

Pneumoperitoneum is not Always an Indication for Laparotomy: Reporting A Case and Review of the Literature

Mahim Koshariya, Amey Jain*, Vijay Tekam, Arshad Khan, Nikhil Tekwani and Sharath AP

Department of General Surgery, Gandhi Medical College and Hamidia Hospital Bhopal, India

***Corresponding Author:** Amey Jain, Department of General Surgery, Gandhi Medical College and Hamidia Hospital Bhopal, India.

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Abstract

Non Surgical Pneumoperitoneum is defined by the presence of free air in the peritoneal cavity that can be detected by an X-ray. Such patients can be managed successfully by observation and supportive care alone or may be subjected to a laparotomy which usually turns out to be nondiagnostic [1].

Keywords: Pneumoperitoneum; Laparotomy; Peritoneal Cavity

Introduction

Pneumoperitoneum in almost more than 90% cases results from perforation of any organ in the gastrointestinal tract [1]. Perforation of the stomach or duodenum caused by peptic ulcer is considered amongst the most frequent causes of presence of free air in the peritoneal cavity. In such scenarios, the clinical features of peritoneal irritation i.e. Peritonitis, are almost always seen and they usually need prompt surgical intervention. However, rarely, Pneumoperitoneum can follow conditions other than perforation of any hollow viscus organ and patients may not require any surgical intervention in emergency; this is termed as "Non-Surgical" Pneumoperitoneum. This condition poses a dilemma to the operating surgeon in terms of providing appropriate and adequate treatment to the patient.

Case Report

A 50 year old Indian man presented to the emergency department of Gandhi Medical College and Hamidia Hospital, Bhopal with acute onset abdominal pain for the past 3 days. There was no history of fever, chills, nausea, vomiting or abdominal distention. His medical history was unremarkable and there was no history of any chronic medical illnesses, any prior surgeries, or any thoraco-abdominal trauma or any event requiring mechanical ventilation. The patient did not take any medications, and was not a smoker or an alcohol consumer. On examination, the patient had a blood pressure of 114/76 mmHg, a pulse rate of 90/min, a respiratory rate of 20 breaths/min and his temperature was 38.3°C. The per-abdominal findings were

absolutely unremarkable with no tenderness, guarding or rigidity and bowel sounds were present, thus no signs of peritonitis were evident on physical examination. The per rectal examination was also found to be within normal limits.

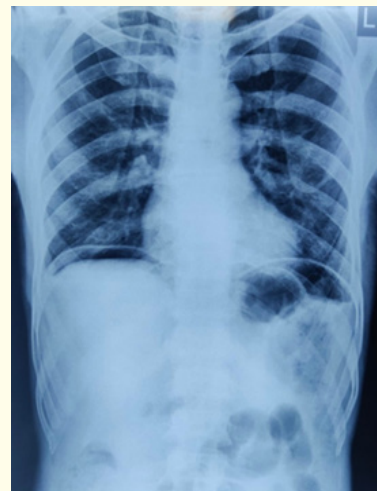


Figure 1: Upright posteroanterior chest radiograph with free subdiaphragmatic air.

The laboratory investigations revealed a complete hemogram within normal limits with a total leucocyte count of 5,950 cells/mm³. C reactive Protein levels were found to be raised - 70.41.

Radiograph of the chest revealed free intraperitoneal air below diaphragm bilaterally i.e. Pneumoperitoneum.

The Computed Tomography scan was performed, which confirmed the presence of Pneumoperitoneum but failed to reveal the

cause of Pneumoperitoneum. Other findings revealed in the CT scan included presence of minimal fluid in the peritoneal and pelvic cavity, fecal loaded prominent large bowel loops with mottled air and mild hepatomegaly.

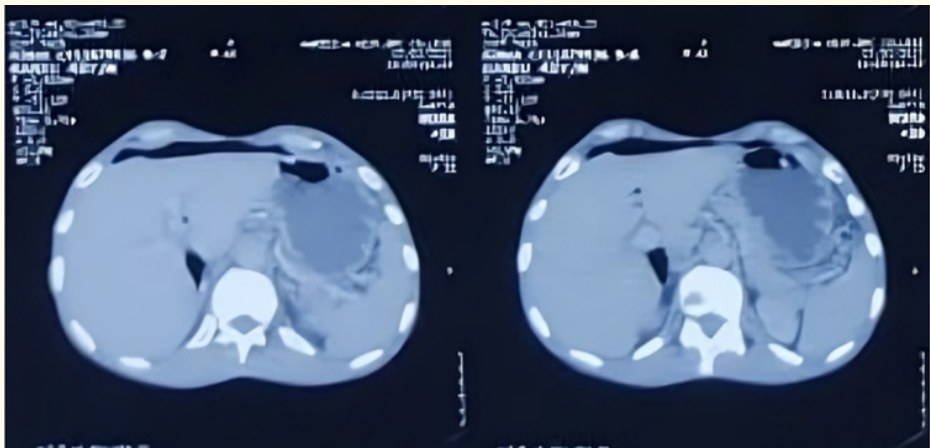


Figure 2: Computed Tomography scan of the abdomen confirming the presence of Pneumoperitoneum.

Patient was managed conservatively and over the next few days a remarkable improvement was noticed in the patient’s condition, and the patient was discharged with stable vitals on 5th post-admission day, although the cause of pneumoperitoneum remained obscure.

Discussion

It was Hugo Popper in 1915 who first demonstrated Pneumoperitoneum radiologically. This finding is generally seen in patients with perforation of a hollow viscus in almost 90% of the cases [1]. However in 10% cases, this radiological finding showing presence of free air in the peritoneal cavity may result from other sources not requiring any emergency surgical intervention [2]. This condition of finding pneumoperitoneum on a radiograph but not requiring any surgical exploration has been termed differently in the past like Nonsurgical/ Spontaneous/Idiopathic/Spontaneous asymptomatic/Misleading Pneumoperitoneum [3].

Pseudopneumoperitoneum, first described in 1930s is the simulated radiological appearance of free intraperitoneal air [4,5]. It’s causes include adventitial air shadow, over distention of any hollow visceral organ, undulant configuration of the diaphragm causing basal lung to appear to lie in the diaphragm, wounds with trapped air, atelectasis of the basal lobes of the lungs, Chilaiditi syndrome [6]. Important distinguishing features that aid in the differentiation between pseudopneumoperitoneum and true free air are failure of the radiolucency to shift when radiograph is taken in different positions [6].

The unusual causes of Pneumoperitoneum can be classified based on the source of the air; intra-abdominal, thoracic, gynecological, iatrogenic, and miscellaneous [2].

Intra-abdominal etiologies of Nonsurgical Pneumoperitoneum include abdominal surgery, peritoneal dialysis, most endoscopic GI procedures. Pneumoperitoneum occurs post-operatively following open as well laparoscopic procedures, and a progressive resolution of free air is expected. Pneumoperitoneum usually resolves within 2 days in two thirds of the cases and within 5 days in 97% cases when assessed by serial abdominal radiographs [7]. Lean adults are more likely to retain a higher amount of free air and may have longer duration of pneumoperitoneum than overweight adults [8].

Most GI endoscopies have also been associated with the development of Nonsurgical pneumoperitoneum. Multiple mechanisms have been theorised for this. One of the theories suggests that air insufflation done during GI endoscopy leads to micro-perforation and dissection of air through the submucosal channels that eventually reach the peritoneal cavity. Another mechanism that has been theorised suggests that air can extravasate through thinned but intact, gut wall without any demonstrable or clinically significant perforation [1].

Pneumatosis cystoides intestinalis (PCI) represents another cause of Nonsurgical Pneumoperitoneum in the paediatric age group. It involves formation of multiple gas-filled cysts within the wall of the GI tract which can later perforate into the abdominal cavity [9]. Treatment with hyperbaric oxygen and antibiotics has demonstrated some efficacy, but conservative and watchful management is generally sufficient. Another uncommon cause of Non-surgical pneumoperitoneum includes postpolypectomy syndrome seen in transmural burns of the colon after polypectomy [10].

Rare abdominal etiologies leading to Nonsurgical Pneumoperitoneum include pneumocholecystitis without perforation of the gallbladder, malrotation, aerophagia and perforated liver abscess with gas forming bacteria [11].

Amongst the thoracic causes of Nonsurgical Pneumoperitoneum are, complications of mechanical ventilation, CPR and Pneumothorax. Adults who require prolonged mechanical ventilation are at a greater risk to develop nonsurgical pneumoperitoneum. The most common route of air entry into the peritoneum is tracking of air from the ruptured alveoli along the sheaths of adjacent vessels within the mediastinum and when the pressure increases, the air tracks along the mediastinal structures into the retroperitoneum and then into the peritoneal cavity [12]. Intermittent positive pressure ventilation leads to air being introduced into the peritoneal cavity directly through microscopic pleural and diaphragmatic defects. Other pulmonary diseases like pneumococcal pneumonia, tuberculosis, emphysema, and blunt trauma have all been implicated as causes of Nonsurgical Pneumoperitoneum.

Gynecological causes are rare in comparison to other etiologies. Mechanism includes upward passage of air (through the fallopian tubes) into the peritoneal cavity. Examples include vaginal insufflation by orogenital sex, vaginal douching, postpartum knee-chest exercises, Hysterosalpingography [13].

Very rarely pneumoperitoneum may occur in conditions like Cocaine use [14], scleroderma, diving with decompression [15].

Conclusion

In majority of the patients, the radiological finding of Pneumoperitoneum is indicative of a serious intra-abdominal pathology requiring urgent surgical exploration. Nonsurgical pneumoperitoneum does not require any surgical intervention and is very rare. But it is suggested that when abdominal pain and distention are minimal, and peritoneal signs, fever, and leucocytosis are absent, nonsurgical causes of pneumoperitoneum should be considered for subsequent conservative management. Thus, more knowledge of these unusual and uncommon causes of pneumoperitoneum can help to avoid unnecessary surgical stress and expense to the patient. Care must be taken while maintaining strict vigilance, especially in immunocompromised patients in whom the signs of peritonitis may be occult and the course may be rapid and grave.

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