

## A rare cause of intraoral endotracheal tube kinking in obstructive hydrocephalus

Dear Editor,

Intraoral kinking of an endotracheal tube (ETT) is a life-threatening event difficult to anticipate and manage, considering the restricted access to the airway, especially during the surgery of the head-neck region. We report a patient of obstructive hydrocephalus, presenting with intraoral impingement of ETT by a prominent molar during the intraoperative period.

A 58-year-old male, diagnosed with obstructive hydrocephalus of post-meningitis etiology, was posted for emergency ventriculoperitoneal shunt surgery under general anesthesia. He had received treatment for bacterial meningitis in the preceding weeks, and subsequently developed sudden deterioration in consciousness (Glasgow coma score: 13 to 9) over 2 hours. The computed tomography scan revealed significant enlargement of lateral and third ventricles, with mild reduction of the extra-axial spaces.

After standard general anesthesia induction, the patient was intubated with 8.5 mm size poly-vinyl-chloride (PVC) ETT (Cormack–Lehane grade 1). The position of ETT was confirmed by capnography tracing and bilaterally equal air entry in the chest. The ETT was secured at a 22 cm mark, measured at his angle-of-mouth. The invasive mechanical ventilation (volume-controlled mode) was initiated under the standard ventilatory parameters, adjusted further to maintain the end-tidal carbon dioxide (ETCO<sub>2</sub>) levels between 30–35 mm Hg. The patient was kept in a supine position with a head tilt to the left side. Anesthesia was maintained with sevoflurane (0.5–1%), and air/oxygen combination (3:2). Just before surgical incision, we observed a sudden peaking of inspiratory pressure (42–54 cm H<sub>2</sub>O), decreased exhaled tidal volume (TV: 100–140 ml), and raised ETCO<sub>2</sub> (52–56 mm Hg). On chest auscultation, bilaterally air entry was grossly diminished with no added sounds. Bronchodilator therapy was administered but it showed no improvement. Anticipating an obstruction in ETT or ventilator tubing, we examined the whole extraoral circuit, but it was patent. The patient was immediately switched over to manual ventilation with a resuscitation bag, but a significant airway resistance was felt. The ultrasound chest was non-contributory, except for bilaterally diminished lung sliding. We introduced a 12-French suction catheter

into the ETT, but it met resistance, and could not be passed. A suctioning was performed through the catheter, but no aspirate came out. Meanwhile, the ETCO<sub>2</sub> reached a level of 70 mm Hg, the TV further decreased to 40–60 ml, and air entry could not be heard on chest auscultation. The flexible fiberoptic bronchoscopy was avoided in the first hand as it is time-consuming, and has an added risk of mucous plug dislodgement into the lower airway.<sup>[1]</sup> Hence, we performed a direct laryngoscopy to exchange the ETT in anticipation of an impacted mucous plug. But on intra-oral examination, we found a kinked ETT (at 17 cm mark) getting impinged on its concave side by a prominent molar [Figure 1]. Immediately, we replaced the PVC-ETT with a reinforced ETT, and subsequently, all the ventilatory parameters returned to normal limits. The rest of the perioperative period remained uneventful.

An ETT confers a patent airway for ventilation. But, at times it can be precarious equipment. An obstructed ETT can cause catastrophic consequences like hypoxemia, hypercapnia, acidosis, pulmonary edema, and even cardiorespiratory arrest.<sup>[2]</sup> The potential causes for ETT blockade include thermal softening, mucous plugs, herniated cuffs, external pressure, malalignment, or manufacturing defects, etc.<sup>[1-4]</sup> Factors affecting the ETT kinking includes its outer diameter and its constituent material. The ETTs are primarily made up of PVC with added plasticizers to make it flexible, while still maintaining its mechanical strength.<sup>[5]</sup> While PVC tubes are sturdy at room temperature, they tend to soften steadily as the temperature rises. Though the difference between room and body temperature is just 10–15°C, it is sufficient to soften the ETT while *in situ* within the trachea. This makes it prone to distortion at acute angles, usually



**Figure 1:** Kinking of endotracheal tube by a prominent molar inside the oral cavity

kinking at a mark 18 cm from the tube tip, concealed inside the oral cavity.<sup>[4]</sup> Although the previous literature has documented few reports, ETT impingement by a prominent molar secondary to thermal softening has been a rare phenomenon.<sup>[1-4]</sup>

This case highlights the importance of vigilant anticipation and meticulous troubleshooting in early identification and management of intraoperative ETT kinking. The other preventive steps include the thorough dental work-up, the use of transparent surgical drapes to easily visualize ETT, using a reinforced ETT, pre-use anesthetic check, and ETT examination for any manufacturing defects.

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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### Conflicts of interest

There are no conflicts of interest.

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## References

1. Sudhir V, Ganne SU, Byrappa V. Unexpected intraoperative airway obstruction in a patient with mild head injury. *J Neurosurg Anesthesiol* 2013;25:219-20.
2. Bharti N, Bala I. Kinking of endotracheal tube during posterior fossa surgery. *Indian J Anaesth* 2010;54:172-3.
3. Choi E, Cho HS, Lee JW. Intraoperative airway obstruction from a whole dissection of the inner wall of a reinforced endotracheal tube. *Korean J Anesthesiol* 2013;65:585-6.
4. Hübler M, Petrasch F. Intraoperative kinking of polyvinyl endotracheal tubes. *Anesth Analg* 2006;103:1601-2.
5. Morton. WJ, Muller CT, Goodwin N, Wilkes AR, Hall JE. Investigation of phthalate release from tracheal tubes. *Anaesthesia* 2013;68:377-81.

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