
CASE REPORTS

Difficult endotracheal tube cuff deflation: an unusual observation

Sudeshna Bhar (Kundu)¹, Sampa Dutta Gupta², Tapas Ghose¹, Kanak Kanti Kundu², Manjushree Ray³ Assistant Professor¹, Associate Professor², Professor, Department of Anaesthesiology, Institute of Post Graduate Medical Education and Research, Kolkata.

**Corresponding author: sudeshna04cmc@yahoo.co.in*

We identified one cuffed endotracheal tube with malfunctioning inflation system. During pre-use testing of the cuff system of an endotracheal tube of internal diameter 5.5 mm, the cuff could be inflated normally. But it was not possible to deflate the cuff in spite of normal deflation of the pilot balloon. Such a condition could lead to the scenario of difficult extubation which could have been detrimental to the patient. Thus we put emphasis on the proper pre-use check of endotracheal tube before intubation.

Keywords: cuffed endotracheal tube, cuff deflation, pre use check

Introduction

Equipment malfunction is a problem of particular importance during anaesthesia and critical care. Difficulty in deflating the cuff of an endotracheal tube (ETT) during extubation may create a major problem. One of the common causes of difficult extubation is failure of the cuff to deflate¹. A case of difficult extubation due to inability to deflate the ETT cuff as a result of failure of pilot balloon assembly has been reported in the past². We present an unusual case of failure to deflate the cuff of an ETT after initial inflation of the same.

Case report

A 7 year old male patient with 22 kg body weight was posted for cervical lymph node biopsy at Paediatric operation theatre of IPGME&R, Kolkata. General anaesthesia and positive pressure ventilation using a cuffed ETT was planned for this patient. Anaesthesia machine, monitors and equipment for airway management were checked as a routine procedure. One PVC disposable cuffed ETT of 5.5 mm internal diameter of high volume and low pressure variety was subjected to routine pre-use testing. No abnormality was detected on inspection. After opening the sterile covering, the inflation tube and the pilot balloon was withdrawn aseptically. The cuff of the ETT was inflated with 5 ml of air using disposable

plastic syringe. Proper integrity of the inflation system was established as there was no obvious spontaneous deflation of the cuff.

After that, we tried to deflate the cuff by attaching the syringe to the inflation valve. We tried to aspirate air from the cuff, but failed to do so with several attempts. The cuff remained inflated, although the pilot balloon was deflated (Figure 1). Therefore, the ETT was discarded.



Figure 1: Pilot balloon remained deflated, but the cuff of the ETT could not be deflated.

A pressure manometer was attached to the pilot balloon to measure the pressure inside the pilot balloon. The pressure was found to be 0 cm of

H₂O, but the cuff was still inflated (Figure 2). We cut the inflation tube and inserted a needle attached with a syringe into the stump of the pilot tube. We were able to aspirate the air to deflate the cuff.



Figure 2: Pilot balloon was deflated and the pressure inside the pilot balloon was 0 cm H₂O, but the cuff of the ETT was still inflated.

Discussion

The purpose of the cuff system of the ETT is to provide a seal between the tube and tracheal wall³. But manufacturing defects of ETT are still encountered⁴.

The design of the inflation valve is such that when the tip of a syringe is inserted into it, a plunger is displaced from its seat. It allows entry of gas into the cuff. The valve gets sealed on removing the syringe so that gas cannot escape from the cuff and pilot balloon³. The plunger is again displaced from its seal when the syringe is reinserted for deflating the cuff. We identified one ETT with malfunctioning inflation system due to some manufacturing defect. In our case, the inflation valve was functioning properly as there was no problem in deflating the pilot balloon. But there was some defect in the inflation tube proximal to the pilot balloon. It was allowing the air to enter the cuff, but it was acting as a one-way valve and was preventing the air to escape from the cuff even when the syringe was attached to the inflation valve.

Normally the pilot balloon acts as a reliable indicator of the degree of distension of the cuff of the ETT. But in the case of faulty functioning of the inflation system, the pilot balloon will be deflated, but the cuff will remain inflated. So during extubation, pilot balloon will give an erroneous indication of cuff deflation. Thus, if this ETT was used without proper pre-use check, it would have resulted in a situation of difficult extubation. Removal of the ETT would be difficult due to persistent inflation of the cuff. On the other hand, forceful attempts at extubation would have resulted in damage to the vocal cords by the inflated cuff.

A common cause of difficult extubation is failure to deflate the cuff. In such cases, the cuff of the ETT can be deflated either by making a cut in the inflation tube or inserting a needle into the stump of the pilot tube cuff or puncturing through the cricothyroid membrane^{5,6}.

The aforementioned problems with difficult extubation may be overcome by simple pre-use testing of the cuff pilot balloon system. Thus we put emphasis on the need to check the integrity of the cuff system of ETT before endotracheal intubation when a new endotracheal tube is being used.

References

1. YVS, Mehandale SG, KSV. Difficult extubation – A Case Report. *Indian J. Anaesth.*2004;48(4):307-308.
2. Borkar S, Desai RA, Naik P, Gautam P. A Case of Difficult Extubation. *Indian J. Anaesth.*2008; **52** (1):83-84.
3. *Tracheal Tubes. Understanding Anesthesia Equipment*, fifth edition: Dorsch JA, Dorsch SE; Lippincott Williams & Wilkins 2008;557-671.
4. Sofi K, El-Gammal K. Endotracheal tube defects: Hidden causes of airway obstruction. *Saudi J Anaesth* 2010;4(2):108-110.
<http://dx.doi.org/10.4103/1658-354X.65123>
PMid:20927272 PMCID:2945507
5. Singh B, Gupta B. Difficult extubation: a new management. *Anesth Analg*1995;**81**:433.
6. Guntupalli KK, Boucek CD. Cricothyroid puncture of an undeflatable endotracheal tube cuff . *Crit Care Med.*1984;**12**:924.
<http://dx.doi.org/10.1097/00003246-198410000-00022>
PMid:6488839