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A Novel Approach For Isolated Left Endobronchial Intubation With Single Lumen Tube In Paediatric Patients

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Abstract
Background: Right thoracoscopy requires selective left endobronchial intubation which is technically difficult and demanding. We are presenting our experience of selective left bronchus intubation without any guidance, using a novel technique.
Methods: 39 consecutive children below 12 years underwent right thoracoscopy from June 2014- Jan 2016. 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 38 (97.4%). 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 34(87.1%), second attempt in 3(7.6%), third attempt in 1(2.5%) and 1(2.5%) patient's left endobronchial intubation could not be achieved. Mean operating time was 1.30 hours (Range: 1.00-2.30 hours). There were 36 empyeama (tubercular-13), 2 hydratid cysts and 1 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: Left endobronchial intubation, thoracoscopy, empyema.

I. Introduction

Video-assisted thoracic surgery[1] 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. The potential advantages of video-assisted thoracic surgery include less postoperative pain, fewer operative complications, shortened hospital stay and reduced costs.

VATS is now being used extensively for pleural debridement in patients with empyema[2], lung biopsy and wedge resection to treat interstitial lung disease, mediastinal masses, and metastatic lesions.
VATS can be performed while both lungs are being ventilated using CO2 insufflation. However, single-lung ventilation (SLV) is extremely desirable during VATS. In addition, anesthesiologists are performing SLV more frequently even for open thoracotomies in infants and children.

Isolated right lung intubation is techniquely easy due to anatomical design of right bronchus and can be achived just by over insertion of endotracheal tube but it is technically difficult to intubate left bronchus, so here we proposed a novel approach for isolated left endobronchial intubation with easily available conventional single lumen tube.

II. Methodology

A case study was conducted on 38 patients, below12 years of age, those required right VATS and were exclusively needed isolated left lung ventilation. All patients had primary right lung pathology with otherwise normal hematological reports.

All patients underwent pre- anaesthetic check up to rule out difficult airway. Informed consent obtained from their parents. 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 endotracheal tube (4+Age/4=Tube diameter (in mm) of calculated size[3].

A small size head ring 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 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. 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 of chest and presence of air entry on the left side of the chest by auscultation. Endotracheal tube was fixed with adhesive tape and then left lateral position was given for surgical procedure.

HR, ECG, NIBP, EtCO2 and SpO2 monitored throughout the procedure. Anaesthesia was further maintained with O2+ N2O (60:40), Isofluorane with controlled mechanical ventilation. Intravenous fluid 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 followed by patient reversed with Inj. Neostigmine 0.5mg.kg^{-1} and Inj. Glycopyrolate 0.04mg.kg^{-1}, it was decided to extubate while the child fully awake.

III. Discussion

OLV[5] provides improved exposure of the surgical field, and diversion of ventilation from the damaged lung. On the other hand, it requires manipulation of the airways, along with significant physiological changes and potential hypoxemia. So, achieving OLV in the pediatric population has posed a unique challenge to anesthesiologists. A review of the past literature shows various techniques and methods i.e. placement of a double- lumen bronchial tube, use of a single- lumen tracheal tube in conjunction with a bronchial blocker and insertion of a conventional endotracheal tube into a mainstem bronchus. But 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. A bronchial blocker combined with a single lumen tracheal tube may be used but Fiberoptic bronchoscopy is needed to confirm the proper position of the blocker.

In order to achieve blind left bronchial intubation, many techniques have been suggested such as using a metal stylet to curve the distal end of the tracheal tube to the left, or by using a distally curved rubber bougie which is directed blindly to the left bronchus, followed by railroading the tube over the bougie[6].Other simple techniques have been suggested to align the trachea with the left main stem bronchus. The first suggested technique is to position the child with his left side up, and his head turned to the right[7], 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 180º 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[8].A third simpler technique is to rotate the tube within the trachea 90 degrees counter clock wise so that the curvature of the tube becomes concave to the left side towards the left main stem bronchus[9].A fourth technique is to manufacture special right-bevelled tubes for left bronchial intubation; the tip of the tube will lie to the left of the midline of the trachea which favors left bronchial intubation[10].In all these techniques, the head and neck of the child are turned to the right which optimizesthe alignment of the trachea with the left main stem bronchus. The endotracheal tube is blindly advanced into the bronchus until the breath sounds on the operative side disappear confirming main stem bronchial intubation of the left lung.

So, here we used a simple maneuver with conventional and easily available endotracheal tubes for isolated left endobronchial intubation without any added instruments. Our study presents exclusively pediatric patients, aged less than 12 yrs those underwent for right sided VATS who needed left lung ventilation. In this case series, we kept endotracheal tube in freezer for 60 seconds to make it stiff so we could be able to avoid use of metal stylet or bougie to avoid trauma. Tube was held in anteriorly concave position without considering the direction of bevel (right or left), followed by the maneuver 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. Confirmation of left intubation was done by auscultation and chest rise during inspiration.

In our study we used pressure control mode for mechanical ventilation with 8 to 12 ml.kg^{-1} tidal volume, hypercapnea, low inspiratory flow(to avoid air trapping), FiO2 60% to prevent hypoxemia during OLV. Here, we used one size smaller endotracheal tube for easy negotiation into left bronchus and partial inflation of cuff helped to prevent spillage of secretion from diseased lung. We could be able to intubate 38 patients out of 39 patients with successful rate of 97.4% and 34(87.1%) patients out of these could be intubated in the very first attempt followed by 3(7.6%) in second attempt, 1(2.5%) in third attempt and 1(2.5%) patients left endobronchial intubation could not be achieved.

IV. Conclusion

We concluded that thoracoscopic procedures for right sided pathology could safely and easily be performed by using this novel technique with the help of conventional single lumen endotracheal tube.

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