

## Breaking the Diaphragmatic Barrier: Unilateral Pneumothorax and Hemothorax after Laparoscopic Myomectomy

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### Abstract

Laparoscopic surgeries can be associated with thoracic complications like pneumothorax and hemothorax. During laparoscopy, opening of pleura-peritoneal channels and defects in the diaphragm can occur termed as porous diaphragm syndrome and can result in pneumothorax. A 30 yr old woman undergoing laparoscopic myomectomy for uterine fibroid developed hemopneumothorax secondary to porous diaphragm syndrome in the post-operative period. ICD insertion and fluid resuscitation effectively treated this condition. The anesthetist and surgeon should be vigilant about these serious thoracic complications of laparoscopy and have knowledge on management of these conditions.

**Keywords:** Laparoscopic surgeries; Uterine fibroid; Laparoscopy

### Introduction

Laparoscopic surgeries have become mainstay of modern surgical techniques but can present with a variety of complications. Rare but life threatening thoracic complications include pneumothorax or hemothorax. We present a rare case of hemothorax and pneumothorax in a young women undergoing laparoscopic myomectomy possibly due to a defect in diaphragm.

### Case Report

A 30 yr old female patient with uterine fibroid was posted for laparoscopic myomectomy. Patient was ASA I with good effort tolerance with a history of allergy to NSAIDs. Airway was normal-MMP II with adequate mouth opening and neck extension. CXR was unremarkable. Pre-op investigations showed a Hb 14.5. Patient was taken to operating room and all routine monitors were attached. Induction was done with fentanyl 100 mics, propofol 110 mg in titrated doses and atracurium 30 mg. A 7.5 mm I.D. endotracheal tube was inserted and patient was put on volume control ventilation with tidal volume of 450 ml with rate of 12 per min. A total of 4 laparoscopic ports were created. Airway pressures before insufflations were 11 cm H<sub>2</sub>O and after laparoscopic insufflation at pressure of 10 cm H<sub>2</sub>O, airway pressures rose to 26 cm H<sub>2</sub>O in trendelenburg position. These pressures were maintained throughout the surgery with end tidal CO<sub>2</sub> in the range of 40-42 mm Hg. Surgery lasted for 2.5 h and blood loss was 700 ml. Surgery was uneventful and no bleed was present at the port site intra-abdominally. At the end of surgery muscle relaxation was reversed and trachea was extubated. Patient was observed in PACU for 2 h and shifted to ward. Patient was pain free and vitals were normal at time of shifting and was transfused 1 unit of blood in the ward.

On post op day 1, patient developed respiratory distress with right sided chest pain. Respiratory rate was 40 per min with an oxygen saturation of 93%, and a pulse rate of 104 per min. On auscultation, air

entry was absent on right side. Abdominal drain had minimal amount of blood. Noninvasive ventilation was initiated with a CPAP of 5 cm H<sub>2</sub>O and CXR was done which showed right sided hydropneumothorax. An intercostals drain (ICD) was put in the 5<sup>th</sup> intercostals space and 1.1 L of collected blood was drained. Patient was shifted to ICU for monitoring. A CT angiography was done after ICD insertion to rule out any bleeding vessel. Lab investigations showed a Haemoglobin of 8.6. Patient improved symptomatically after ICD insertion and NIV. Next day she was taken off NIV and was put on oxygen via facemask and was maintaining saturation of 96-97% without any signs of respiratory distress. Air entry improved considerably on right side and a repeat CXR showed minimal pleural effusion on right side. ICD drain output was then 100-200 ml per day with sero-sanguinous discharge. Patient was shifted to the ward after 2 days, ICD was removed on the 5<sup>th</sup> day and patient was discharged on the 7<sup>th</sup> post op day.

### Discussion

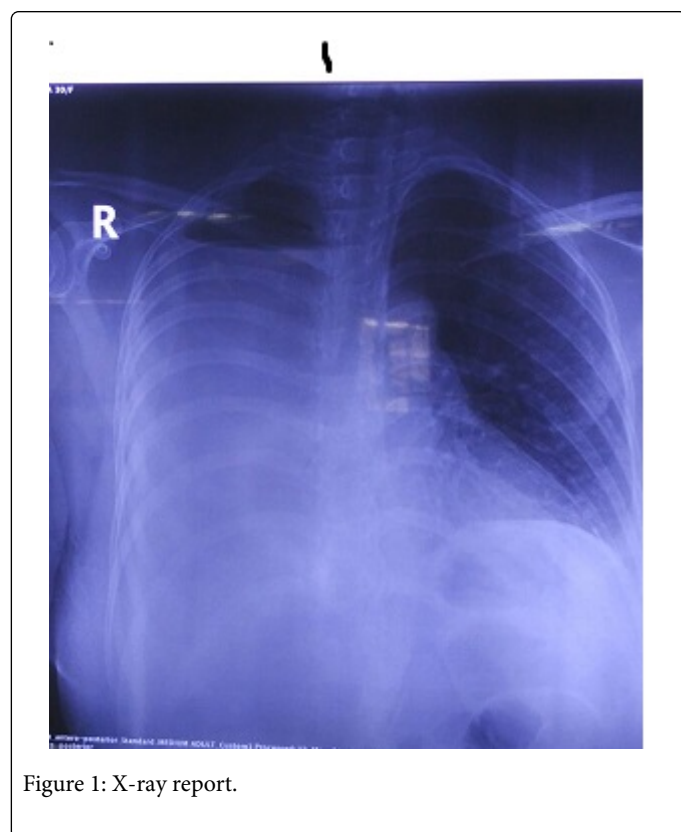
Laparoscopic surgeries are associated with numerous complications including spontaneous pneumothorax and hemothorax. These thoracic complications are rare with their incidence being as low as 0.01-0.4% [1,2]. Nevertheless, these can lead to catastrophies if not identified and managed in time. Pneumothorax can occur due to diaphragmatic injury during surgery. However, in our case, no such traumatic injury occurred and the surgery was limited to pelvic region.

Diaphragm may have defects, especially in the central tendinous region which can open up when the intra-abdominal pressure rises, as during creation of pneumoperitoneum. These defects create channels between abdominal and thoracic cavity known as pleura-peritoneal channels. This pathology is termed as porous diaphragm syndrome [3,4]. This may lead to transfer of gases or fluids into the thoracic cavity from abdomen [5]. The gases can also travel through the esophageal hiatus into the mediastinum and pleura [6].

Childers et al. reported right side pneumothorax during laparoscopy due to congenital diaphragmatic defects [7]. May et al. reported a right

side hemothorax following laparoscopic hysterectomy due to porous diaphragm syndrome [8]. The patient had intra-abdominal bleed which also passed through the diaphragm into the thoracic cavity. In a similar case, uterine haemorrhage occurred post cesarean and blood entered the chest from abdominal cavity [9].

In this patient, airway pressures were maintained below 30 cm H<sub>2</sub>O throughout the intra-operative period, so it is unlikely that pneumothorax developed due to barotraumas. The patient most probably developed pneumothorax due to presence of porous diaphragm. Presence of frank blood cannot be explained by this mechanism as abdominal blood will have saline mixed in it infused during surgery. Moreover, abdominal drain had minimal fluid. The blood in ICD drain was most likely of thoracic origin. Hemothorax after pneumothorax can occur due to rupture of pleural vessels, located mostly on the parietal pleura. When the pleura gets distended by gas, these vessels can rupture and cause hemothorax. This pathology is termed as spontaneous hemopneumothorax (SHP) and is defined when more than 400 ml of blood in pleural cavity is present along with spontaneous pneumothorax [10]. Thus our patient most likely developed pneumothorax due to porous diaphragm followed by SHP (Figure 1).



Pneumothorax can also occur due to spontaneous bullae rupture during positive pressure ventilation, but this seems less likely as patient was young with no history of obstructive airway disease. Risk factors for development of pneumothorax or pneumomediastinum include PETCO<sub>2</sub> greater than 50 mmHg and longer operative times [11].

Management for hemopneumothorax includes ICD insertion in 5th intercostal space. If patient is unstable due to massive hemothorax, adequate fluid management with blood transfusions should also be administered. Inotropes and intensive care may be required in such

cases. Video-assisted thoracoscopic surgery (VATS) is recommended to locate and ligate the bleeding vessel [10]. VATS was not done in our patient as she didn't have any ongoing bleeding and CT angiogram did not reveal any bleeder

Through this case, we try to highlight the importance of unanticipated laparoscopic thoracic complications. Gynaecological procedures do not involve manipulation or trauma to diaphragm or liver, but can result in serious life threatening situations due to anatomical defects and openings in diaphragm. One needs to be vigilant during intra-operative as well as post-operative period for such complications. The anesthetist must also be careful of the irrigation used by the surgeons intraoperatively. This irrigation can travel up in the thorax through the diaphragmatic defects leading to hydrothorax [12]. A simple chest auscultation following laparoscopy will help in identifying such patients and aid in prompt treatment. Had we done a chest auscultation in our patient post-op, we might have identified pneumothorax followed by ICD insertion which would have prevented hemothorax and resulted in less morbidity.

Laparoscopic surgeries have been associated with complications like pneumothorax or hemothorax, but this is probably the first case report where both complications occurred simultaneously.

## Conclusion

Laparoscopy, though extremely useful and an integral part of surgery is not without its complications. Serious complications like hydro-pneumothorax can occur without any warning and one must be aware of the diaphragmatic openings present during laparoscopy and its consequences. Management of these situations warrant understanding of the mechanism with resuscitation and ICD insertion.

## Learning points

1. Laparoscopic surgeries are associated with a variety of complications which both the anesthesiologists and surgeon must be aware of.
2. Porous diaphragm is a rare distinct entity which can result in life threatening complications like hydro-pneumothorax.
3. Anesthesiologist and surgeon must be able to identify and manage thoracic complications of laparoscopy.

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