

## Common source but a rare cause for intraoperative breathing circuit leak: Every anaesthesiologist should be aware of

Sir,

A 60-year-old American Society of Anaesthesiologists physical status II patient was posted for laparoscopic cholecystectomy. After protocolised anaesthesia machine check and preoxygenation using closed circuit, patient was induced and intubated. Correct placement of endotracheal tube (ETT) was confirmed with square wave capnography in bag mode. Circuit was switched to ventilator mode with fresh gas flows (FGF) of 2 L/min. Good square wave capnography was seen. A number 16 French nasogastric (NG) tube insertion was passed freely with minimal resistance. The NG tube insertion produced gurgling noise and on suctioning it was negative for gastric contents. Subsequently, we noticed inadequate filling of ventilator bellows.

Immediately, we increased the FGF to 6 L/min and simultaneously searched for the source of leak from all parts of the circle system. The capnography trace was unsatisfactory and expiratory tidal volume was displayed as 25% of set tidal volume. The circuit was changed to manual mode, but the leak persisted. Cause for the circuit leak at patient end was ruled out by reconfirming the position and cuff pressure of ETT. The patient was shifted to Bain breathing system, with FGF of 8 L/min. Oxygenation and capnography were satisfactory and hence, we proceeded with the surgery. Since the machine and circuit were assessed to be leak proof, we were suspicious about the NG tube position. We inserted the open end of NG tube into a water seal and noticed the gas bubbles escaping cyclically with respiration. When the open end of the NG tube was closed, the circle system was delivering the set tidal volume with normal square wave capnography. Thus we confirmed the source of circuit leak to be the NG tube malposition. Direct laryngoscopy confirmed the passage of the NG tube through the glottis, and it was removed. Extubation and postoperative period was uneventful.

Nasogastric tube is normally inserted after induction and intubation in elective surgeries. In the present

case, after the NG tube insertion, the 'circuit leak' was recognised by the workstation sensors within few breaths, which diverted our focus to ensure adequate oxygenation and ventilation, rather than checking the NG tube position. The higher FGF used in Bain breathing system masked the circuit leak. NG tube malposition is associated with significant morbidity and mortality in intensive care unit.<sup>[1]</sup> The reported incidence of NG tube malposition into the tracheobronchial tree is reported to be 2%.<sup>[2]</sup>

Most of the complications due to malpositioning are related to feeding which is unlikely in the intra-operative period. Hence, the reported incidence of NG tube malposition in the intraoperative period are limited.<sup>[3]</sup> Direct laryngoscopy can help in identifying the relationship of the NG tube with the ET tube; radiological confirmation of the NG tube tip within the stomach shadow is confirmatory, which is not always feasible during the intra-operative period. Fuchs *et al.* mention the increase in cuff pressure as one of the non-radiological methods of confirming the malposition of NG tube into the trachea.<sup>[4]</sup>

The check for circuit leak should not end with the assessment of ET tube (correct tip position, cuff position and pressure). It should be extended to rule out NG tube malposition, especially when the circuit leak occurs immediately after its insertion. Inserting NG tube under direct vision using laryngoscopy could have prevented this complication. Routine protocolised anaesthesia machine check-up, back up ventilator equipments, prompt recognition of the problem and seeking help earlier would be safe.

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