

ORIGINAL ARTICLE

Usefulness of ETVIEW TVT endotracheal tube® for correct positioning of bronchial blockers in left lobectomy: an easy and safe combination

M. GIGLIO¹, D. ORESTE², N. ORESTE¹

¹Anesthesia and Intensive Care Unit, San Paolo Hospital, Bari, Italy

²Radiology Unit, San Paolo Hospital, Bari, Italy

ABSTRACT

One-lung ventilation is an important concern for open thoracotomy or video-assisted thoracoscopic surgery. Double-lumen endotracheal tubes are commonly used for this purpose, but, despite their widespread use, their positioning is still limited by the difficulty of insertion compared with a single-lumen tube (related to the stiffness and the large diameter of the double-lumen tube) and the need of a fiberoptic bronchoscopy. The use of a bronchial blocker passed through a single-lumen endotracheal tube (ET) is another way to separate lungs, but its use still requires the need of a fiberoptic bronchoscopy to control its correct placement. Recently, a new single-lumen tube, called the ETVIEW TVT®, has been released. This new device is equipped with a mini video-camera embedded at the tip of the tube, allowing to directly visualize the tracheal mucosa, the carina and the bronchi. This work demonstrates the utility and the main advantages of this new single-lumen tube for placing correctly a bronchial blocker without the control of bronchoscopy in patients undergoing left lobectomy.

Key words: Thoracic surgery - Pneumonectomy - Thoracic surgical procedures.

One-lung ventilation is an important concern for open thoracotomy or video-assisted thoracoscopic surgery to facilitate lung exposure for the surgical procedure by collapsing the lung. Indications for lung separation include isolation of one lung to avoid contamination from septic material or blood, as well as pneumonectomy and lobectomy. Double-lumen endotracheal tubes are commonly used for this purpose. However, despite their widespread use, double-lumen tubes positioning is still limited by several factors, such as the difficulty of insertion compared with a single-lumen tube (related to the stiffness and the large diameter of the double-lumen tube), the need of a fiberoptic bronchoscopy to confirm the correct placement, the need of experience and practice to the successful management and the risk of dislocation during patients postural changes. The use

of a bronchial blocker passed through a single-lumen endotracheal tube (ET) is another possibility to separate the lungs. The single-lumen tube with an endo-bronchial blocker has some advantages over the double-lumen tube, such as an easier insertion in patients with difficult airways management and no need for tube exchange when postoperative mechanical ventilation is required.¹ The main disadvantages are the difficulty to deflate the lung, to suction secretions and to ventilate the collapsed lung, but several techniques have been described to overcome these difficulties.² Moreover, fiberoptic bronchoscopy has been considered necessary to verify the position of the bronchial blocker.^{3, 4} Recently, a new single-lumen tube, called the ETVIEW endotracheal tube® (ETVIEW Tracheoscopic Ventilation Tube, ETVIEW Ltd, Misgav, Israel)⁵ has been released.

CardioMed Supplies Inc.

199 Saint David Street
Lindsay, Ontario K9V 5K7
Telephone: (705) 328-2518
Facsimile: (705) 328-9747
Email: mail@cardiomed.com
Website: http://www.cardiomed.com

This device is equipped with a mini video-camera, which is embedded at the tip of the tube. The video-camera is connected to an external monitor, which displays the inner surface of the trachea and the main bronchi. These technical improvements allow to avoid the use of fiberoptic bronchoscopy to confirm the correct placement of a bronchial blocker. In fact, once the trachea has been intubated in the common way, the position of the blocker is on continuous visual control during the entire procedure and during surgery, even during patient postural changes and surgical manipulations. Furthermore, aspirations can be done under continuous vision.

The purpose of this study was to demonstrate that using this new device, correct positioning of the endobronchial blocker could be achieved without a fiberoptic bronchoscopy in left lung surgery patients.

Clinical series

Eighty patients were enrolled in this study: 48 males and 32 females, (18-75-year old), undergoing thoracic surgery for which one-lung ventilation was required. All patients underwent left lobectomy. The Phycon Uniblocker® (Vitaid Ltd., Toronto, ON, Canada) bronchial blocker was used. The cuffs of the tube and bronchial blocker were tested for leaks before intubation. The bronchial blocker was lubricated with 10% lidocaine spray. The ETView TVT endotracheal tube® size was adapted to sex, height and weight of the patients (6.5 or 7.0 mm for females and 7.0 or 7.5 mm for males). Anesthesia was induced with lidocaine 40 mg, propofol 2 mg/kg, fentanyl 2 mcg/kg and cis-atracurium 0.1 mg/kg intravenously. The tube was inserted under direct laryngoscopy. The bronchial blocker was advanced under direct vision sufficiently, and at least 4 mL of air was injected into its cuff. The blocker position was controlled through direct vision when the patient was turned in lateral decubitus, and thereafter continually during surgery. At the end of the operation, when one-lung ventilation was no longer necessary, the deflated blocker was pulled back and the tracheal mucosa was carefully examined for signs of injury. The mean duration of surgery was 2 hours±30 minutes.

The blocker was inserted in the left bronchus at first attempt in all patients. In almost all the patients, it was in an ideal position. The blocker dislocated during the operation in five cases. Reinsertion to the initial depth resulted in satisfactory lung collapse in all cases. In two other cases, it was impossible to suction bronchial secretions adequately; in these cases the removal of the blocker and of bronchial secretions was necessary. The blocker was then re-positioned under vision. At the end of surgery, no patients showed evidence of tracheal mucosal injury.

Discussion

In this study single-lumen tubes with smaller internal diameters (6.5-7.5 mm) were used, thus allowing smaller mucosal injury. It was possible to use small-diameter tubes, because the placement of the blocker was made under vision, but without using a bronchoscope. The bronchial blocker cuff is a low volume-high pressure device.⁵ The manufacturer has recommended that 4-8 mL of air be used to seal the bronchus. The smallest volume possible should be used to prevent over-inflation, which might result in pressure damage to the bronchial mucosa.⁶ The blocker cuff was inflated gradually, starting at 4 mL and checking under vision the inflation of the cuff. No patients showed mucosal injury at the end of surgery.

Only in two cases it was necessary to remove the blocker in order to suction bronchial secretions and, fortunately, these manoeuvres did not cause any mucosal injury. Moreover, this suggests the clinical importance of suctioning secretions adequately before the blocker insertion.

A properly positioned blocker can be dislodged either when the patient is turned to the lateral decubitus position or during surgical manipulation. This occurred in several cases in the course of the study. In all cases, the blocker was repositioned to its previous depth and surgery was finished uneventfully.

Present report shows that left lobectomy can be easily and safely performed with the combination of ETView TVT® and a bronchial blocker. The main advantages include: no need of fiberoptic bronchoscopy, easier management of lung separation technique, increased safety for direct and

continuous vision of dislodgment of the blocker position and of the tracheal mucosa and time saving due to the avoidance of a fiberoptic bronchoscopy.

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Corresponding author: N. Oreste, Anesthesia and Intensive Care Unit, San Paolo Hospital, Via Caposcardicchio, 70124 Bari, Italy. E-mail: nicoreste@libero.it

Utilità del tubo endotracheale ETVIEW endotracheal® per il corretto posizionamento del bloccatore bronchiale in interventi di lobectomia sinistra: un'opzione facile e sicura

Un aspetto importante della chirurgia toracica, soprattutto delle toracotomie open, o della chirurgia toracoscopica video-assistita, è la ventilazione monopolmonare, il cui scopo è quello di facilitare l'accesso e le manovre chirurgiche sul polmone tramite il collasso del polmone stesso. Le indicazioni alla ventilazione monopolmonare prevedono, tra le altre, l'isolamento di un polmone per evitare la contaminazione con materiale infetto, con pus o sangue, la pneumonectomia o la lobectomia. In questo tipo di procedure vengono comunemente utilizzati i tubi endotracheali (*endotracheal tube*, ET) a doppio lume, nonostante l'utilizzo di questo tipo di tubi sia gravato da una serie di problematiche, come una difficoltà maggiore di inserimento rispetto ai tubi a singolo lume (legata alla maggiore rigidità e al diametro più grande dei tubi a doppio lume), la necessità di ricorrere all'uso della fibro-broncoscopia per controllarne il corretto posizionamento, la necessità di una notevole pratica ed esperienza da parte dell'operatore per una corretta gestione, e il rischio che il tubo a doppio lume si dislochi in corso di intervento o a seguito di cambiamenti posturali del paziente. Altri strumenti utilizzati per separare i polmoni durante interventi di chirurgia toracica sono i bloccatori bronchiali, fatti passare attraverso un ET a singolo lume. L'utilizzo di un ET a singolo lume combinato con un bloccatore endo-bronchiale offre una serie di vantaggi rispetto al tubo a doppio lume, quali un più facile inserimento in pazienti con vie aeree "difficili" e, nel caso in cui si rendesse necessaria la ventilazione meccanica a fine intervento, la praticità di non dover sostituire

il tubo ET¹. Gli svantaggi maggiori comprendono la difficoltà di aspirare le secrezioni bronchiali, di ottenere una desufflazione completa del polmone e di ri-ventilare il polmone collassato, anche se diverse tecniche sono state proposte per superare queste difficoltà². Anche in questo caso, d'altronde, si rende necessario l'uso della fibro-broncoscopia per controllare il corretto posizionamento del bloccatore^{3,4}.

Recentemente è stato introdotto sul mercato un nuovo tubo ET chiamato ETVIEW TVT® (ETView Tracheoscopic Ventilation Tube, ETVIEW Ltd, Misgav, Israele)⁵.

Questo strumento è dotato di una mini video-camera che si trova alla punta del tubo stesso che a sua volta è collegata con un monitor, permettendo quindi la visualizzazione diretta e continua della mucosa tracheale, della carena e dei bronchi principali. Questi miglioramenti tecnici consentono di evitare l'uso della fibro-broncoscopia per controllare il corretto posizionamento del bloccatore. Una volta che la trachea è stata intubata in maniera tradizionale, infatti, la posizione del bloccatore è continuamente controllata in visione diretta durante tutta la procedura e durante la chirurgia, anche durante i cambiamenti di posizione del paziente o in corso di manipolazioni chirurgiche, e anche l'aspirazione delle secrezioni bronchiali può essere eseguita in visione diretta.

Scopo di questo case report è quello di dimostrare che l'utilizzo di questo nuovo strumento rappresenta una valida alternativa per controllare il corretto posizionamento del bloccatore bronchiale, senza ricorrere alla fibro-broncoscopia, in pazienti sottoposti a interventi di lobectomia sinistra.

