



## Non-Surgical Pneumoperitoneum in Children

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### Abstract

*Pneumoperitoneum without intraabdominal hollow viscus perforation is termed as nonsurgical or spontaneous pneumoperitoneum, which does not demand surgical intervention. Because of rarity of this condition and symptomatic similarity with the pneumoperitoneum due to gut perforation, the condition diagnosed only after a negative laparotomy. Awareness of this entity, a detailed history and clinical evaluation is necessary to clear this diagnostic dilemma. The treatment of such cases solely depends on the primary causes of pneumoperitoneum. Here, we report two cases of pneumoperitoneum of different etiologies with a brief discussion of similar cases as reported in literature.*

*Keywords: Pneumomediastinum; Pneumatosis intestinalis; Spontaneous bacterial peritonitis; Ruptured hepatic abscess; Endoscopic procedure*

### Introduction

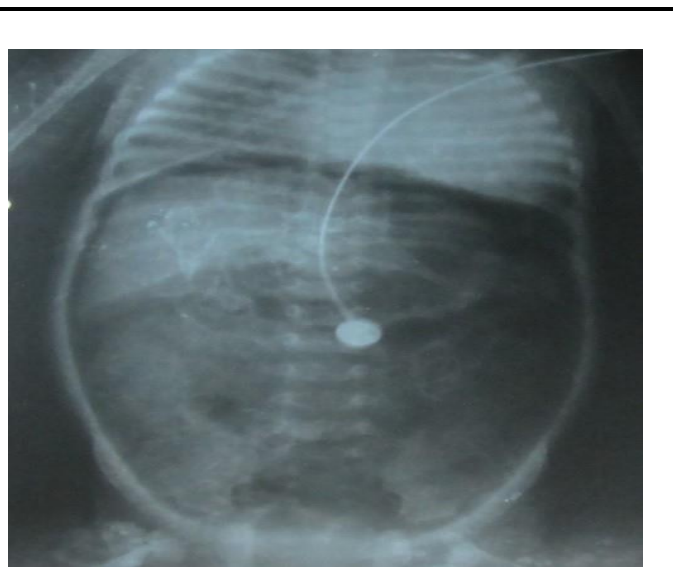
Usually, pneumoperitoneum (free gas under the diaphragm) occurs due to perforation of hollow viscus which required urgent surgical intervention. But, there are few conditions like; pneumomediastinum, pneumatosis intestinalis, spontaneous bacterial peritonitis, ruptured hepatic abscess, endoscopic procedure where pneumoperitoneum can be seen without any perforation of gut. These cases do not require surgical intervention and are termed as non-surgical pneumoperitoneum (NSP). These cases do not have the definitive signs of peritonitis and can be managed non-operatively. Timely diagnosis, close monitoring of the patient's vitals and treatment of the primary cause (whenever detected) are necessary in the management of such conditions with the potential avoidance of significant surgery associated with long term morbidity.

### Case history

#### Case 1

A four-month-old boy admitted with respiratory distress in the pediatric medicine department. His BP was 68/48 mm Hg. S1 and S2 were merged with a pansystolic murmur. 2-D echocardiography showed ventricular septal defect (VSD). Chest X-ray suggested pneumonitis for which the patient received treatment and responded well. But on 2<sup>nd</sup> day onwards, he developed acute abdominal distention and respiratory distress. An X-ray was done immediately which showed significant free gas under the diaphragm (Figure 1). On digital rectal examination, there was no evidence of bleeding or ballooning. Moreover, there were no definite signs of peritonitis. We tried to evaluate the condition again and again. A percutaneous aspiration suggested intraperitoneal free gas. As the repeat X-ray did not show resolution of free intraperitoneal gas, we performed emergency exploration. But, we did not find any evidence of hollow viscus perforation or sign of peritonitis. We closed the abdomen expediently and shifted our patient to PICU again for post-operative care. Instead of intensive postoperative care in PICU,

the patient developed a cardiac arrest on 3<sup>rd</sup> POD and cardiopulmonary resuscitation proved to be futile. In summary, the pneumoperitoneum was probably due to pneumomediastinum. And, the air entered the abdomen through any of the diaphragmatic rents.

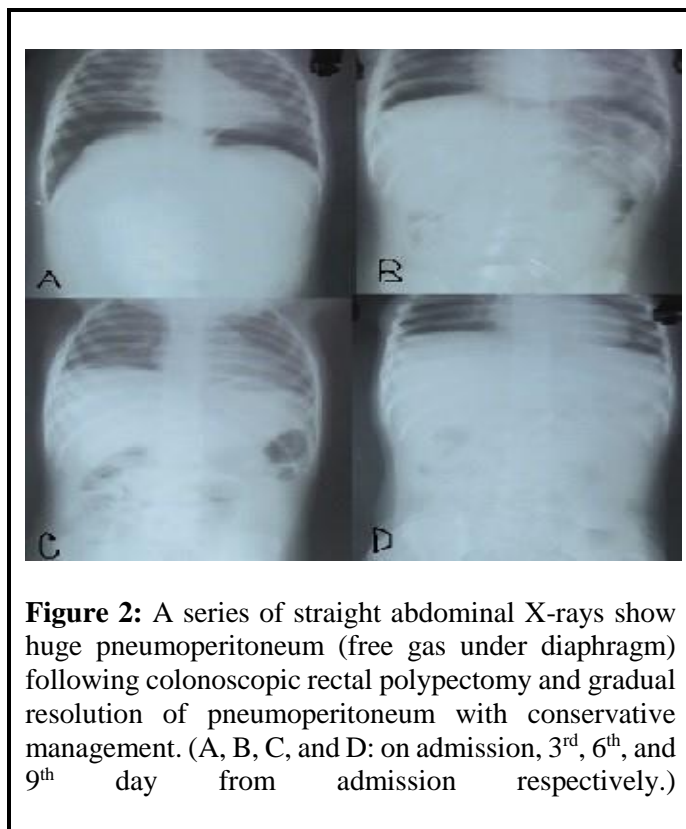


**Figure 1:** Straight X-ray abdomen and pelvis shows free gas under the diaphragm and huge pneumoperitoneum following an episode of pneumonitis in a known patient of congenital heart disease (VSD).

## Case 2

A 14-month-old baby girl presented to the pediatric surgery OPD with abdominal distention and vomiting. She had a history for colonoscopic resection of rectal polyp one day prior to her presentation. On examination, abdomen was distended but, pulses, BP were normal. Rectal examination revealed liquid stool. An X-ray abdomen showed free gas under the diaphragm. We admitted the patient for further evaluation and management. As the patient was not having any definite symptoms and signs of peritonitis, we deferred the surgery. Moreover, there were no definite features of sepsis secondary to intestinal perforation. We put the patient on NPO (nothing per mouth) and started intravenous fluid and antibiotic therapy. Repeat X-ray on next day showed a reduction of the pneumoperitoneum. We decided to continue the conservative treatment with alternate day X-ray and monitoring of patient's vitals. We could start oral feeding on 6<sup>th</sup> day and the patient tolerated well. Finally, on 9<sup>th</sup> day, X-ray showed complete resolution of free gas (Figure 2). Thus, we discharged the patient. In accordance to the history and investigation we

concluded that there was a small mucosal tear during colonoscopic intervention. However, with time the small leak had sealed off completely with complete bowel rest and IV antibiotic therapy. As highlighted in this case, a small iatrogenic perforation due to endoscopy could be managed conservatively if it is diagnosed early and before fulminant peritonitis develops.



**Figure 2:** A series of straight abdominal X-rays show huge pneumoperitoneum (free gas under diaphragm) following colonoscopic rectal polypectomy and gradual resolution of pneumoperitoneum with conservative management. (A, B, C, and D: on admission, 3<sup>rd</sup>, 6<sup>th</sup>, and 9<sup>th</sup> day from admission respectively.)

## Discussion

NSP is an uncommonly encountered entity, especially in the pediatric age group. It can develop from pneumomediastinum, pneumatosis intestinalis, spontaneous bacterial peritonitis, ruptured hepatic abscess, iatrogenic, endoscopic procedure and idiopathic. Idiopathic pneumoperitoneum is even more rare condition for which no clear etiology (perforation of an intraabdominal viscus and known causes of NSP) has been established [1]. Usually, NSP presents with abdominal distension and pain but, does not have any definite symptoms and signs of sepsis (fever, tachycardia, tachypnoea and leucocytosis). Thus, diagnostic dilemma is always there. Similar clinical findings may be present in small mucosal tear in the colon during endoscopic procedure (colonoscopic rectal polypectomy) [2]. Incidence of colonic perforation (CP) could be as low as 0.02% in diagnostic colonoscopy and could be as high as 0.6% in therapeutic colonoscopy.

Depending on patients' characteristics and comorbidities, it could be associated with a high rate of morbidity (40%) and mortality (14%). According to recent literature, patients with CP can be successfully managed by endoluminal repair and or laparoscopic repair [3]. We could manage one of such case in our institute by conservative management (complete bowel rest and intravenous antibiotics and close monitoring of patient's vitals). Probably there was a small mucosal tear in the colon which only permit to escape luminal air but not the intestinal content. Thus, there was no signs of peritonitis. To the best of our knowledge, there is no published literature about the non-operative management of CP.

NSP can be distinguished from surgical pneumoperitoneum in many ways. Firstly, presence of associated comorbid conditions which can create NSP. Secondly, the absence of definite signs and symptoms of peritonitis. Thirdly, a significant amount of free gas under the diaphragm. As in GI tract perforation, enteric contamination and peritonitis develop rapidly. Thus, only a small amount of air escapes the hollow viscus before the patient get thorough examination by the physician. Fourthly, a repeat X-ray after air insufflation of the stomach (via a nasogastric tube) will have no changes in free gas. In upper GI tract perforation, an enhancing X-ray will be seen after artificial pneumogastrogram. Lastly, a serial X-ray will show some changes in the form of resolution of pneumoperitoneum.

NSP poses significant management dilemmas for surgeons, especially when signs and symptoms of peritonitis are absent or when the cause is completely unknown before laparotomy [4]. In this situation, most important determinant of prognosis is taking the correct decision which is extremely challenging. However, abdominal CT is a more helpful in diagnosing the pneumoperitoneum and identifying the cause of "acute abdomen". Moreover, modern technology with multidetector CT is highly accurate for predicting the site of GI tract perforations [5]. Additionally, the general condition of the patient plays an important role to take the right decision. Once the patient starts to improve (clinically/ radiologically) with non-operative management by 48 hours, a surgeon should abandon the surgery [6]. In some cases, with idiopathic pneumoperitoneum a subclinical small visceral perforation may have occurred, permitting only the

leakage of air and not of bowel contents, exactly like CP after polypectomy. These cases can be successfully managed by non-operatively instead of minimal invasive repair of the perforation. Apart from close monitoring of the patient's vitals and serial X-rays, percutaneous drainage of pneumoperitoneum is needed sometimes for decompression [7].

### **Conclusion**

Children with NSP present as a diagnostic dilemma. Because of the rarity of this condition it can escape the eye of the clinician. Preoperative diagnosis can be made if the condition is kept in mind while treating any case of pneumoperitoneum.

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