# Case of the Month

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# *"Post-Operative Pneumoperitoneum: Perforated Viscus or Not?"*

## CASE PRESENTATION

A 36 years old lady, 40 days post uncomplicated laparoscopic appendectomy, presented to the Emergency Department, complaining of upper abdominal pain. The patient was doing well until 1 day prior to her presentation to the ED when she started experiencing upper abdominal pain. The pain was sudden in onset and continuous. It was of fluctuating intensity reaching from a pain score 5/10 to a maximum of 10/10. The pain was located along the upper abdomen in a band-like distribution involving the left and right hypochondriac regions, the epigastrium and it radiated to the left shoulder. She noticed that sleeping on her back increased her pain. Over-the-counter painkillers, such as acetaminophen, provided only minimal relief of the pain. Her pain was associated with mild dyspnea.

***Patient's vital signs on arrival***

**Temperature** 37 degree Celsius **Oxygen saturation:** 99% on room air

**Heart rate:** 88 beats per minute regular **Blood pressure:** 124/80

Inspection of the abdomen was significant for abdominal distention and three well healed scars at the sites of laparoscopic port insertion. On palpation, the abdomen was soft but tender in the left and right hypochondriacs, and epigastric regions. No rebound or guarding were appreciated. Digital rectal exam was unremarkable.

***Laboratory investigations***

**WBC:** 7.81x10^3/mcL (4-11 x10^3/ mcL) **Hemoglobin:** 9.70 g/dl (13-17 g/dl)

**Platelets:** 368.0 x10^3/mcL (150-450 x10^3/ mcL)

**B-hCG:** negative **ALT:** 20 IU/L (16-63 IU/L) **ALP:** 14 IU/L (46-116 IU/L)

**Amylase:** 26 IU/ L (25-115 IU/L) **CRP** 66.2 mmol/L (0 - 9 mmol/L)

Upright abdominal and chest x-rays revealed a small amount of free air under the right hemi-diaphragm ***(Figures 1 and 2)***. The patient was given 1 gram of IV acetaminophen, after which her pain improved but did not completely subside over her 3-hour course in the emergency department. Hence, she was offered a CT scan of her abdomen, which she refused and left against medical advice after agreeing to follow up over the phone.

## FOLLOW-UP

The patient was followed over the phone at 1, 7 and 21 days post-ED visit. On day 1, the patient reported mild improvement of pain. She suffered 4-5 episodes each lasting 2-3 hours and reaching an intensity of just 5/10. She was pain-free between the episodes. On day 7, the patient reported 4-5 episodes of pain over the preceding 7 days of less intensity. Day 21 after the visit, she had complete resolution of her pain. She reported being pain-free for almost a week.

## DISCUSSION

Pneumoperitoneum is defined as the presence of air within the peritoneal cavity. It appears as a radiolucency seen in the sub-diaphragmatic area on an upright chest x-ray. Causes of pneumoperitoneum have been divided into 2 major subgroups- Surgical (90%) and Non-surgical (10%).[1] In most instances, surgical pneumoperitoneum is a result of a perforated viscus which is considered life-threatening and necessitates urgent surgical management. Non-surgical pneumoperitoneum is self-limited and either resolves with conservative management only or results in non-diagnostic laparotomies. 10% of all cases of pneumoperitoneum are non-surgical- 25% of which are post-operative, whether laparoscopy or laparotomy.[1] Additional causes of non-surgical pneumoperitoneum are listed in ***Table 3***.

Intra-operative pneumoperitoneum is a desired outcome in all laparoscopic procedures to allow proper visualization of the peritoneal cavity. However, a well-established complication is the persistence of the pneumoperitoneum post-operatively, which can cause a surgical dilemma on whether the patient needs to be operated on or managed conservatively. Several case reports and studies have evaluated the etiological factors contributing to the persistence of post-operative pneumoperitoneum radiologically.[2-7]

Smith et al.[2] reported a case of post-laparoscopic pneumoperitoneum that lasted for 48 days- the longest time period to be reported in literature for a laparoscopic procedure. The patient was taken for an exploratory laparotomy that showed no significant findings. In another case report by Ceydeli et al.[3], a patient presented with persistence of delayed pneumoperitoneum 8 weeks following a laparotomy for a colectomy. The authors concluded that clinical correlation with the radiological findings is crucial when evaluating a non-surgical cause of pneumoperitoneum.

Chapman et al.[5] conducted a retrospective study to evaluate different factors affecting the persistence of post-operative pneumoperitoneum. They concluded that age, sex, and body habitus played no role on post-operative pneumoperitoneum, however the presence of drains increased the duration of persistent pneumoperitoneum. In agreement with Chapman, Gayer et al.[6] found that patient with drains had longer duration of persistent pneumoperitoneum. In addition, Gayer also found a correlation with sex and body habitus, but not age.

Hope et al.[4] found that 39% of patients evaluated with CT showed pneumoperitoneum post-operatively and, in 23% of the patients, persistent pneumoperitoneum lasted for as long as 3 weeks. Millitz et al.[7] conducted a prospective study of 55 patients who were followed after a laparoscopic cholecystectomy. The patients were evaluated at day 1, 2, 4, 7, and 14. Only 49% of the patients had pneumoperitoneum at day 1 and only one patient had persistent pneumoperitoneum 2 weeks post-operatively.

As observed in the previous papers, all cases were evaluated for the duration of pneumoperitoneum from a radiological perspective rather than with the clinical symptoms which is considered the cornerstone of medical practice. Our patient presented with signs and symptoms of peritoneal irritation. However, in correlation with the history provided by the patient, her examination and laboratory investigations, we decided to proceed with expectant management. The patient was followed based on the progression of her clinical symptoms, which showed gradual improvement over the course of 2 weeks with complete resolution on day 14.

## CONCLUSION

Clinical symptoms of post-operative pneumoperitoneum are short-lived and self-limited. Correlating the clinical presentation with the radiological findings is essential to identify non-surgical causes of pneumoperitoneum and avoid negative laparotomies. Clinical follow-up is an important aspect of the expectant management. More studies are needed to correlate the radiological findings with the clinical findings. A definite guideline regarding expectant management versus surgical intervention can be established based on this correlation

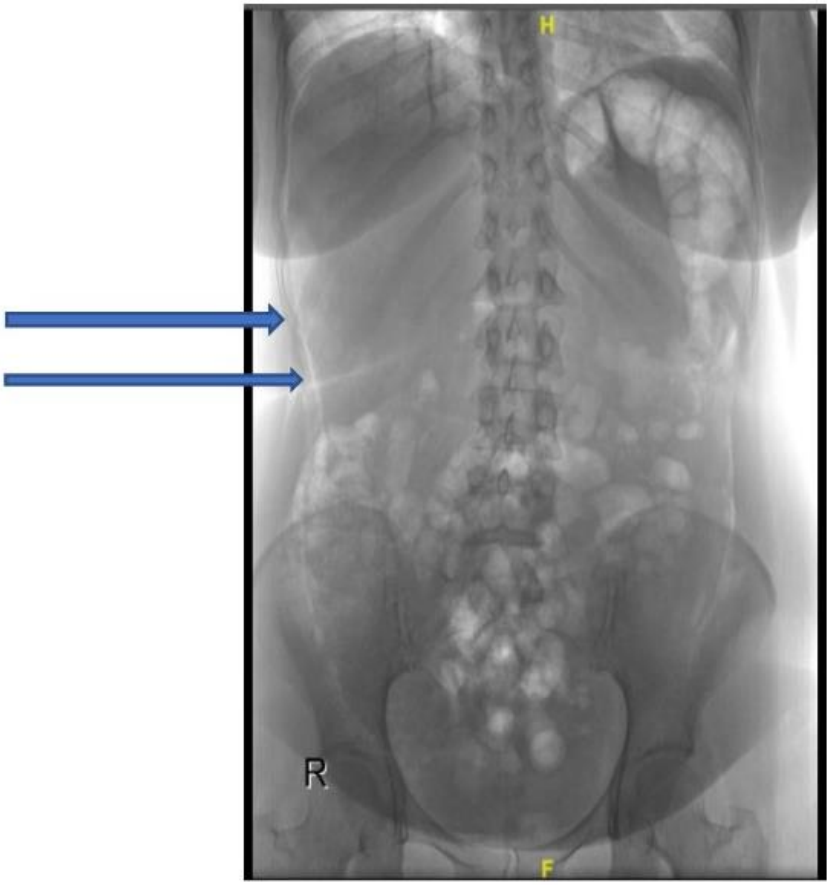


***Figure 1- abdominal xray- upright showing pneumoperitoneum as depicted by the blue arrows.***

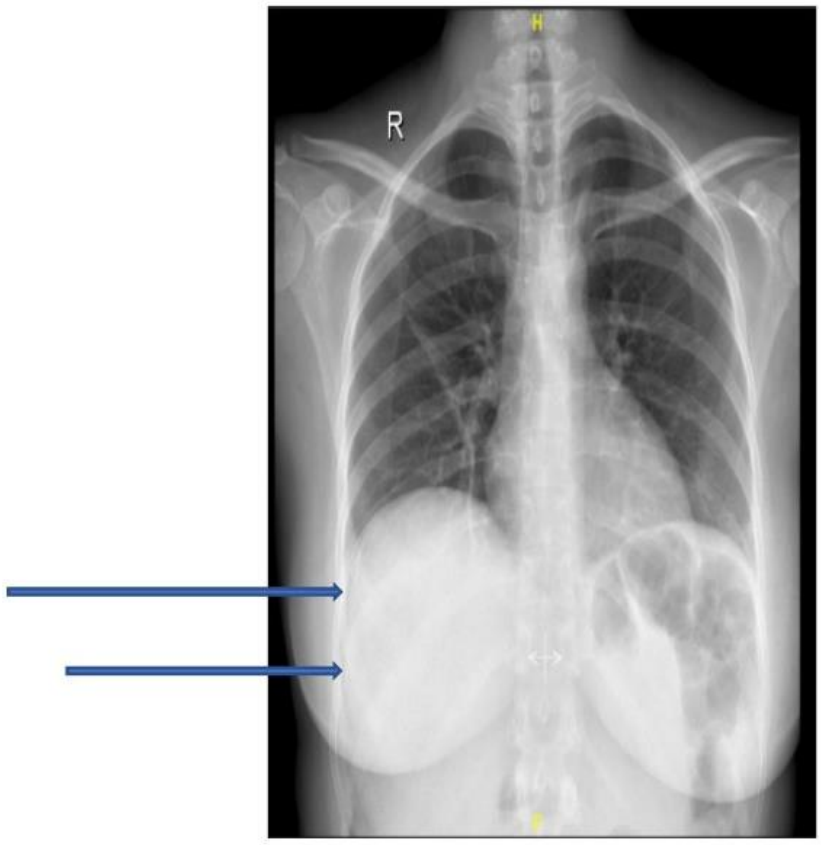


***Figure 2 – Upright chest xray- Pneumoperitoneum as depicted by the blue arrows***

**Table 3.** 'Non-surgical' causes of pneumoperitoneum [1,3]

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| **Post-operative** |
| Retained air from open laparotomy |
| Retained air from laparoscopy |
| **Thoracic** |
| Intermittent positive-pressure ventilation causing Barotrauma |
| Increased intrathoracic pressure- cough, retching |
| Valsalva maneuver |
| Asthma |
| Post bronchoscopy |
| Post adenotonsillectomy |
| Cardiopulmonary resuscitation and mouth-to-mouth ventilation |
| Pulmonary tuberculosis |
| Blunt trauma |
| Bronchopulmonary fistula |
| Spontaneous rupture of pulmonary blebs |
| **Abdominal** |
| Pneumatosis cystoides intestinalis |
| Endoscopic procedures |
| Postpolypectomy syndrome |
| Peritoneal dialysis |
| Spontaneous bacterial peritonitis |
| Collagen vascular disease |
| Pneumocholecystitis |
| Jejunal and sigmoid diverticulosis |
| Distended hollow viscus |
| Subclinical perforated viscus |
| Splenic embolization |
| **Gynecological** |
| Vaginal insufflation |
| Knee-chest exercises |
| Pelvic inflammatory disease |
| Ovarian cancer |
| Coitus |
| Oral sex |
| Vaginal douching |
| Gynecologic examination procedure |
| **Miscellaneous** |
| Cocaine use |
| Diving with decompression |
| Dental extraction |
| Idiopathic |

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