

# Ballooned Out Tracheal Cuff of DLT Causing Acute Obstruction: Is there a Way to Test Its Integrity?

Priyanka Bansal<sup>1</sup>, Vandna Arora<sup>2</sup>, SS Lohchhab<sup>3</sup>, Rupali Arora<sup>4</sup>, Somya Tomar<sup>5</sup>

## ABSTRACT

**Introduction:** Sudden intraoperative desaturation may be due to numerous reasons such as- ETT kinking, dislodgement, obstruction by tight gauze, obstruction off ETT lumen by foreign body, blood, bronchospasm, tension pneumothorax and hemothorax, pulmonary embolism and finally equipment malfunction.

**Case Report:** We hereby present a case of 28 year old female that was diagnosed with hydatid cystic.

**Conclusion:** Regular cuff pressure measurement and vigilant patient monitoring goes a long way to prevent catastrophe.

**Keywords:** Ballooned Out Tracheal Cuff, DLT, Acute Obstruction

## INTRODUCTION

ETT cuff herniation (ETT aneurysm) as a cause of bronchial obstruction is a rare and often difficult to diagnose more so after one hour of surgery. Main causes of cuff herniation include expansion of air used for cuff inflation due to nitrous oxide absorption (expansion of upto 30- 40 ml of air has been reported), faulty cuff wall (one part may be weaker, poorly formed, thinner) or malposition of ETT especially after position change.<sup>1</sup>

We report a case, where ETT cuff herniation occurred during one lung ventilation, thus leading to a complete airway obstruction. The main aim of our report is to focus the attention to such a rare case scenario which though uncommon but may prove fatal.

## CASE REPORT

A 28 year old female presented to our hospital with fever along with left sided chest pain since 1 month and cough with expectoration for 1 week. She was diagnosed with hydatid cystic lesion in left lower lobe of lung and thoracotomy for enucleation of cyst was planned. Preoperative examination revealed satisfactory cardiopulmonary status. Routine preoperative investigations and pulmonary function tests were normal. Arterial blood gas values on room air were PaO<sub>2</sub> 88 mmHg, PaCO<sub>2</sub> 38 mmHg, pH 7.40, and HCO<sub>3</sub> 25 mm. Electrocardiogram showed regular sinus rhythm.

Selective bronchial intubation of the left mainstem bronchus was performed with a 39F left-sided double lumen tube (DLT) (Broncho-part; Rusch, Germany). Correct position of ETT was confirmed with a fiberoptic bronchoscopy, after which the patient was placed in lateral decubitus position (fig-1,2). Volume-controlled ventilation, including a 7ml/kg tidal volume (VT) under 100% FIO<sub>2</sub>, a 12/ min respiratory rate. A 5 cm H<sub>2</sub>O PEEP was used. ETCO<sub>2</sub> was observed



Figure-1: Malformed cuff (herniated cuff) of ETT



Figure-2: Normal cuff of ETT

at 31mmHg and plateau pressure at 19 cm H<sub>2</sub>O. OLV was initiated. An hour later, the patient exhibited profound hypoxemia and a significant decrease in SPO<sub>2</sub> from 94% to 88%. Arterial blood gas (ABG) values were pH 7.42, PaO<sub>2</sub> 53 mmHg (on 100% FIO<sub>2</sub>), PaCO<sub>2</sub> 45 mmHg, HCO<sub>3</sub> 22.8 mM, and 82% SaO<sub>2</sub>. The patient's hemodynamics and ECG remained stable. Expiratory flow and expiratory VT were

<sup>1</sup>Assistant Professor, Department of anaesthesia and ICU, PGIMS, Rohtak, <sup>2</sup>Assistant Professor, Department of anaesthesia and ICU, PGIMS, Rohtak, <sup>3</sup>Professor and Head, Department of Cardiac Thoracic Surgery, PGIMS, Rohtak, <sup>4</sup>Junior Resident, Department of Anaesthesia, PGIMS, Rohtak, <sup>5</sup>Junior Resident, Department of Anaesthesia, PGIMS, Rohtak, India

**Corresponding author:** Dr Vandna Arora, Assistant Professor, Department of anaesthesia and ICU, PGIMS, Rohtak, India

**How to cite this article:** Priyanka Bansal, Vandna Arora, SS Lohchhab, Rupali Arora, Somya Tomar. Ballooned out tracheal cuff of DLT causing acute obstruction: is there a way to test its integrity?. International Journal of Contemporary Medical Research 2020;7(6):F1-F2.

**DOI:** <http://dx.doi.org/10.21276/ijcmr.2020.7.6.9>



unchanged, and no leak was noticed. The correct position of the DLT was immediately confirmed by fiberoptic inspection. End-expiratory flow was not interrupted by the next insufflation and reached zero before the next respiratory cycle, therefore no dynamic hyperinflation or intrinsic PEEP (iPEEP) was observed. Once the surgeon was informed, the nondependent lung (nonventilated lung) was expanded manually by administration of pure oxygen, and a continuous positive airway pressure (CPAP) at 5 cm H<sub>2</sub>O was subsequently applied. This strategy allowed rapid improvement of the patient's oxygenation, and oxymetry pulse could be maintained above 95% throughout the surgical procedure under OLV. During the manual expansion of the nondependent (nonventilated) lung, hemodynamics remained stable. Once the one lung ventilation was commenced, saturation started decreasing again. Two lung ventilation along with 100% oxygen had to be given intermittently. In spite of that significant resistance was encountered and maximum saturation that could be attained was 64%. Finally after completion of surgery patient made supine and DLT changed to single lumen tube. Saturation immediately returned to 100%. Patient extubated uneventfully.

We checked the DLT and its cuff to rule out leak or deformity. When the cuff was inflated, to our surprise, ballooning was seen, to the extent of almost triple in size.

## DISCUSSION

'A light purse is a great curse.' One lung ventilation is itself associated with risk of intraoperative hypoxemia and desaturation, superimposed cuff herniation posed another challenge leading to complete occlusion of ETT lumen.

In a letter to 'Anaesthesia' two cases have been reported by Davidson and Zimmer in which cuff herniation led to airway obstruction in patients undergoing abdominal surgery. The ETT used was Mallinckrodt, magill type. The obstruction of airway occurred almost immediately, but in our case desaturation occurred almost after one hour of normal surgery.<sup>1</sup>

Another case has been reported by Grime et al using an armoured Mallinckrodt ETT, in spite of inflating the cuff to 'just seal' volume of 8 cc. They suggested that use of saline for cuff inflation with regular check of intracuff pressure serves the purpose of 'a stitch in time saves nine', especially in prolonged procedures involving nitrous oxide.<sup>2</sup>

Mohammad et al reported a case of right upper lobe atelectasis due to complete airway obstruction by cuff herniation.<sup>3</sup>

Main causes of cuff herniation include expansion of air used for cuff inflation due to nitrous oxide absorption (expansion of upto 30- 40 ml of air has been reported), faulty cuff wall (one part may be weaker, poorly formed, thinner) or malposition of ETT especially after lateral decubitus position. The cuff once deformed may push the tube against the tracheal wall or may block the lumen at end of tube as in our case.<sup>4,5</sup> The situation is particularly dangerous in view that surgery was midway, position of patient was lateral decubitus and only one lung ventilation was in place. This situation made immediate airway management almost impossible. Performing cuff

deflation test is the best to diagnose any structural defect or leak. Ballooning of cuff may occur even late due to ambient warm body temperature leading to cuff expansion, leakage of nitrous oxide in long cases and gradual weakening of cuff wall.

## CONCLUSION

It is our sincere suggestion to be aware of this situation even with modern PVC low-pressure high volume cuffs, more so in situations where quick decision and action is out of anaesthesiologist's control. Regular cuff pressure measurement and vigilant patient monitoring goes a long way to prevent catastrophe. Repeat ETT evaluation, especially on change of position is a must. Finally equipment malfunction can prove dangerous anytime and thus checking equipment thoroughly before proceeding is emphasized

## REFERENCES

1. Davidson. I. & Zimmer. S. Letter 10 Editor. *Anaesthesia* 1989, 44; 938.
2. Grime PD, Tyler C. An obstructed airway: cuff herniation during nasotracheal anaesthesia for a bimaxillary osteotomy. *Br J Oral Maxillofac Surg.* 1991;29:14-15.
3. Moazeni Bitgani M, Madineh H. Intraoperative atelectasis due to endotracheal tube cuff herniation: a case report. *Acta Medica Iranica.* 2012 ;50:652-654.
4. Patterson KW, Keane P. Missed diagnosis of cuff herniation in a modern nasal endotracheal tube. *Anesth Analg.* 1990;71:563-564.
5. Kao MC, Yu YS, Liu HT, Tsai SK, Lin SM, Huang YC. Airway obstruction caused by endotracheal tube cuff herniation during creation of tracheal stoma. *Acta Anaesthesiol Taiwan* 2005;43:59-62.

**Source of Support:** Nil; **Conflict of Interest:** None

**Submitted:** 05-05-2020; **Accepted:** 20-05-2020; **Published:** 18-06-2020