
Vocal cord closure leading to inadequate ventilation with Laryngeal Mask Airway ProSeal™ in a paralysed patient during laparoscopic surgery

Sir,

A 43-year-old female (weight = 61 kg and body mass index = 24.4 kg/m²) was undergoing laparoscopic hysterectomy under general anaesthesia which included the use of fentanyl, propofol and vecuronium. A Laryngeal Mask Airway-ProSeal™ (PLMA) size 3 was used and secured successfully. The intracuff pressure was adjusted to <60 cmH₂O and maintained intraoperatively. A gastric drain tube was inserted. Mechanical ventilation (volume-control mode) with tidal volume (V_T) = 500 ml, respiratory rate = 14 cycles/min, inspiratory: expiratory = 1:2, positive end-expiratory pressure = 5 cmH₂O, minute volume = 7 L resulted in ETCO₂ = 32 mmHg and airway pressure (P_{aw}) = 24 cmH₂O with no leak. Anaesthesia was maintained with propofol and 50% oxygen in N₂O.

Following creation of capnoperitoneum and steep Trendelenburg position (60°), P_{aw} was 30 cmH₂O and V_T ≈ 350 ml. Half an hour later, there was an audible leak at P_{aw} = 30 cmH₂O, V_T ≈ 250 ml and ETCO₂ = 55 mmHg though SpO₂ was 99%. The heart rate (74/min) and blood pressure (BP) (120/68 mmHg) remained stable. Proper position of the PLMA was confirmed. Auscultation revealed bilateral equal air entry, but reduced intensity of breath sounds and no adventitious sounds. Bronchospasm, pneumothorax and subcutaneous emphysema were ruled out.

An attempt to increase the minute ventilation was made by increasing the respiratory rate to 20 cycles/min and reducing the steepness of Trendelenburg position to 45°. However, ETCO₂ increased steadily over the next half an hour to 92 mmHg, heart rate was 95/min, BP = 132/75 mmHg and State Entropy™ = 42 [Figure 1]. Analgesia and skeletal muscle relaxation were deemed adequate.

As the ETCO₂ had reached dangerous levels, we performed fibre-optic bronchoscopy (FOB) which revealed a full view of the vocal cords, no downfolding of the epiglottis and oesophageal opening was not visible confirming the cuff was correctly placed. However, the anterior commissure was completely



Figure 1: Monitor showing vital parameters, high end-tidal CO₂ (solid arrow) and adequate State Entropy™ (dotted arrow)

closed. Withdrawal of 5 ml air from the cuff did not alter the position of vocal cords. Any other large airway obstruction was ruled out by FOB view till the main bronchi. Change in neck position, namely, sniffing position with chin lift, flexion or rotation failed to relieve obstruction. Therefore, PLMA was removed and a 7.5 mm endotracheal tube secured. P_{aw} was 26 cmH₂O and ET-CO₂ < 40 mmHg soon after. Surgery was completed successfully. The PLMA cuff showed no abnormality in shape or size when inflated to 30 ml. On further enquiry, we realised that the PLMA was used ≈ 70 times. An indirect laryngoscopy performed 6 h postoperatively revealed no abnormalities.

PLMA provides a safe airway for controlled ventilation including laparoscopic procedures.^[1] The incidence of mechanical vocal cord closure in paralysed patients is about 0.4%.^[2] It is reported that the PLMA cuff compresses the laryngeal inlet anteroposteriorly and reduces the tension of the vocal cords.^[2] This allows the arytenoids to rotate inwards and the vocal cords to close. Withdrawing air from the cuff and assuming sniffing position may reduce this compressive force relieving obstruction. Mechanical closure of the vocal cords has been reported with the classic-LMA while using cricoid pressure^[3] and 'Airway Management Device'.^[4] Similar problem in two unparalysed patients was relieved by administration of neuromuscular blocking agent,^[5] and the LMA itself may not be the culprit in them.

The pathogenesis of airway obstruction in our patient is most likely mechanical rather than physiological. The overused PLMA might have exerted more pressure on the laryngeal inlet because of the weakening of the cuff. Furthermore, the larger distal cuff may compress the laryngeal inlet. The steep Trendelenburg position and

capnoperitoneum might have pushed the trachea and larynx cephalad against the PLMA causing closure of the glottic aperture which was not relieved by manipulation of the head and neck position. This report highlights the possibility of an airway obstruction with PLMA due to mechanical causes even in paralysed patients.

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Conflicts of interest

There are no conflicts of interest.

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