



Airway obstruction by a folding metal rod within a Reinforced Oral tracheal Tube: Case Report

Claudio Luciano Franck,¹ Samuel da Rosa Sousa,² Guilherme Voltolini,² Raquel Jardim de Melo,³ Isabela Picolotto Moraes⁴

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Abstract

The Reinforced Orotracheal Tube (ROT) is an airway device for intubation that allows invasive ventilation during general anesthesia. The ROT differs from a Conventional Endotracheal Tube (CET) by the presence of a stainless-steel spiral, which strengthens the wall and hinders collapse.

The ROT can be used when there is a risk of obstructing the flow of gases through compression or elbowing of the endotracheal tube, during orofacial surgical procedures, neurosurgery or in non-supine surgical positions under deep general anesthesia. The metallic spiral, which reinforces the lumen of this endotracheal tube, is subject to damage and deformities that can compromise the permeability of its lumen.

The ROT should be used only during the surgical procedure under deep general anesthesia. If there is a need for the permanence of orotracheal intubation in the postoperative period of patients referred to the intensive care unit, the ROT should be replaced by the polyvinyl chloride CET, given the risk of damage to the ROT due to bites with fracture of the metal rod and obstruction by folding, as in this case, which will be reported below.

The rarity of similar reports in the literature and the severity of obstruction of an endotracheal tube causing severe hypoxemic disorders, guided the objective of this case report, which aims to guide preventive and resolving measures, in addition to including to the list of diagnoses of causes of acute obstructions of an endotracheal tube.

Keywords: Airway obstruction; Armoured tube; intubation: mechanical ventilation.

Authors:

1-MD, PhD. Faculdade Evangélica Mackenzie do Paraná, Hospital Universitário Evangélico Mackenzie, Brazil

2-MD, Hospital e Maternidade São José dos Pinhais, Brazil

3-MD, Hospital Universitário Evangélico Mackenzie, Brazil

4-MD. Hospital das Clínicas da Universidade Federal do Paraná, Brazil

Corresponding author: claudiolfranck@hotmail.com

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Case report

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Male patient, 67 years old, with American Society of Anesthesiologists (ASA) physical status classification system II, Mallampati classification score III, submitted to left nephrectomy in the right lateral decubitus position. After anesthetic induction, during laryngoscopy, glottal visualization 3A of the Cormack-Lehane classification was verified. It was carried out with difficulty and with the help of a Bougie gum-elastic conductive guide, which allowed the introduction of a ROT number 7.5 (ROT-7.5). After completion of the procedure, the patient was referred to the Intensive Care Unit with ROT, and remained under sedation with RASS-2 until the tenth day, when he presented asynchrony with the ventilator, reduced tidal volume and oxygen desaturation.

Maneuvers were started to clear the ROT with the hypothesis of corking. The introduction of the suction probe stopped progressing through the internal lumen of the ROT when it reached the place where it was in contact with the teeth.

The impossibility of progressing the suction probe associated with progressive desaturation, led us to the option of removing the ROT and performing laryngoscopy to re-intubate with a CET, which resolved the problem in question.

In the evaluation of the ROT, there was a rupture of the metal rod, exactly at the point of contact with the dental arch (Figure 1), possibly related to repeated bites, which determined the proximal detachment of the rod and its folding (Figure 2) in the internal light of the ROT-7.5 after two centimeters with consequent obstruction of its lumen. The use of ROT is restricted to the trans operative period under deep general anesthesia, in surgeries with risk of compression or elbow. The ROT should be replaced with a conventional endotracheal tube,

if it is necessary to remain intubated in the postoperative period, due to the risk of damage to its metal rod, which causes obstruction with increased morbidity.

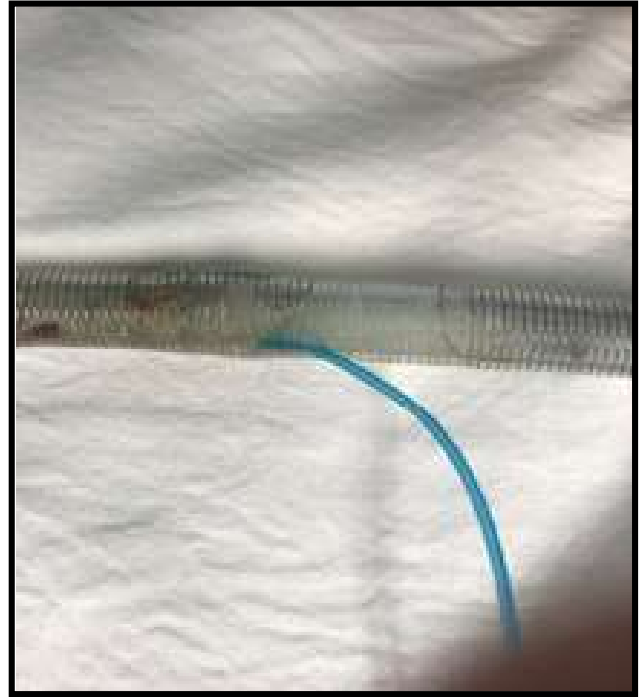


Figure 1 ROT with the fracture of the metal rod



Figure 2 ROT with the wall cut by a scalpel blade to demonstrate the folding of the metal rod.

Discussion

General anesthesia is performed with intubations with disposable Endotracheal tubes to allow the ventilator to be connected to the airways and maintain adequate patient ventilation throughout the procedure. In some situations, the CET may be at risk of folding, obstructing the air flow.¹

Some surgeries require endotracheal tubes with greater resistance to folding and as an option there is ROT.² ROT is used in situations where there is a risk of obstruction or compression of the endotracheal tube, such as head and neck surgery, neurosurgery or non-supine surgical positions,³ although the procedure in question was a nephrectomy performed in the right lateral decubitus position.

The ROT is reinforced by a metallic spiral internalized in the extension of the tube wall by the material used in the manufacture, be it rubber, polyvinyl chloride, latex or silicone.⁴ The stainless-steel spiral minimizes the possibility of bending and elbowing, however specific complications related to the metallic spiral that reinforces the lumen of this endotracheal tube can occur and determine its occlusion.

The knowledge of this possibility can foresee effective and resolute measures avoiding hypoxia, hypercapnia, pneumothorax and pulmonary edema.³ The increase in airway pressure, a positive deflection in the inspiratory phase of capnography, hypoxia are predictive that can aid the diagnosis, which can be proven by the impossibility of passing the suction tube through the wire tube, promoting the maneuvers of changing the endotracheal tube in an adequate time.⁵

The fracture of the metal rod can lead to respiratory failure due to obstruction of the ROT and in addition the rod can detach and migrate through the distal orifice of the ROT to lodge in the bronchi with the capacity to produce perforating lesions in its wall.⁶

In this study the fracture occurred only in the proximal portion of the nail. The characteristics of the ROT indicate a reduced risk of bending the tube due to the spiral-wound reinforcement wire, but it doesn't prevent the risks of obstruction by compression and collapse of the lumen, which due to the two characteristics can be irreversible.⁷ Biting is one of the main reasons for damage to ROT and the presence of the wired spiral does not protect against chewing movements during extubation.

The use of the Guedel cannula during the reversal of neuromuscular block may decrease the risk of tube breakage and obstruction,⁸ although it can more rarely occur in the trans operative period under deep anesthesia.⁹

Postoperatively in patients intubated by oral route, the wired endotracheal tube should be replaced by the conventional polyvinyl chloride endotracheal tube to prevent partial or total airway obstruction that can be caused by bites.¹⁰

The deformity of the ROT with a reduction in its internal caliber, generates obstruction of ventilation with a sudden increase in inspiratory pressures with expiratory fraction of CO₂,¹¹ and complications such as hypoxia, negative pressure pulmonary edema, increased intracranial pressure and increased blood pressure.⁵

In this present study, the reduction in tidal volume and hypoxemia were relevant. Obstruction with the use of ROT can occur for other reasons, such as the dissection of the internal plastic layers by airflow, forming bubbles that can block the lumen of the cannula. This complication is usually associated with the use of nitrous oxide.¹²

Wired endotracheal tubes are not recommended in intensive care, but in oral surgeries there may be edema of the structures, which prevents or makes it difficult to change ROT at the end of the procedure.¹³

In the case in question, the anesthetic team reported difficulties during oral intubation, but

there was no edema in upper airway structures, a fact that would not prevent its exchange. The knowledge of the possible complications of ROT allows the early diagnosis of the problem.

The increase in pressure in the airways, a positive deflection in the inspiratory phase of capnography and desaturation are predictive, which together with the impossibility of passing the suction catheter through ROT confirm the diagnosis and allow in a timely manner to perform the maneuvers for endotracheal tube replacement.⁵

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