, more rarely, pneumatosis

intestinalis and pneumoperitoneum have been described.

The presence of free air in the peritoneum is termed pneumoperitoneum, usually a manifestation of visceral perforation. However, a rare presentation of pneumoperitoneum may occur without any identifiable perforation, termed spontaneous pneumoperitoneum [2]. This has been associated with COVID-19 infection, particularly among individuals receiving mechanical ventilation or supplemental oxygen, and is explained of barotrauma [3].

This case reports a rare presentation of pneumoperitoneum in an older adult with mild COVID-19 infection, who did not require intubation or supplemental oxygen, highlighting the importance of considering COVID-19 in the absence of clinical severity or complications.

Case presentation

A 75-year-old man with well-controlled diabetes mellitus for 10 years presented with a fever of 2 days duration with rhinorrhoea and sneezing. He had a loss of taste and smell of 3 days duration, for which he had done a COVID-19 rapid antigen test, which yielded positivity. He had no shortness of breath, cough, or chest pain. There were generalised malaise and myalgia. Due to the absence of significant respiratory symptoms, he was managed symptomatically with paracetamol and antihistamines as outpatient care. Two days later, he presented with severe worsening abdominal distention and pain of 2 hours duration. Although he had not passed stools for two days, he did not have vomiting. The fever had resolved by then. The abdomen was diffusely tender, with no rebound tenderness, guarding, or free fluid, although bowel sounds

were diminished. The patient had not undergone any intrabdominal surgery or less invasive procedures and had not had blunt trauma. He was afebrile on presentation and with a blood pressure of 110/80 mmHg and a pulse rate of 90/min. The respiratory examination was normal with a pulse oximetry of 97%.

A chest X-ray and an erect abdomen X-ray were performed, which demonstrated free intraperitoneal air beneath the right hemidiaphragm consistent with pneumoperitoneum. Although there were no signs of bowel obstruction, such as multiple air-fluid levels, there was evidence of a moderate degree of small bowel distention. There was no evidence of pulmonary involvement due to COVID-19 infection. The blood investigations were unremarkable (Table 1). No metabolic factors were identified that would have contributed to bowel motility abnormalities. A surgical consultation advised conservative management in the absence of peritonitis or complete ileus. The patient was closely monitored with abdominal girth measurement and for clinical signs of peritonitis or perforation.

He was kept nil per oral initially for the 1st 24 hours and was administered intravenous pantoprazole 40 mg bd and intravenous metoclopramide 10 mg bd. The distention gradually resolved, and the patient remained clinically stable. A liquid-based diet was followed by a soft-consistency diet on days 2 and 3, respectively. On day 3, he opened bowels with stools of normal appearance and consistency. The patient did not require any cardiopulmonary support, including any supplemental oxygen. He was discharged from care on day 4. Contrast CT of the abdomen and pelvis performed one week later was reported as normal. He underwent upper gastrointestinal endoscopy and colonoscopy at 1-month intervals; both were unremarkable.

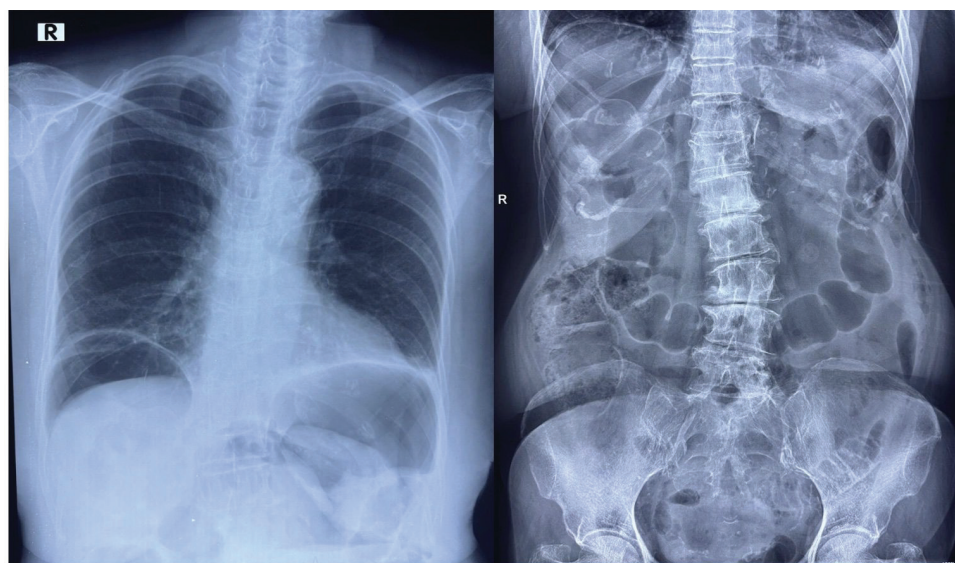


Figure 1. The chest X-ray postero-anterior view and the abdomen X-ray erect demonstrate air under the diaphragm consistent with pneumoperitoneum and moderately dilated loops of bowel without evidence of obstruction.

Table 1. Investigations of the patient

	Patient's values	Normal Values
White blood cells	7 x 10 ⁹ /l (Neutrophils 68%, Lymphocytes 32%)	4 – 10 x 10 ⁹ /l
Haemoglobin	12.2 g/dl	12-16 g/dl
Platelets	265 x 10 ⁹ /l	150 – 450 x 10 ⁹ /l
C-Reactive Protein	8 mg/l	<6
Erythrocyte sedimentation rate	49 mm 1st hour	
Glycosylated haemoglobin (HbA1c)	7.2%	<6.5%
Serum creatinine	1.1 mg/dl	0.7 – 1.3 mg/dl
Serum sodium	138 mmol/dl	135-145 mmol/dl
Serum potassium	3.8 mmol/dl	3.5-4.5 mmol/dl
Serum ionised calcium	4.8 mg/dl	4.5-5.3 mg/dl
Serum magnesium	1.9 mg/dl	1.7-2.2 mg/dl
Thyroid-stimulating hormone	2.7 mIU/l	0.5-4.5 mIU/l
Aspartate aminotransferase (AST)	15.1 U/l	<50
Alanine aminotransferase (ALT)	11.7 U/l	<50
COVID Rapid Antigen test	Positive	
COVID RT PCR Ct Value	22	<25 indicates a high viral load

COVID RT PCR Ct Value – COVID reverse transcriptase polymerase chain reaction cycle threshold value

Discussion

This case reports a rare and intriguing occurrence of pneumoperitoneum in a 75-year-old man with uncomplicated COVID-19 infection who did not require supplemental oxygen or intubation. Pneumoperitoneum is generally considered an emergency condition, often resulting from perforation of a hollow viscus. Examples include peptic ulcer disease, intestinal obstruction, bowel ischaemia or even blunt trauma [4]. A smaller subset, termed spontaneous or non-surgical pneumoperitoneum, is described that can occur in the absence of perforation. These include peritoneal dialysis, post-endoscopic procedures, pneumatosis cystoides intestinalis, coitus, vaginal douching and hysterosalpingography. Other rare causes include emphysematous infections, scuba diving and gas-forming peritonitis [5].

A phenomenon known as the Macklin effect describes the passage of air into the mediastinum, retroperitoneum, and peritoneal cavity via alveolar rupture and air dissection along vascular sheaths, driven by high airway pressures and positive end-expiratory pressure (PEEP). This is observed in ventilated patients, in barotrauma (in obstructive airway disease), and during cardiopulmonary resuscitation. COVID-19 is associated with pneumoperitoneum in those managed with mechanical ventilation [6,7]. However, this patient was neither intubated nor on non-invasive ventilation, and his oxygen saturation remained stable on

room air throughout hospitalisation. This effectively rules out barotrauma as a causative factor.

Another plausible mechanism for this occurrence is COVID-19-induced gastrointestinal tract injury. The SARS-CoV-2 virus is shown to infect through ACE2 receptors that are found in abundance in the gastrointestinal tract, especially in enterocytes of the ileum and colon [1,8]. Post-viral invasion may lead to disruption of mucosal injury, resulting in ulceration or even micro-perforation. While gross perforation may lead to peritonitis, these localised breaches or increased permeability of the mucosa may give opportunity for air to translocate to the peritoneum without obvious evidence of rupture, an inflammatory response or even sepsis.

Mesenteric ischaemia or microthrombi formation are increasingly recognised in the spectrum of COVID19-related hypercoagulability. Case reports and autopsy series have described mesenteric vascular thrombosis in patients with COVID-19 without obvious classical risk factors. This patient did not demonstrate any radiological or clinical signs of mesenteric ischaemia. However, the occurrence of a transient ischaemia or microvascular thrombotic event leading to mucosal damage and air leakage cannot be excluded [9].

Transdiaphragmatic air migration is another hypothetical process seen in those with concomitant pneumothorax and pneumomediastinum. Although no such findings were evident in the imaging, subclinical alveolar rupture and air

tracking along fascial planes to the peritoneum have been hypothesised in similar cases. Age-related changes that contribute to diaphragmatic and fascial plane integrity in older adults may also underlie atypical air migration [5].

Our patient's presentation is notable for the absence of typical precipitants of non-surgical pneumoperitoneum, such as a recent surgical procedure, endoscopic intervention, or peritoneal dialysis. He remained stable clinically without the development of sepsis or bowel obstruction. The plain radiography excluded the presence of air fluid interfaces suggestive of mechanical small bowel obstruction. Furthermore, there was the presence of gas throughout the colon and rectum, indicative of bowel patency. There was no gross bowel dilation evidenced by haustral preservation and patterns such as the step-ladder sign and stack of coin appearance. This supported the decision to manage the patient conservatively. Expectant management or non-operative treatment of pneumoperitoneum has been a safe approach in carefully selected patients [10].

The broader clinical implication of this case is to raise clinicians' awareness of atypical gastrointestinal manifestations of COVID-19, particularly in older adults. The index of suspicion for non-surgical pneumoperitoneum should be considered when COVID-19 patients present with abdominal symptoms, but without peritoneal signs or hemodynamic instability. As unnecessary surgical interventions in the context of viral infection may increase morbidity and resource burden, a conservative approach, supported by appropriate imaging and close observation, can be both safe and effective. Spontaneous pneumoperitoneum is particularly relevant in older adults due to age-related physiological changes, blunted peritoneal responses, and multiple comorbidities that mask symptoms and increase procedural or ischemic risk. Weakened diaphragmatic and fascial integrity may facilitate air migration without perforation. Recognising this benign variant is vital, as unnecessary surgery in older adults carries high morbidity; thus, conservative management guided by imaging is often the safer approach [4,11].

From a pathophysiological perspective, this case contributes to the growing understanding of the systemic nature of COVID-19. Although initially considered a respiratory illness primarily, COVID-19 has demonstrated the capacity to affect virtually all organ systems, including the gastrointestinal tract. The role of ACE2 expression in mediating both viral entry and downstream inflammation and tissue damage offer a plausible mechanistic link between COVID-19 and gastrointestinal complications, including rare phenomena such as pneumoperitoneum [12,13].

This case report adds to the limited but growing body of literature documenting spontaneous pneumoperitoneum in non-intubated, non-critically ill COVID-19 patients [2]. It emphasises the need for a nuanced approach to abdominal

findings in COVID-19 and supports the evolving clinical paradigm that not all cases of pneumoperitoneum are surgical emergencies. Further research and accumulation of case reports may help delineate specific risk factors, pathophysiologic mechanisms, and optimal management strategies for such presentations.

Conclusion

This case report highlights the occurrence of spontaneous pneumoperitoneum in the absence of mechanical ventilation or intestinal perforation as a rare manifestation in COVID-19 patients. Furthermore, it underscores the diagnostic value of erect abdominal radiography and also emphasises that all cases of free intraperitoneal air warrant surgical exploration. Awareness of this entity is essential to prevent misdiagnosis and avoid unwarranted surgical procedures. Conservative management may be appropriate in selected cases with close monitoring and supportive care.

Conflicts of interest: The authors declare that there are no conflicts of interest

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Spontaneous pneumoperitoneum in an older adult with uncomplicated COVID-19

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