



REVISTA BRASILEIRA DE ANESTESIOLOGIA

Official Publication of the Brazilian Society of Anesthesiology
www.sba.com.br



MISCELLANEOUS

The Dissection of Reinforced Endotracheal Tube Internal Wall causing Intraoperative Airway Obstruction under General Anesthesia. Case Report.

Esra Mercanoglu* ¹, Derya Topuz ², Nur Kaya ³,

1. MD; DESA; Zonguldak Ataturk Government Hospital, Anesthesiology and Reanimation Department, Zonguldak, Turkey

2. MD; Zonguldak Gynecology and Pediatrics Government Hospital, Anesthesiology Department, Zonguldak, Turkey

3. MD, Associate Professor; Uludag University Medical Faculty, Anesthesiology and Reanimation Department, Bursa

Received from Zonguldak Ataturk Government Hospital, Anesthesiology and Reanimation Department, Zonguldak, Turkey.

Submitted on May 31, 2012. Approved on July 9, 2012.

Keywords:

Endotracheal tube;
Inner wall dissection;
Case report;
General anesthesia.

Abstract

Endotracheal intubation is performed to establish a secure airway. However, this carries its risks and obstruction of an endotracheal tube (ETT) is a potentially life-threatening event. We report two cases with an obstruction of the resterilized, single use, spiral, reinforced endotracheal tubes by dissection of the internal wall. As a conclusion, we suggest not reusing and resterilizing single tubes in these cases to avoid a complication like dissection of the internal wall of the tube, as this has been the main cause.

© 2013 Sociedade Brasileira de Anestesiologia. Published by Elsevier Editora Ltda. All rights reserved.

Introduction

Endotracheal intubation is performed to establish a secure airway. However, this carries its risks and obstruction of an endotracheal tube (ETT) is a potentially life-threatening event ¹.

Obstruction of an ETT by mucus, blood, or a kink is not uncommon, whereas obstruction by a foreign body or an obstruction related to ETT - such as dissection of internal wall, herniation of the cuff, detachment - are rare events ¹.

Various causes like patients' respiratory diseases or positions during the operations, types of operations, some problems with anesthesia machines or equipments are associated with intraoperative ventilatory failure, but an acute endotracheal tube obstruction is difficult to quickly discern from other causes. Endotracheal tube obstruction may be caused not only by a foreign body but also equipment failure.

We hereby report two cases with an obstruction of the resterilized, single use, spiral, reinforced endotracheal tubes by dissection of the internal wall.

* Corresponding author: Department Anesthesiology. Institution Zonguldak Ataturk Government Hospital. U.U.T.F. Anesteziyoloji ve Reanimasyon A.D. Nilüfer Bursa
E-mail: esramercan76@yahoo.com

Case Reports

A 52-year-old man, ASA I, 81 kg, 182 cm height was scheduled for an elective tiroidectomy under general anesthesia after obtaining written consent. His prior history and physical examination were normal. After a premedication with 0.5 mg atropine and 10 mg diazepam via intramuscular route, anesthesia was induced with 5 mg.kg⁻¹ tiopental, 2 mcg.kg⁻¹ fentanyl and 0.6 mg.kg⁻¹ rocuronium bromide. Intubation was achieved without difficulty with 8.0 mm I.D. (Teleflex Medikal GmbH, Willy Rusch Kermen Germany) reesterilized spiral reinforced endotracheal tube. The operation began after the team gave the patient a suitable head extension position. They maintained anesthesia with 1 MAC sevoflurane and 1:1 mixture of O₂ and N₂O. Everything was stable with ETCO₂ 40 mm Hg, peak airway pressure 30 cm H₂O, SpO₂ %99 and other hemodynamic properties until a sudden increase of peak airway pressure up to 42 cm H₂O at the 130th minute of the operation. However, ETCO₂ and SpO₂ did not change at the beginning. Albuterol for bronchoconstriction and 1.5 mg.kg⁻¹ lidocaine for laryngospasm were administered but nothing changed. We confirmed the right position of the tube by auscultation of bilateral chests. Peak airway pressure was increasing very fast up to 50 cm H₂O and we found it very difficult to ventilate the patient. During this time, SpO₂ and ETCO₂ became lower very fast: down to 64% and 20 mm Hg, respectively. The shape of the capnography curve became smaller as a consequence of lowering ETCO₂ without changing its original form. We stopped N₂O at that point and FiO₂ became 100%. We inserted a suction catheter for a possible obstruction but it got stuck and did not progress. As soon as we exchanged the tube for another one all parameters quickly turned back to the baselines. After the operation, we administered 125 mg methylprednisolone to prevent edema. No other complications were observed till the end of the operation and the patient could be extubated.

The second case was a 25-year-old woman, ASA I, scheduled for an elective laparoscopic cholecystectomy after obtaining written consent. We premedicated her and induced general anesthesia with the same drugs as in the first case, intubating with reesterilized 7.5 mm I.D - same ETT type as the first case. We used sevoflurane MAC 1 to maintain general anaesthesia, but this time air was used instead of N₂O. All parameters were stable until patient was ventilated with difficulty, first mechanically then manually at the 45th min. At the same time, peak airway pressure was increased from 20 cm H₂O to 45 cm H₂O. This time, SpO₂ and ETCO₂ were stable. At first, a suction catheter was inserted to relieve the obstruction but it did not progress. As soon as we exchanged the ETT with another one, peak airway pressure returned to baseline and the patient could be ventilated. At the end of the operation, extubation could be performed with no complication.

After the two tubes had been inspected from the outside, almost 1.5 cm long oval shapes and little dissections were observed. As shown in the figures, there were air trapped under the wall of the tubes (Figures 1 and 2). And, once we observed the tubes from inside with video-assisted flexible



Figure 1. Wall of tube - air trapped.



Figure 2. Wall of tube - air trapped.

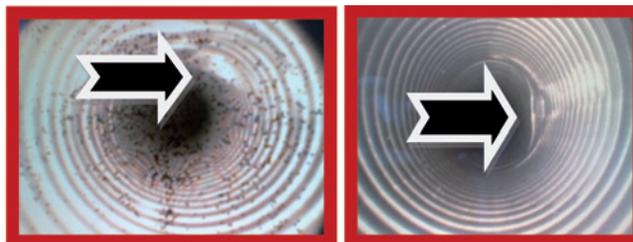


Figure 3. Dissection of the tubes between the spiral parts.

bronchoscopy, we observed dissection of the tubes between the spiral parts which was enough to obstruct the tubes, as seen in the images (Figure 3).

Once we assumed that the damage of the tube was due to faulty manufacture, we contacted the company regarding the tubes' complication. It appears that this complication was related to reesterilized and reused single-use tubes.

Discussion

Having an ETT in place does not guarantee a patient airway and the ETT itself may become a source of airway obstruction².

We experienced a very rare complication during general anesthesia such as the obstruction of the ETT by dissection of internal wall of the tube, with or without N₂O. Since there may be risk of gas diffusion into the wall of the tubes and repeated sterilization may increase the risk of developing bubbles and dissection, N₂O should be stopped³. If the peak airway pressure increases suddenly under general anesthesia, the recommended maneuvers are: suspicion of an obstruction of the tube, passing a suction catheter through the tube and performing a fiberoptic examination⁴. We could not perform fiberoptic bronchoscopy because we didn't have one available in the operating room at that time. Nonetheless, we could observe inside the ETT with flexible bronchoscopy.

Complications like ETT obstruction have been reported during anesthesia with the use of N₂O, or even without N₂O exposure, due to heat, ethylene oxide and glutaraldehyde solution and stretching of a reinforced endotracheal tube^{3,5-8}.

Rao et al.⁸ described an unusual case of obstruction of a reinforced ETT. The patient was intubated with a 9.0-mm nylon reinforced latex ETT (Safety-flex, Mallinckrodt®, Athlon, Ireland). They used N₂O and did not stop it as they did not mention the opposite. When they could not advance the suction catheter, they found out a partial obstruction in the tube. After they had replaced the tube, they could relieve the airway obstruction.

Tose et al.³ reported a case of obstruction of a reinforced ETT during laryngo microsurgery under total intravenous anesthesia. This case shows an obstruction complication that can be seen even without any anesthetic gases.

Jeon et al.⁹ reported an incident where there was dissection of a reinforced ETT that led to its partial obstruction. Their case also shows an unexpected complication from reusing products intended for single use.

Paul et al.⁷ reported an unusual case of ETT obstruction caused by a flap-like detachment of the inner coating from the spiral of a reinforced tube which acted like a valve, which is a different example of ETT obstruction from ours and other cases. Like us, they supported not reusing ETT and believe ETT reuse to be the main reason for similar complications.

In conclusion, to avoid a complication such as the dissection of the tube's internal wall, single tubes should not be reused and resterilized as these could be main causes.

References

1. Szekely SM, Webb RK, Williamson JA, Russell WJ - The Australian Incident Monitoring Study. Problems related to the endotracheal tube: an analysis of 2000 incident reports. *Anaesth Intensive Care*. 1993;21:611-616.
2. Hosking MP, Lennon RL, Warner MA et al. Endotracheal tube obstruction: recognition and management. *Mil Med*. 1989;154:489-491.
3. Tose R, Kubota T, Hirota K, Sakai T, Ishihara H, Matsuki A - Obstruction of a reinforced endotracheal tube due to dissection of internal tube wall during total intravenous anesthesia. *Masui*. 2003;52:1218-1220.
4. Stone DJ, Gal TJ - Airway management. In: Miller RD, ed. *Anesthesia*. New York: Churchill Livingstone, 2000;141451.
5. Populaire C, Robard S, Souron R - An armored endotracheal tube obstruction in a child. *Can J Anaesth*. 1989;36:331-332.
6. Kopp KH, Wehmer H - Nitrous oxide induced intraluminal tube obstruction during endotracheal intubation with armored tubes. *Anaesthesist*. 1981;30:577-579.
7. Paul M, Dueck M, Kampe S, Petzke F - Failure to detect an unusual obstruction in a reinforced endotracheal tube with fiberoptic examination. *Anesth Analg*. 2003;97:909-910.
8. Rao GS, Ali Z, Ramkiran S, Chandrasekhar HS - The dissection of a reinforced endotracheal tube causing nearfatal intraoperative airway obstruction. *Anesth Analg*. 2006;103:1624-1625.
9. Jeon YS, Kim YS, Joo JD et al. - Partial airway obstruction caused by dissection of a reinforced endotracheal tube. *Eur J Anaesthesiol*, 2007;24:978-986.