

# Pneumothorax during Laparoscopic Gastric Banding

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## Abstract

Pneumothorax is one of the dreaded complications following general anesthesia, which if not recognized well in time leads to increased morbidity and mortality. It commonly precipitates following a pulmonary barotrauma and a significant incidence is due to an iatrogenic cause. We present an unusual occurrence of pneumothorax in a 49 year old female patient admitted for a laparoscopic adjustable gastric banding. Etiology, mechanism of air-entry from peritoneal to pleural cavity and management are discussed.

## INTRODUCTION

Laparoscopy has now been universally accepted as a valuable diagnostic and operative technique since its introduction by Jacobeus in 1910, because of lower mortality and morbidity compared to open surgical procedure.(1)

The use of laparoscopy has eliminated the upper abdominal incision, and the impairment of pulmonary mechanics and ventilation. Consequently, patients can be discharged from the hospital earlier.

Although advantages and safety of laparoscopy had led to its widespread use, attention has been drawn to some of the hazards of pneumoperitoneum which forms an integral part of the technique. Subcutaneous emphysema, pneumothorax, airembolism, haemorrhage, perforation of viscera and cardiac arrhythmia are some examples of possible intraoperative hazards

Pneumothorax after creation of pneumoperitoneum was first described in 1939. It remains an extremely uncommon complication of pneumoperitoneum with a reports incidence of 0.01 – 0.4%. (2); (3)

## CASE REPORT

A 49 year old female patient with a BMI (body mass index) of 43 Kg/m<sup>2</sup> was admitted for an elective bariatric surgical procedure: a laparoscopic adjustable gastric banding. A properly performed study in a sleep laboratory revealed an obstructive sleep apnoea (OSA). All the other pre-anesthetic investigations were within normal ranges and she was accepted for surgery as ASA II, under general anesthesia

after explaining the procedure and the risks.

General anaesthesia was induced with propofol 200 mg iv followed by succinylcholine 100 mg ev to facilitate tracheal intubation with an 7.5 millimeter cuffed tracheal tube.

Anaesthesia was maintained with oxygen/air and desflurane. The patient also received rocuronium 50 mg iv for maintenance of neuromuscular blockade.

Monitors included blood pressure, end-tidal carbon dioxide, ECG, pulse oximetry, and nerve stimulator.

Abdominal inflation was performed with carbon dioxide and the trocars were placed uneventfully. The patient was placed in a 30° reverse Trendelenburg position to assist surgical exposure.

During the lesser epiploon dissection and exposure of diaphragmatic crus, the peak inspiratory pressure increased from 30 to 42 cm water. The arterial oxygen saturation decreased from 97 to 70% and an obstructive waveform pattern was noted on the end tidal carbon dioxide monitor. The patient presented at this time severe hipotension ( 75/35 mmHg) and tachycardia (130 bpm). Decreased breath sounds on the left lung field were noted. The trocars were removed and the abdomen was deflated.

A chest film confirmed the diagnosis of left pneumothorax. A left chest tube was placed with immediate improvement of the arterial oxygen saturation to 95%. We decided to stop surgery.

The neuromuscular block was reversed with neostigmine 1,5 mg and atropine 0,5 mg iv, and the patient assumed spontaneous breathing. The trachea was extubated and the patient was transported to the postanesthetic care unit.

A control chest film revealed complete resolution of the pneumothorax. Her postoperative course was uncomplicated. The chest tube was removed on the third postoperative day and the patient was discharged on the fourth postoperative day without any further problems.

### **DISCUSSION**

Laparoscopic procedures are increasingly used in order to avoid incisions in the upper abdomen that can cause detrimental changes in cardiopulmonary function. The mortality rate of eight per 100,000 laparoscopies has been reported with complications such as cardiac arrhythmias, pulmonary embolism, bowel trauma, haemorrhage, and acute hypotension from compression of the inferior vena cava.

Pneumothorax during laparoscopic procedures is a very rare complication.

In the case presented, the pneumothorax may be the result of three situations: a barotrauma due to mechanical ventilation, a direct surgical injury to diaphragm or the existence of congenital defects in the diaphragm.

Pulmonary barotrauma is a well-known but rarely seen complication of mechanically ventilated patients in general anaesthesia. It is thought to be due to increased pressure in alveoli, which leads to eventual rupture and subsequent development of respiratory distress. Mishaps related to faulty technique, machine dysfunction, device failures are the commonest denominators for the precipitation of such an event. (4), (5)

In a laparoscopic gastric banding, a diaphragmatic injury can occur during the exposure of the diaphragmatic pillars. An accidental rent in the diaphragm may act as a flap valve, opening during inspiration and closing during expirations, causing a tension pneumothorax.

There are potential channels of communication in some individuals between peritoneal cavity, pleural and pericardial sacs. There are reports of unusual cases where either air or fluid has passed from peritoneal to pleural cavity through diaphragmatic defects when intra-abdominal pressure is raised.

Embryologically, pleural and peritoneal cavities develop from one sac and the separation is effected by formation of diaphragm. The anterior, lateral and central portion of diaphragm develop from septum transversum and the fused ventral mesentery. The posterior, lateral and central portion of diaphragm is formed by fusion of the dorsal mesentery and mesoderm with pleuroperitoneal membrane. If mesoderm is not properly deposited at any of these adjacent points of union, a failure of proper fusion may result in congenital diaphragmatic defects or congenital weak points in diaphragm. Gas may leak through these diaphragmatic defects when intraabdominal pressure is raised. Gas may also dissect retroperitoneally through natural opening in diaphragm (aortic, venacaval or oesophageal) producing pneumomediastinum that may rupture the pleural space causing a pneumothorax. (6)

Pneumothorax in the mechanically ventilated patient may present as an acute cardiopulmonary emergency beginning with respiratory distress that, if unrecognized and untreated, progresses to cardiovascular collapse. The diagnosis of this entity could be made on a clinical basis by hypotension, hyperresonant percussion note, diminished breath sounds and tachycardia. The mortality rate rises squarely with increased time delay in diagnosis and management.

The decision to stop the surgery depends on the patient's haemodynamic stability, the underlying cause and the possibility of implementation of the surgical technique to lower inflation pressure. If detected early during the surgery in a stable patient, pneumoperitoneum should be deflated, a chest tube inserted and then the surgery completed. If detected towards the end of the procedure in a stable patient, the operation should be completed and nothing further needs to be done, as the carbon dioxide in the pleural cavity gets reabsorbed rapidly after deflating the abdomen.

In the case presented, we decided to finish the surgery because the surgical technique could not be performed with lower inflation pressure.

In conclusion, although spontaneous pneumothorax during laparoscopic gastric banding is rare, it can be life threatening. A high index of suspicion, intensive monitoring and judicious management results in a successful outcome.

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