Difficult Ventilation in an Infant After Successful Intubation

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Abstract: Manufacturing defects in the connector of the endotracheal tube are not frequently encountered in emergency and planned intubations. Manufacturing defects in the connector of the endotracheal tube also cause partial or complete airway obstruction, resulting in a life-threatening condition following intubation in a sick infant with limited reserves. For this reason, an endotracheal tube must be checked carefully before its use. The authors believe that passing a stylet through the tube to check for a defect in the tube lumen or tube connector must be included in routine check of an endotracheal tube. The current report presents a patient who experienced a complete airway obstruction following intubation due to a manufacturing defect in the connector of the endotracheal tube.

Keywords: Endotracheal tube connector, manufacturing defect, airway obstruction, case report

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Introduction

Endotracheal intubation is important in securing the patency of the airway when spontaneous breathing is not sufficient. The breathing machine to be connected to the patient, the breathing circuit, and the lumen and the connector of the endotracheal must be checked before an intubation attempt because the inability to ventilate the patient following endotracheal intubation is a life-threatening condition.

The inability to ventilate the patient after successful endotracheal intubation has various causes related to the patient (pneumothorax, bronchospasm, chest wall rigidity, endobronchial mass), the endotracheal tube (kinking of the tube, obstruction in the tube lumen), and the breathing circuit (detachment in the breathing circuit, obstruction in the breathing circuit) (1,2). The current report presents a pediatric patient who could be intubated but could not be ventilated following endotracheal intubation due to a total obstruction in the airway caused by a manufacturing defect in the connector of the endotracheal tube.

Case Report

A 67-day-old male infant weighing 4,100 grams and diagnosed with transcobalamin defect, metabolic syndrome, ventriculomegaly, hydrocephalus, hypertension, patent foramen ovale, atrial septal defect, and refractory epilepsy, was scheduled by neurosurgeons to undergo ventriculoperitoneal shunt insertion under general anesthesia. Physical examination before surgery did not reveal an upper respiratory tract infection or breathing difficulty. On pre-anesthetic assessment, the ASA score was 3, the vital signs were within normal ranges, mouth opening was sufficient, and the thyromental distance was 2 cm. The patient was moved to the operating room following a 6-hour fasting period. An electrocardiogram was obtained, and non-invasive blood pressure and peripheral oxygen saturation were monitored. The patient was administered a mixture of sevoflurane and oxygen via a face mask;
under inhalation anesthesia, a venous line was installed on the dorsum of hand using a 24-G intravenous cannula, and the anesthesia was induced by the administration of midazolam 0.1 mg/kg, fentanyl 1 mcg/kg, and rocuronium 0.5 mg/kg. The patient was intubated using a cuffed endotracheal tube size 3. However, no air entry into the lungs and even the stomach was observed while manually ventilating the patient using the anesthesia balloon. The endotracheal tube was withdrawn, and the ventilation was continued with anesthesia mask because no air entry into the lungs and the stomach was heard on auscultation, normal capnography waveform was absent, and there was an increase in peak airway pressure. The endotracheal tube was examined after removal; the idea of passing a stylet through the endotracheal tube has emerged to understand whether there was a defect in the tube lumen. It was, however, realized that the connector of the endotracheal tube was totally obstructed while attempting to pass a stylet through the endotracheal tube (Figure 1). The patient was re-intubated using another cuffed endotracheal tube size 3. Upon ventilation of the patient by the anesthesia balloon, air entry into the lungs and capnogram waveform were observed, and the tube was anchored at 10 cm while both lungs were equally ventilated. No problems occurred in the intraoperative and postoperative periods.
Figure 1

Discussion

Endotracheal tube defect is one of the causes of resistance to the inflation of the anesthesia balloon in manual ventilation and a constant increase in the inspiratory pressures after successful endotracheal intubation (3). The defects in the endotracheal tube connector may cause a partial (4-10) or a complete airway obstruction (3,11). Our literature review has shown that other authors have used checking the tube inside the mouth using a laryngoscope (3, 4, 9), aspiration of the tube lumen (3,4,5,7,8,10), and extubation and re-intubation (9-11) in patients who could not be ventilated sufficiently following successful intubation. The repetition of such invasive procedures can be avoided by a detailed examination of the endotracheal tube.

Table 1

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The manufacturing defects in the endotracheal tubes are not common and can be overlooked during an examination before an intubation attempt. A metallic flap narrowing the tube lumen had been observed when the connector of the endotracheal tubes used to be manufactured from aluminum, and checking the endotracheal tube connector had been recommended before intubation attempt (12). Interestingly, our literature search found only one pediatric case report in which the defect in the endotracheal tube connector could be noticed during a check before intubation. In other reported cases, the endotracheal tube connector defect has been noticed only after performing the intubation procedure. It must be kept in mind that difficulty in ventilating despite successful intubation can be life-threatening in a pediatric patient with poor general condition requiring an emergency intubation.

Conclusion

The cuff of the endotracheal tube is routinely checked before intubation, but the authors consider that passing a stylet through the endotracheal tube must also be routinely used to check whether there is a defect in the tube lumen or the tube connector.

Informed Consent: Obtained written informed consent from the parents of the patients who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – K.E.S., C.S.O.; Design – K.E.S., C.S.O.;

Conflict of Interest: The authors have no conflicts of interest to declare.

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Main Points

- Control of the endotracheal tube is important during the preparation for intubation.
- Should check the cuff of the endotracheal tube by inflating it with a syringe.
- Visual inspection of the endotracheal tube connector and the lumen of the endotracheal tube is also vital

References


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3- Praneeth, J. A Rare Scenario of Can Intubate Cant Ventilate. doi:10.9790/0853-1804196465


10- Malde AD, Jain RA. Problems, ETT obstruction and breathing circuit malfunction. If ruled out, one should not forget to look for rare causes like defective connector. Indian Journal of Anaesthesia. 2014;58(1). doi:10.4103/0019-5049.126842


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Table

Table 1- Defects in the endotracheal tube connector in the literature

<table>
<thead>
<tr>
<th>References</th>
<th>Age of patient</th>
<th>Operation</th>
<th>Endotracheal tube connector (ETTc) defect site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evren Sahin et al</td>
<td>67 day</td>
<td>Ventriculoperitoneal shunt</td>
<td>Completely obstructed ETTc</td>
</tr>
<tr>
<td>Praneeth J et al</td>
<td>12 years</td>
<td>Bilateral adenotonsillectomy</td>
<td>Completely obstructed ETTc</td>
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<tr>
<td>Dwivedi et al</td>
<td>3 month</td>
<td>Pyeloplasty</td>
<td>Pinhole opening in an ETTc</td>
</tr>
<tr>
<td>Sethi et al</td>
<td>3 month</td>
<td>Emergency arthrotymia</td>
<td>The narrow lumen ETTc</td>
</tr>
<tr>
<td>Kumar et al</td>
<td>5 month</td>
<td>Cleft lip and palate repair</td>
<td>The narrow lumen ETTc</td>
</tr>
<tr>
<td>Jain et al</td>
<td>7 month</td>
<td>Bilateral inguinal herniotomy</td>
<td>The narrow orifice ETTc</td>
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<tr>
<td>Jain et al</td>
<td>3 years</td>
<td>Percutaneous cystolithotripsy</td>
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<tr>
<td>Shamshery et al</td>
<td>1 month</td>
<td>Pyloromyotomi</td>
<td>Obliteration in the ETTc</td>
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<tr>
<td>Malde et al</td>
<td>2 years</td>
<td>Laparotomy</td>
<td>Membranous diaphragm in the distal end of the ETTc</td>
</tr>
<tr>
<td>Singhal et al</td>
<td>8 month</td>
<td>Inguinal herniotomy</td>
<td>Completely obstructed ETTc</td>
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</table>
Figure Legends

Figure 1 - Endotracheal tube connector lumen completely closed