

PNEUMOTHORAX DURING LAPAROSCOPY: ONE MORE REMINDER!

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ABSTRACT

Bilateral pneumothorax is a rare complication encountered during laparoscopic surgeries. A 56 year old male patient was posted for elective laparoscopic umbilical hernia repair. He developed bilateral pneumothorax under general anaesthesia. Different causes of air-entry into the pleural cavity, differential diagnosis and management of such cases are highlighted.

Key words: Pneumothorax; Laparoscopy; Anaesthesia

INTRODUCTION

Since its introduction by Jacobeus in 1910, laparoscopy has now been accepted as a valuable operative and diagnostic technique due to the low mortality and morbidity associated with it as compared to open surgical procedures.¹ Although the advantages and safety profile of laparoscopic surgeries are well-known, there are a number of complications which can occur during this frequently used procedure, including pneumothorax, pneumomediastinum, pneumopericardium, subcutaneous emphysema, gas embolism, visceral injuries.² Although there are many reports of pneumothorax occurring during laparoscopic surgeries, yet it is rare and unexpected to encounter bilateral pneumothorax while performing intraperitoneal onlay mesh (IPOM) repair for umbilical hernia. We present such a case here, to serve as a useful reminder.

CASE REPORT

A 56 year old male weighing 114 kg was posted for elective laparoscopic umbilical hernia repair at GMCH, Chandigarh. He had no significant past medical or surgical history and all his routine preoperative investigations (including haemogram, urine analysis, blood urea, creatinine, serum electrolytes, coagulation profile, blood sugar, chest X-ray, ECG) were normal. On examination of his airways, the patient had a heavy jaw with a Mallampatti grade II.

The patient was premedicated with tablet alprazolam 0.5 mg and tablet ranitidine 150 mg on the night before and the morning of surgery. In the operation theatre (OT) the patient was connected to multichannel monitor (S/5 Datex-Ohmeda, Finland) and was monitored for heart rate, ECG, non-invasive blood pressure, end tidal carbon dioxide and oxygen saturation. His baseline blood pressure was 130/80 mmHg, heart rate was 80 beats/min and peripheral O₂ saturation was 98%. Intravenous (i.v.) infusion was started with 18G cannula and 100% oxygen was administered by using a mask. Anaesthesia was induced with i.v. glycopyrrolate 0.2 mg, morphine 7.5 mg, and thiopentone 300 mg. Suxamethonium 100 mg was given intravenously and his trachea was intubated with 8.0 mm (I.D.) cuffed endotracheal tube. Tube position was confirmed by auscultation of bilateral equal breath sounds. Atracurium 30 mg i.v. was given and anaesthesia was maintained with 66% N₂O in oxygen with 0.5 - 1% isoflurane, using closed circuit with controlled ventilation (Aestiva 5, Datex Ohmeda). At the start of surgery, the baseline end-tidal CO₂ was 30-32 mmHg, the peripheral O₂ saturation was 99-100%, the blood pressure was 136/78 mmHg and the heart rate was 85. His peak airway pressure was 18 mm of Hg. Laparoscopic surgery commenced and CO₂ insufflation of peritoneal cavity was done with a pressure of 12 mmHg. After CO₂ insufflation, the peak inspiratory pressure and end-tidal CO₂ were 20-22 mmHg and 32-36 mmHg, respectively.

Initially there were no intraoperative problems and anaesthesia was well maintained. However, 90 minutes after the start of surgery there was a fall in blood pressure to 90/50 mm of Hg and oxygen saturation came down to 95-96%. Peak airway pressures rose up to 56 mm of Hg and end-tidal CO₂ was increased to 60-64 mmHg. Arterial blood gas (ABG) analysis showed a pH of 7.185, a PaCO₂ of 74.7 mmHg, a PaO₂ of 75 mmHg and a SaO₂ of

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95%. Immediately N_2O and isoflurane was stopped, the fraction of inspired oxygen (FiO_2) was increased to 1.0 and manual ventilation was performed. The operating surgeon was asked to discontinue the procedure and exsufflate CO_2 . On auscultation, breath sounds were markedly decreased bilaterally, and there was hyper-resonant note on percussion. Portable chest x-ray was not available in the operation theatre. Hence clinically suspecting bilateral pneumothorax, a 20-gauge needle was inserted bilaterally in the 2nd intercostal space. Egress of air bubbles through both the needles confirmed our suspicion. Following this there was slight fall in airway pressures to 46-48 mm of Hg and end-tidal CO_2 decreased to 52-54 mm of Hg. As the airway pressures were still high, a chest tube was inserted on the right side of his chest. This was followed by a marked improvement in airway pressure, which decreased to 28-30 mm of Hg. End-tidal CO_2 also decreased to 38-42 mm of Hg. O_2 saturation improved to 98% and blood pressure was 118/74 mm of Hg. His ABG at this time showed a pH of 7.254, a $PaCO_2$ of 54.3 mmHg, a PaO_2 of 396 mmHg and a SaO_2 of 99.9%. Surgeon was then asked to continue with the surgery and the subsequent course of anaesthesia was uneventful. At the end of the procedure, neuromuscular blockade was reversed with 2.5mg neostigmine and 0.4mg glycopyrrolate. Patient's trachea was extubated and oxygen was administered to him using an oxygen mask at a flow rate of 8 L/min and FiO_2 of 0.5. His ABG showed a pH of 7.34, a $PaCO_2$ of 44 mmHg, a PaO_2 of 127.8 mmHg and a SaO_2 of 98 %. Absence of pneumothorax was confirmed on chest X-ray on the second postoperative day and his chest tube was removed. His subsequent hospital stay was uneventful and the patient was discharged from hospital on the 3rd post-operative day.

DISCUSSION

Laparoscopic hernia repair is now being increasingly performed as an alternative to traditional open repair.³ Its advantages include a low recurrence rate, reduced risk of infection, adhesion and damage to the intra-abdominal organs, less postoperative pain and prompt return of patients to their daily lives.⁴ Various complications associated with laparoscopic surgeries are well known.^{6,7} Occurrence of pneumothorax during laparoscopic surgery has been reported in the past.^{1, 5, 8-10} Pneumothorax is known to occur during general anaesthesia either in patients with pre-existing lung disease or as a result of barotrauma due to positive pressure ventilation or due to

leakage of gas from abdominal cavity during pneumoperitoneum.⁵⁻⁷ Our patient developed bilateral pneumothorax during laparoscopic umbilical hernia repair.

Intraoperative pneumothorax occurring during laparoscopic surgeries could develop due to surgical or non-surgical causes. Various non-surgical complications that should be considered include barotrauma, damage to the bronchus during endotracheal intubation, rupture of congenital bulla or blebs, and side effects due to the insertion of a central venous catheter.⁸ In our case, the patient did not have any pre-existing lung disease, his endotracheal intubation was smooth, central venous catheter was not inserted and positive pressure ventilation with high pressure was not done. Accordingly, the complication in our patient was assumed to have occurred during the surgical procedure. The most plausible explanation for the development of pneumothorax in our patient was probably due to the passage of gas from peritoneal cavity to the thorax via anatomical defects in the diaphragm.

Intraoperative management of patients with pneumothorax during laparoscopic herniorrhaphy is fraught with problems. CO_2 insufflation should be immediately stopped. Nitrous oxide should also be discontinued and patient should be ventilated with 100% O_2 . This can lead to decrease in the depth of anaesthesia in the intraoperative period. Light plane of anaesthesia is a predisposing factor for production of arrhythmia in the intraoperative period. In addition, haemodynamic instability often occurs during tension pneumothorax. This adds to the already existing problem of associated hypoxia and arrhythmia. Our patient did not have any arrhythmia and had only mild fall in oxygen saturation during the course of surgery. Whenever possible, diagnosis should be confirmed by chest X-ray. However, portable chest X-ray was not available in our operation theatre. Hence the diagnosis of pneumothorax in our patient was made on the basis of clinical signs and symptoms.

Tube thoracostomy in patients with intraoperative pneumothorax is not a mandatory procedure unless the patients are haemodynamically unstable or their respiratory function is impaired. Carbon dioxide, being highly diffusible, is spontaneously absorbed within 30-60 minutes.^{9,10} As our patient had very high peak airway pressures and end-tidal CO_2 , along with a fall in blood pressure and O_2 saturation, we decided to insert a right intercostal drain for the safe management of the patient.

Pneumothorax is a well known complication of laparoscopic surgeries but it is rare to encounter bilateral pneumothorax in patients undergoing laparoscopic hernia.^{5,7,9,10} It is important that anaesthesiologists have a high index of suspicion about the possibility of intraoperative pneumothorax occurring during laparoscopic surgery. One needs to closely monitor the haemodynamics of the patient and identify any alterations in end-tidal CO₂ and the peak airway pressures so as to detect any signs suggesting possibility of pneumothorax during laparoscopic surgery. Timely intervention and appropriate management are the keys to the successful management of this at-risk group of patients.

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