

# Isolated Pneumomediastinum Following Laparoscopic Cholecystectomy: An Unpredictable Situation

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## ABSTRACT

Pneumomediastinum is a clinical event characterized by the presence of air in the mediastinum. Often a result of physical trauma, this condition results from air escaping from the respiratory airway and moving into the mediastinal cavity. Although rare, it can also develop following abdominal laparoscopic surgical procedures. Diagnosis is commonly made by visualizing a radiolucent airline in the mediastinum and/or surrounding the heart following a chest X-ray radiography or a thoracic CT scan. This case study describes the diagnosis, treatment and follow-up of a 51 years old female patient who developed pneumomediastinum following a laparoscopic cholecystectomy.

**Key Words:** *Pneumomediastinum. Laparoscopic cholecystectomy. Thoracic computed tomography scan.*

## INTRODUCTION

Pneumomediastinum, also known as mediastinal emphysema, is a clinical event characterized by the presence of air in the mediastinal cavity. Rene Laennec described it in 1819, but the first official publication was made by Louis Hamman in 1939.<sup>1,2</sup> Pneumomediastinum mostly develops after air escapes from the lungs, respiratory tract or intestines in the thoracic cavity and enters the mediastinal cavity. Although it is rare, there have been reports of pneumomediastinum after laparoscopic abdominal surgical procedures.<sup>2-4</sup> The most frequent symptoms of pneumomediastinum are chest pain, shortness of breath, and fever. Pneumomediastinum is diagnosed by visualizing mediastinal air using either postoperative chest X-ray radiography or thoracic computed tomography (CT).<sup>1,2</sup> Treatment is decided on a case-by-case basis, depending on the clinical presentation of the patient, physical examination results and the presence of inflammation parameters in the blood.

This report presents the authors' approach to a case of pneumomediastinum that developed following laparoscopic cholecystectomy.

## CASE REPORT

A 51 years old female presented at the polyclinic complaining of epigastric pain after eating. She reported

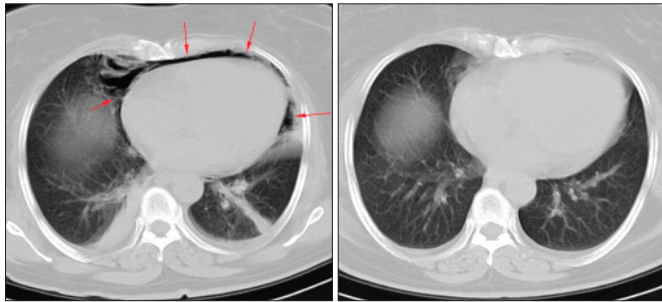
that these symptoms had been present for years but had only recently become more severe. There was no medical history of systemic disease such as hypertension, diabetes or pulmonary disease. Following a thorough physical examination, minimal tenderness in the epigastric area upon palpation was the only sign. No pathological findings were determined from routine biochemical blood parameters, urine tests or thoracic and abdominal X-rays. Total blood count values were as follows: haemoglobin: 11.2 g/dL, WBC: 8900/mL and platelet: 288000/mL. Following abdominal ultrasonography, multiple stones were seen in the gallbladder lumen, the largest of which was 12 mm. The patient was diagnosed with symptomatic cholelithiasis and a decision was made to perform a laparoscopic cholecystectomy using the standard American technique. The optimum pneumoperitoneum pressure for laparoscopic surgery was 13 mmHg and total duration of the operation was 35 minutes. During the procedure, respiratory parameters were as follows: partial pressure of oxygen (pO<sub>2</sub>): 308 mmHg, partial pressure of carbon dioxide (pCO<sub>2</sub>): 35 - 40 mmHg, tidal volume: 475 ml. No surgical problems were encountered intraoperatively. On postoperative day 1, the patient exhibited respiratory difficulties and a temperature reaching 38°C. Routine blood tests were done and a thoracic X-ray taken. WBC (13600/mL), sedimentation (40 mm/h (1-20)) and CRP (14.5 mg/dL (0-0.8)) were measured and other blood test results were within normal limits. There was no pathological evidence on the thoracic X-ray. However, following a thoracic CT with contrast, significant air was observed both around the heart and in other areas of the mediastinum; both observations are consistent with pneumomediastinum (Figure 1). To prevent the development of serious mediastinitis, the patient was prescribed a regimen of meropenem and teicoplanin treatment. Intensive respiratory physiotherapy was also applied. After 14

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*Received: October 11, 2012; Accepted: February 15, 2013.*



**Figure 1:** Thoracic CT (axial) images taken after injection of contrast agent (postoperative day 2). The red arrows show free air in the mediastinum.

**Figure 2:** Thoracic CT (axial) images following treatment (postoperative day 14). The pre-treatment free air in the mediastinum can be seen to have completely disappeared.

days of treatment, no air was detected on thoracic CT (Figure 2). The patient was discharged and prescribed a treatment of 400 mg moxifloxacin daily.

## DISCUSSION

Pneumoperitoneum is frequently created with CO<sub>2</sub> to facilitate the surgical procedures in laparoscopic surgery.<sup>1,5-7</sup> Several changes may be seen in some of the respiratory parameters depending on the absorption rate of the gas used, the increase in abdominal pressure, the ventilator technique and the anaesthetic agent applied.<sup>1,7,8</sup> Most of these events caused by changes in respiratory parameters may be associated with the passage of insufflated gas from the abdominal cavity to the thoracic cavity by any route. The gas that has passed into the thoracic cavity may cause serious complications such as pneumomediastinum, unilateral or bilateral pneumothorax or pneumopericardium.<sup>7,9,10</sup>

Pneumomediastinum is defined as the presence of air within the mediastinum. The most common cause is the sudden increase in pressure or rupture of the alveoli from excessive straining. Pneumomediastinum may also develop from physical trauma, bronchoscopy, oesophagoscopy or mechanical ventilator application.<sup>2,8</sup> Following laparoscopic abdominal surgery, isolated subcutaneous emphysema or emphysema together with pneumomediastinum is often seen, while isolated pneumomediastinum very rare. Most cases of isolated pneumomediastinum following laparoscopic abdominal surgery can be explained by the passage of insufflated air from weak points of congenital defects of the diaphragm or oesophageal and hiatal openings into the thoracic cavity.<sup>1,4-6,10</sup> We hypothesize that in this case the development of isolated pneumomediastinum without any evidence of subcutaneous emphysema was caused by the passage of air to the mediastinum from diaphragmatic or oesophago-aortic hiatus defects.<sup>2</sup> This is an extremely rare event and other cases of isolated pneumomediastinum have not been reported in the literature.

Pneumomediastinum diagnosis is usually made by postoperative clinical findings. The most frequently seen symptoms are chest pain, shortness of breath, hypotension and fever, and diagnosis is made by visualizing a radiolucent air line in the mediastinum and surrounding the heart by chest X-ray and thorax CT evaluation. Diagnosis should be made swiftly and treatment must begin immediately. The patient should be monitored for at least 24 - 48 hours. During this follow-up period, supplementary oxygen may be given for shortness of breath and antibiotic treatment for fever or evidence of infection.

In conclusion, isolated pneumomediastinum following laparoscopic cholecystectomy is very rare. Clinical observation and radiological evidence of air in the mediastinum are sufficient for diagnosis. Monitoring of the patient, supplemental oxygen, and antibiotic treatment are important steps in treatment and prevention of serious complications such as mediastinitis.

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