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Case Report
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Pitfalls in Ventilation Devices

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Abstract

Adequate ventilation is the greatest concern of all the anaesthesiologists. Any disturbance in the ventilation process could result in serious hazards: hypoxemia or barotrauma. Deficient devices are one of many causes of such derangements. Some of the typical complications of airway/ventilation tools are described extensively in textbooks, but many other uncommon events can still occur. We described two interesting cases of device-related ventilation inadequacy, hoping that acquaintance with such jeopardizes would be helpful in emergency situations for other colleagues.

Keywords: Heat and Moisture Exchanger filter, leak, obstruction, tube connector

Introduction

Ventilation devices are not failure proof; therefore, anaesthesiologists should be vigilant and check the correct performance of these devices. Breathing circuits, due to multiple parts and connections that they have, are prone to disconnections and malfunctions. There are handful of reports about foreign bodies stocked in tubes and tracts (1-3), kinking or twisting of tubes (4), or clot formation (5). Malfunctions related to the ventilation apparatus may be due to production pitfalls or user errors (6). Here, we report two rare cases of production error, which made difficulties in ventilation.

Case Presentations

Case 1

A 30-year-old otherwise healthy male patient transferred to the operating theater for aesthetic rhinoplasty surgery. Anaesthesia was induced uneventfully, and trachea was intubated using an 8-mm-inner-diameter armored endotracheal tube (ETT). The tube attached to a previously checked breathing circuit and ventilation was perfect. At this moment, the anaesthesia nurse informed us that the breathing circuit is actually a used one and should be replaced with a new one. We changed the tubing and connected the ETT to a new circuit. Immediately, the capnometric curve disappeared from the monitoring, airway pressure rose, and chest did not expand anymore; we disconnected the tubes and a self-inflating bag was used for ventilation, which was competent. On thorough inspection of tubes, we realized that the Y-piece has only one duct to just one tube, which was attached to the expiratory limb of the circuit, and the inspiratory tube of the circuit faced a literally dead end at the Y-piece. When we compared it with a normal Y-piece, the difference was obvious (Figures 1 and 2). After changing the tubes, surgery was done, and the patient emerged at the end of procedure without any problem. This experience was due to manufacturing mishaps, which was reported to the manufacturer.

Discussion

The circuit check before every anaesthesia is of great importance; since we changed the tubes after anaesthesia induction, checks were difficult to perform and, therefore, were neglected. The obstruction would have been picked up, had we checked the patency before connecting the circuit to the patient. The obstruction would be on the expiratory limb of the circuit and the risk of barotrauma and pneumothorax would have been increased if the tubes

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were connected reversely. Reports like this case emphasize the importance of checks and stepwise troubleshooting after providing patient's safety, which relies on the availability of self-inflating bags and other rescue devices.

Case 2

A 35-year-old male patient transferred to the operating theater for functional endoscopic sinus surgery by an otorhinolaryngologic surgeon. After an uneventful induction and tracheal intubation, the ETT was attached to a heat moisture exchange (HME) filter and ventilation provided by using intermittent positive pressure ventilation with 600 mL of tidal volume and resulted in peak inspiratory pressure (PIP) of 20 cmH_2O. Twenty minutes later, airway pressure dropped and the end-tidal CO_2 curve disappeared, for which we had suspicion toward disconnection. The patency of tubes was checked, and everything seemed intact, but manual ventilation with self-inflating bag with the HME filter in place revealed a leakage. On thorough inspection, the ridge of two plastic parts of the HME filter, which should be fitted together, was detached, and air was leaking through the gap (Figure 3). By replacing a new filter, everything came back to normal, and surgery continued to the end and patient emerged without any problem.

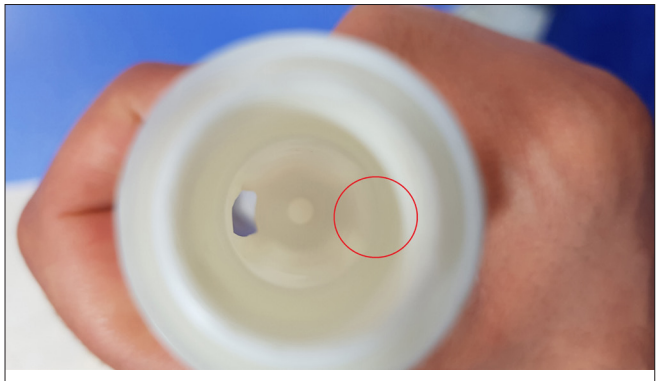

Figure 1. Absence of orifice (red ring)

Figure 2. Normal Y-piece with two orifices

Main Points:

- All devices related to airway management and patient ventilation must be checked before anaesthesia induction.
- Anaesthesiologist must be vigilant at any moment in operating theatre.
- Coordination between anaesthesiologist and anaesthesia nurse is critical and very important.

Discussion

There are a handful of articles reporting HME filter obstruction, which made ventilation difficult and resulted in misdiagnosis of bronchospasm (7, 8), but even in these cases with increased PIP, crack and cleavage has not been reported. The problem reported to the manufacturer to be solved for later products.

Every fitting in airway setting is prone to disconnection even inside a single device and must be checked in occasion of ventilation problems.

Conclusion

Anaesthesiologists' vigilance is the only means that can detect the errors and guarantee patient safety.

Figure 3. Cleavage of plastic fittings between two plastic parts of the HME filter
HME: heat and moisture exchange

Informed Consent: Written informed consent was obtained from patients who participated in this case.

Peer-review: Externally peer-reviewed.

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References

1. Chacon AC, Kuczkowski KM, Sanchez RA. Unusual case of breathing circuit obstruction: plastic packaging revisited. Anaesthesiology 2004; 100: 753. [Crossref]
2. Delroy-Buelles I, Girgis M. Obstruction in a breathing circuit. Anaesthesia 2013; 68: 429. [Crossref]
3. Sethi AK, Mohta M, Sharma P. Breathing circuit obstruction by a foreign body. Anaesth Intensive Care 2004; 32: 139-41.
4. Desai S, Torgal S, Rao R. Breathing circuit obstruction caused by kink in the reinforced kink-resistant circle system tube. Indian J Anaesth 2013; 57: 96-7. [Crossref]
5. Gopinath N, Bala I. Anaesthetic breathing circuit obstruction by a massive blood clot. Eur J Anaesthesiol 2005; 22: 562-3. [Crossref]
6. Yasar MA, Erhan ÖL, Bestas A, Avci L, Ezici M. An anaesthesia face mask with no lumen. Eur J Anaesthesiol 2005; 22: 561-2. [Crossref]
7. Kapoor H, Date A, Gujarkar K, Wagh H. Defective heat moisture exchange filter causing 'block' in anaesthesia breathing circuit. Indian J Anaesth 2016; 60: 66-8. [Crossref]
8. Reddy SC, Lim E. Unexpected airway obstruction due to oversaturation of a heat and moisture exchange filter. Anaesth Intensive Care. 2017; 45: 274.