Original Research Article

Indian Journal of Anesthesia and Analgesia
2018; 5(10): 1620-1622
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.51018.6

Selective Left Endobronchial Intubation in Paediatric Cases: Lesson Learnt Using Single Lumen Tube

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Abstract

Background: Selective left endobronchial intubation in right thoracoscopy is technically demanding. We are presenting our mid term experience of selective left bronchus intubation using the previously published maneuver with single lumen endotracheal tube. *Methods:* 135 consecutive children below 12 years underwent right thoracoscopy from June 2014-Jan 2017. Endotracheal tube was kept in the freezer for 60 seconds to provide slight stiffness. Selective left bronchial intubation was done using neck extension, head tilt towards the right and left chest elevation maneuver. The tip of tube was rotated by 90° after 9cm to guide it towards left main bronchus. Maximum of three attempts were tried and ET tube kept in the trachea if selective intubation was not possible. *Results:* Selective left bronchus intubation could be done in 131 (97.03%). Follow-up ranged from 3 to 12 months. All cases were asymptomatic at last follow up. Selective intubation could be done on first attempt in 126 (93.33%), second attempt in 3 (2.22%), third attempt in 2 (1.48%). In 4 (2.96%) cases left endobronchial intubation could not be achieved. Mean operating time was 1.30 hours (Range: 1.00-2.30 hours). There were 115 empyeama (tubercular-13), 18 hydratid cysts and 2 esophageal duplication cyst. The intercostal drain was kept for a mean period of 3 days (Range: 2-4 days). All the cases were kept nil orally for 6 hours and discharged at a mean duration of 5 days (Range 4-6 days). *Conclusions:* Thoracoscopic procedures for right sided pathology could safely and easily be performed using this novel technique.

Keywords: Selective Left Endobronchial Intubation; Thoracoscopy; Empyema.

How to cite this article:

Chaurasia Basant & Verma S.R. Selective Left Endobronchial Intubation in Paediatric Cases: Lesson Learnt Using Single Lumen Tube. Indian J Anesth Analg. 2018;5(10):1620-22.

Introduction

Video-assisted thoracic surgery [1,2] is finding an ever-increasing role in the diagnosis and treatment of a wide range of thoracic disorders that previously required sternotomy or open thoracotomy. VATS require lung decompression in the form of selective endobronchial intubaion of the opposite side so that the operating space could be offered. Unlike abdominal surgeries thoracic surgeries are slightly demanding due to the requirement of technical expertise of selective endobronchial intubation and less available working space due to restricted chest wall pliability. The selective endobronchial intubation in a limited facility setup is a challenge and thus requires certain modification. We previously described selective left endobronchial intubation [3] using single lumen endotracheal tube. Here we are presenting our midterm results and lessons learnt.

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Received on 24.06.2018, **Accepted on** 01.09.2018

Methodology

This study included 135 patients, below12 years of age, which required right VATS. All patients had primary right lung pathology with otherwise normal hematological reports.

All patients underwent pre- anaesthetic check up. Informed consent obtained. All patients were pre-medicated with Inj. Glycopyrolate 0.04 $mg.kg^{-1}$, Inj.Ondensetrone 0.1 $mg.kg^{-1}$ and Inj. Fentanyl 1 $mcg.kg^{-1}$. Intravenous induction was done with Inj. Vecuronium 0.1 $mg.kg^{-1}$ and Inj. Thiopentone sodium 5$mg.kg^{-1}$. after adequate relaxation intubation was done with the help of macintosh blade of proper size according to age of the patient with one size smaller ET tube.

A head ring was placed under the occiput, laryngoscopy was done and endotracheal tube was passed through the vocal cords, as the black marking on the ET tube passed the cords, patient was lifted-up 35-45 degree on the left side with the help of assistance by placing both hands under the left chest and then head was rotated 90 degree towards the right side while keeping laryngoscope and ET tube in- place. Now ET tube was rotated 90 degree towards the left side and was pushed further inside.

Left endobronchial intubation was confirmed by absent air entry on the right side and presence of air entry on the left side of the chest by auscultation. Endotracheal tube was fixed and then left lateral position was given for surgical procedure.

HR, ECG, NIBP, $EtCO_2$ and SpO_2 monitored throughout the procedure. Anaesthesia was further maintained with O_2+ N_2O (60:40), Isofluorane with controlled mechanical ventilation. IV DNS given according to holliday and segar's [4] 4-2-1 formula. At the end of surgery endotracheal tube was withdrawl and both lungs were inflated. Patient reversed with Inj.Neostigmine 0.5$mg.kg^{-1}$ and Inj. Glycopyrolate 0.04$mg.kg^{-1}$, it was decided to extubate while the child fully awake.

Results

A total of 135 consecutive cases requiring right thoracoscopy for various indications formed the study group. Selective left bronchus intubation could be done in 131 (97.03%). Follow-up ranged from 3 to 12 months. All cases were asymptomatic at last follow-up. Selective intubation could be done on first attempt in 126 (93.33%), second attempt in 3 (2.22%), third attempt in 2 (1.48%). In 4 (2.96%) cases left endobronchial intubation could not be achieved thus the procedure was performed with endotracheal tube kept in the trachea and CO_2 insufflation to create the space. Mean operating time was 1.30 hours (Range 1.00- 2.30 hours). There were 115 empyema cases out of which 13 turned out to be tubercular on subsequent biopsies. There were 18 hydatid cysts and 2 oesophageal duplication cyst also which were managed thoracoscopically with this approach. The intercostal drain was kept for a mean period of 3 days (Range: 2-4 days). All the cases were kept nil orally for 6 hours and discharged at a mean duration of 5 days (Range: 4-6 days).

Discussion

Achieving one lung ventilation (OLV) in the pediatric population is very challenging to the anesthesiologists. Various maneuvers and techniques thus have been described in literature. Double lumen endotracheal tubes are currently the most acceptable method for one lung ventilation. Unfortunately the smallest size [5] of double lumen endobronchial tube currently available is no. 26 (left sided) which could be used in children above 8 years of age. In infants and young children, the available sizes of the double lumen tubes or the Univent tubes do not match the anatomy of this age group.

The first suggested technique is to position the child with his left side up, and his head turned to the right [6], so that the mediastinum and gravity may push the left bronchus down to align with the trachea.

A second technique is to rotate the bevel of the tube 180^{o} and the head turn to the right so that the bevel of the tube will shift to the right, while its tip will be on the left of the midline which favors left bronchial intubation [7].

In all these techniques, the head and neck of the child are turned to the right which optimizes the alignment of the trachea with left main bronchus. The endotracheal tube is blindly advanced into the bronchus until the breath sounds on the operative side disappear.

So, here we kept endotracheal tube in freezer for 60 seconds (duration was arbitrarily decided based on our previous experiences) to make it slightly stiff. This provided the advantage that the tube was pliable enough to be maneuvered to the concerned side and also the use of metal stylet or bougie could be avoided. Tube was held in anteriorly concave position without considering the direction of bevel (right or left), followed by the maneuver [3] i.e. patient was lifted-up 35-45 degree from left side with the help of

assistance by placing both hands under the left chest and then head rotated 90 degree towards the right side while keeping laryngoscope and ET tube in- place then ET tube was rotated 90 degree towards the left side and was pushed further inside. We have learnt from our experience till now that it is the combination of all the three inputs viz, tube pliability, position of the patient and the rotation of the tube that make selective intubation possible. In conditions where any of the components are missing, the probability of the selective intubation becomes difficult.

In our study we used pressure control mode for mechanical ventilation with 8 to 12 $ml.kg^{-1}$ tidal volume, hypercapnea, low inspiratory flow with FiO_2 60%. We found that using one size smaller endotracheal tube for endobronchial intubation make selective intubation more probable. We also modified the operating position from true lateral to semilateral in an attempt to prevent flooding of the normal lung with secretions. With this experience we feel that this maneuver and modified position can be used to do thoracoscopy in most of the pediatric conditions.

Conclusion

So, here we concluded that thoracoscopic procedures for right sided pathology could be safely and easily performed by using this technique with the help of single lumen endotracheal tube.

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