Dissection of the wired endotracheal tube’s lumen during general anesthesia: a case report

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Abstract
Objective: The aim of this study is to report a case of a clinically significant obstruction during mechanical ventilation caused by the dissection of the wired endotracheal tube’s lumen during general anesthesia in a pediatric patient.

Case report: A 12-years old patient undergoing general anesthesia for open appendectomy was intubated with a wired endotracheal tube and difficult removal of the guide. After starting the mechanical ventilation, there was increased expiratory fraction of CO₂ and need for increased inspiratory pressure. Chance of complications with higher incidences were raised and treated unsuccessfully. Finally, during patient reintubation, the dissection of the endotracheal tube lumen was observed, and ventilation was restored to normal.

Conclusion: Anesthesia involves numerous possible complications. Suspicion and constant vigilance are essential for early diagnosis and treatment of any threat to the individual integrity. This case is relevant for emphasizing a possible very rare complication related to airway, which can quickly cause hypoxia and irreversible damage. Thus, this case contributes to the detection of this complication more frequently.

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Dissecção de lúmen de tubo endotraqueal aramado durante anestesia geral: relato de caso

Resumo
Objetivo: Relatar um caso de obstrução à ventilação mecânica clinicamente significativa causada por dissecção do lúmen do tubo endotraqueal aramado durante anestesia geral em um paciente pediátrico.

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Introduction

Tracheal intubation in general anesthesia is an essential technique for numerous surgical procedures. Airway protection and mechanical ventilation enable the safe administration of anesthetics to ensure adequate hypnosis, pain inhibition, and muscle relaxation.\(^1\)

However, the use of this technique depends on the correct operation of a set of equipment and materials related to the anesthesia. Any defect in any of these materials can compromise the intubation technique and determine a potentially tragic event due to ventilation problem and airway protection. Defects may appear anywhere on the ventilator (bellow, corrugated pipe, capnography, gas input) and endotracheal tube (mucus, foreign body, kinking, cuff herniation or leakage). Because the problem manifestation is common to several clinical complications, it is often not readily identified and corrected, which leads to rapid deterioration of respiratory symptoms and may lead to death.\(^2\)

We report an uncommon case of deformity and obstruction of the wired endotracheal tube caused by a very difficult removal of the guide wire inserted into the tube.

Case report

Male patient, 12 years old, 35 kg, referred to the operation room (OR) by the emergency service to receive an open appendectomy. He arrived at the OR accompanied by his mother who denied allergies, comorbidities or regular use of medications. Patient’s physical status ASA I, HR 110 bpm, blood pressure (BP) 108 \(\times\) 52 mmHg, \(\text{SpO}_2\) 96% in room air; good general condition normal skin color, mild dehydration, eupneic, lucid and oriented. Regarding airway, he had appropriate mouth opening and neck mobility (Mallampati I).

Intravenous infusion was made in left arm with Jelco 20G. After intravenous induction with fentanyl (250 mcg), lidocaine (20 mg), propofol (110 mg) and cisatracurium (7 mg), ventilation under face mask was started.

\textit{Relato:} Paciente de 12 anos submetido à anestesia gera para apendicectomia aberta foi intubado com tubo endotraqueal aramado e retirada de guia do tubo difícil. Após iniciar a ventilação mecânica houve aumento da fração expiratória de \(\text{CO}_2\) e necessidade de aumento da pressão inspiratória. Hipóteses de complicações com maiores incidências foram aventadas e tratadas sem sucesso. Finalmente, ao reintubar o doente, foi verificada dissecção do lúmen do tubo endotraqueal e a ventilação foi restaurada à normalidade.

\textit{Conclusão:} O ato anestésico envolve inúmeras possíveis complicações. A suspeição e a vigilância constantes são essenciais para diagnosticar e tratar precipitadamente qualquer aameça à integridade do indivíduo. O presente caso é relevante por enfatizar uma possível complicaçãomuito incomum relacionada às vias aéreas capaz de causar hipóxia e danos irreversíveis rapidamente. Dessa forma, o caso contribui para que essa intercorrência seja detectada com maior frequência.

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After intubation with the help of a Macintosh curved blade #3 and the introduction of the wired endotracheal tube (ETT) #6, the tube guide was removed with great difficulty (Fig. 1). The cuff was inflated and confirmed the position by symmetrical bilateral auscultation and compatible capnographic curve.

Coupled to the automatic mechanical ventilator in the PCV mode, the inspired pressure was 17 cmH\(_2\)O at respiratory rate (RR) 16 rpm and positive end expiratory pressure (PEEP) 5 cmH\(_2\)O, FiO\(_2\) 40% with 3% sevoflurane. After 20 min, a tidal volume of 120 mL was seen. Therefore, the inspired pressure was increased to 25 cmH\(_2\)O to obtain a tidal volume of 280 mL. Subsequently, the gas analyzer indicated increasing rate of ETCO\(_2\) up to 68 mmHg. Symmetrical and bilateral auscultation was performed, with reduction of murmurs. Administration of ketamine IV (25 mg), did not change the ventilatory pattern. RR was reduced to 10 rpm and a ratio of 1:5 in expiratory time.

After collecting arterial blood gases, intravenous propofol (50 mg) was administered as well as an increasing fraction of inspired sevoflurane. At that point, BP was 97 \(\times\) 54 mmHg. Arterial blood gas measurement showed pH 7.2; P\(\text{CO}_2\) 56.6 mmHg; HCO\(_3^-\) 22.3; Hb 10.7; Na\(^+\) 143; K\(^+\) 3.9; Cl\(^-\) 101; Ca\(^{2+}\) 0.7.

It was decided to change the endotracheal tube to another wired #6. Intubation was performed with no difficulties. The patient was coupled to the ventilator in PCV.
Dissection of the wired endotracheal tube's lumen during general anesthesia

Inadequate dissection of the wired endotracheal tube (ETT) is a rare complication, with reported cases involving the inner wall of a wired ETT after its reuse. It has been observed that the respiratory system's response to bronchospasm treatment, with a decrease in the intrapulmonary tidal volume and an increase in the respiratory rate, may be worsened by the use of a wired ETT. This is because the wired ETT often has an irregular lumen, which can cause ventilation difficulties and related complications.

A study by Mercanoglu et al. reported a case of dissection of the inner wall of a wired ETT after its reuse. They concluded that the resterilization and reuse of this material predisposed the reported complications. Based on published data, as well as on this report, measures for bronchospasm treatment were initiated with unsatisfactory results. They opted for exchanging the ETT and the returning to the parameters prior to tube dissection.

In the case described here, there was no immediate suspicion of the wired tube inner wall dissection. Thus, as soon as the patient began to show symptoms of bronchospasm that were treated with deeper anesthesia, administration of vasodilators, and ventilator adjustment with lower respiratory rate and increased expiratory time. After these measures and with no reversal of symptoms, it was decided to change the disposable wired endotracheal tube. Only after inspection of this device, it was noted that its inner walls were dissected.

Among the possible causes reported in the literature, the wired tube dissection may occur due to the reuse or resterilization of the device. Once the aforementioned situations do not apply to this case report, it can be assumed that there was quality control problems in the manufacture of the endotracheal tube.

Conclusion

Knowledge of possible complications, such as the one presented in this report, as well as careful evaluation of patients and routine making the anesthetic-surgical checklist enables doctors to predict unwanted situations and allows immediate intervention to decrease repercussions imposing risk to the patient's life.

Conflicts of interest

The authors declare no conflicts of interest.

References
