

INTRAOPERATIVE SPONTANEOUS PNEUMOTHORAX IN A PATIENT UNDERGOING LAMINECTOMY AND TRANSPEDICULAR SCREW FIXATION: A CASE REPORT

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Abstract

Development of pneumothorax in patients undergoing posterior spine surgery, although rare, is not unheard of. Our case report highlights detection of intraoperative pneumothorax in a 51-year-old female patient undergoing laminectomy and transpedicular screw fixation which was successfully treated with finger thoracostomy and chest tube insertion. In conclusion, early recognition, and treatment of pneumothorax despite the challenges faced by the surgeons and anesthesiologists owing to prone position can be lifesaving.

INTRODUCTION

Pneumothorax is a known complication of mechanical ventilation.^[1] Intraoperatively, pneumothorax can develop during central line insertion, regional blocks or mechanical ventilation.^[2] Tension pneumothorax is a rare life-threatening complication of posterior spinal surgery that needs immediate intervention.^[3] Even a pre-existing, asymptomatic pneumothorax can be exacerbated during pedicle screw placement despite having a high safety margin, because of disruption in lateral and ventral walls of the vertebra.^[4]

However, posterior spinal surgery in prone position makes it difficult to diagnose and treat tension pneumothorax as access to the sites for pleural punctures and subsequent tube insertion is limited. This case shows an example of intraoperative pneumothorax and its successful management that proved to be life saving for the patient.

CASE PRESENTATION

A 51-year-old 60 kg female, presented with low backache since past 6 months with radiation to bilateral lower limbs, associated with tingling and numbness. Being ASA grade 1, her past medical history was unremarkable. On examination, the power in both the lower limbs was 3/5 with no other abnormality. Her routine investigations were within normal limits. However, the MRI showed significant stenosis at lateral recess at L4-5 and L5-S1 with

compression of bilateral exiting nerve roots. She was diagnosed as a case of prolapsed intervertebral disc at L4-L5, L5-S1 with grade I anterolisthesis of L4 over L5.

She was admitted and scheduled for elective L4-L5 laminectomy with L4-L5 and L5-S1 discectomy with L4-L5-S1 transpedicular screw fixation under general anaesthesia. After obtaining informed consent, the patient was shifted to the operation theatre with the following vitals – HR – 88/min, BP – 124/80 mmHg, SpO₂ – 99% on room air and bilateral equal air entry with normal vesicular breath sounds. Premedication Inj glycopyrrolate 0.2 mg, Inj midazolam 1.5 mg and Inj fentanyl 100 mcg were given intravenously. She was induced with titrated doses of propofol. Intubation was done with 7.0 mm cuffed flexometallic endotracheal tube uneventfully after proper relaxation with Inj vecuronium 6mg and bag & mask ventilation for 4 minutes. After confirmation with capnography, the ETT was fixed at 20 cm at the angle of mouth and the patient was taken up in prone position with ASA standard monitoring and put on mechanical ventilation at volume-controlled mode with tidal volume set at 400 ml, respiratory rate 14/min and PEEP at 5 cm of H₂O. Peak airway pressure was 18 cm of H₂O. The patient was maintained with oxygen, nitrous oxide and sevoflurane.

Surgery was progressing uneventfully when suddenly the peak airway pressure went up to 40 cm of H₂O and there was decrease in tidal volume. On auscultation, the air entry was found to be almost nil

DISCUSSION

on the left side of the chest while the right side had normal vesicular breath sounds. ETT was pulled out uptill 18 cm and chest was re-auscultated which still indicated that left side had no air entry. Patient was given Inj Hydrocortisone 100 mg iv and salbutamol puffs through ETT, but the peak pressure remained 35 cm of H₂O. Patient then started desaturating with SpO₂ falling upto 82%. Nitrous oxide was immediately shut down and gradually saturation started rising up to 93%. The surgery then went on for another 35 minutes with stable hemodynamics.

As the surgery concluded, patient was taken into supine position when the blood pressure suddenly dropped to 78/54 mmHg, heart rate 52/min, peak pressure at 43 cm of H₂O and expiratory volume being half the target tidal volume. There was no obstruction or kinking in the airway. Patient was switched to pressure control mode. Further fall in saturation was observed to 76%. Tension pneumothorax was suspected and needle thoracostomy was performed. A shot was taken with the help of available c-arm. The picture was compared with the preoperative chest x-ray which showed significant left sided pneumothorax. The neurosurgeon then proceeded to puncture the pleura in the 4th intercostal space along the mid axillary line and an intercostal drainage tube was inserted immediately on the affected side. Hemodynamic stability was achieved within the next 5 minutes.

The patient was extubated post operatively and shifted to ICU for monitoring. Chest x ray was taken as soon as she was shifted to ICU to confirm the presence of pneumothorax and correct positioning of the drainage tube. Patient was then conservatively managed for three more days before being shifted to the regular wards. Subsequently chest tube was removed after the pneumothorax resolved. Patient was discharged under satisfactory condition.

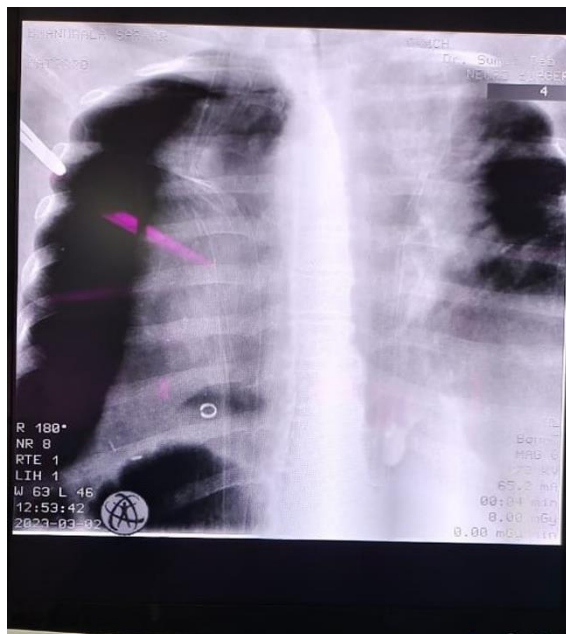


Figure 1: Intraoperative fluoroscopic picture showing left sided pneumothorax

Pneumothorax is a life-threatening emergency in which air accumulates between the two layers of pleura. The connection between thoracic cavity and extra-thoracic space causes an influx of air pushing against and collapsing lung parenchyma. It makes matters worse if it develops intraoperatively as the positive airway pressure further increases the amount of air accumulated inside the cavity, thereby increasing the intrathoracic pressure, lung collapse and hemodynamic instability due to compression of inferior vena cava.^[5]

Pre-existing remote trauma can be one of the causes of intra-operative pneumothorax as reported by Mavarez-Martinez et al.^[6] Pneumothorax can also be iatrogenic, apart from traumatic. Heyba et al,^[7] described a case of pneumothorax after creation of pneumoperitoneum during laparoscopic cholecystectomy. Other possible causes of developing intraoperative pneumothorax are central line placement, posterior spinal exposure, pedicle screw placement, and posterior rib resections as reported in the study conducted by Lewis et al.^[8] Our case report describes a scenario of pedicle screw fixation in a patient of prolapsed disc with significant motor deficit. We had not tried central line placement as the peripheral assess was adequate. Levine et al,^[5] reported a case of intraoperative pneumothorax with pre-existing trauma and multiple rib fractures, however, our patient had no history of trauma.

Development of tension pneumothorax may be accompanied by tachycardia, tachypnoea, rise in central venous pressure, airway pressure, and end-tidal carbon dioxide (CO₂). Obstructive shock sets in with decreased venous return and cardiac preload leading to fall in oxygen saturation, blood pressure, or tracheal deviation towards the contralateral side. Our case had similar findings as described by MacDuff et al in their study.^[9]

It can be confirmed on chest x-ray PA view in erect posture showing inwardly displaced pleural line and absence of lung markings.^[10] The patient might land up with cardiorespiratory collapse if urgent thoracostomy is not performed.^[11]

Timely recognition and its management is challenging because of prone positioning.^[12] It is difficult to detect on radiographs in prone position and the surgeons and anaesthesiologists have to rely merely on signs and symptoms of hemodynamic compromise which may sometimes be too late. Pneumothorax reported by Levine et al,^[5] was detected only in the postoperative period when the patient had already deteriorated. Heyba et al,^[7] detected pneumothorax intraoperatively and were able to successfully manage the case without any delay as the patient was in supine position. Although, we were fortunate enough to detect it inside the operation theatre, our patient was in prone position. Even after successful detection of pneumothorax, prone positioning hinders the assess to the sites of

thoracostomy i.e., fifth intercostal spaces in the anterior axillary lines respectively.^[13] We had to wait for the surgery to get over as the patient was hemodynamically stable and intercostal drainage tube was inserted later.

Point of care investigations like ultrasound may prove beneficial in recognition of intraoperative pneumothorax to cater to the difficulties encountered with prone positioning.

CONCLUSION

Spinal surgeries can cause pneumothorax intraoperatively that is difficult to detect and treat. Investigations like radiographs have limited role in recognition when the surgery is in prone position. The doctors have to rely solely on clinical features to make accurate diagnosis. Having presence of mind and urgent needle thoracostomy are crucial to saving life.

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