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ONE LUNG VENTILATION IN A CHILD WITH POSTERIOR MEDIASTINAL TUMOUR

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ABSTRACT Neuroblastoma is the most common extracranial solid pediatric malignancy. Surgical removal of posterior mediastinal thoracic neuroblastoma needs one lung ventilation (OLV) which continues to present technical and physiological challenges to the anesthetist. Lung separation for one-lung ventilation can be accomplished with the use of a double-lumen tube, a single-lumen tube (SLT) with intentional endobronchial intubation, a SLT with bronchial blocker or an arterial embolectomy catheter (Fogarty catheter), and a Univent tube. Placement of a bronchial blocker can be accomplished outside or within a SLT blindly and with the help of rigid or fiberoptic bronchoscope (FOB). We describe here successful placement of a bronchial blocker for one-lung ventilation through a SLT.

KEYWORDS : Posterior mediastinal mass, Airway, One lung ventilation, Intraluminal bronchial blocker.

Case Report

A 7-yr-old 20-kg boy, height 140cm, diagnosed case of neuroblastoma in posterior mediastinum, presented to us. He was scheduled for right thoracotomy for excision of tumour. He had received 6 cycles of chemotherapy. Medical history was unremarkable. No history of weight loss. His investigations CBC, RFT, LFT, PFT, coagulation profile, ECG, ECHO were normal. CXR showed homogenous soft tissue density mass in posterior mediastinum with no evidence of rib erosion.

He was kept nil per oral for 6 hours. Written informed consent for anesthesia was taken from parents.

Plan was general anesthesia with One Lung Ventilation using Bronchial blocker through Single lumen tube.

In OR routine monitors were placed ECG, NIBP, Pulse oximetry. IV access was secured with 18 G cannula. Anesthesia was induced with intravenous inj Midazolam 0.5 mg, inj Propofol 40 mg, inj Fentanyl 40 mcg. After checking for mask ventilation, inj Atracurium 10 mg was given.

Direct laryngoscopy was done, and trachea was intubated with a 6.0-mm inner diameter (ID) cuffed Single lumen tube (SLT). It was passed into right bronchus. One lung ventilation was confirmed by auscultation. Then bronchial blocker was passed through the endotracheal tube into right bronchus. Single lumen tube was then withdrawn upto carina. A pediatric Fibreoptic bronchoscope (size 3.5) was then introduced into single lumen tube and bronchial blocker was then withdrawn till the cuff was visible. Tube was then secured with tube plasters.

Post induction monitors included etCO2, temperature monitoring, urine output monitoring. Arterial line was secured with 20g cannula in radial artery. Right IJV was cannulated with 5F triple lumen catheter under USG guidance.

Anesthesia was maintained with oxygen,air 50:50, sevoflurane MAC 1.0 and atracurium infusion. The patient was positioned in the left- lateral decubitus position, and the position of the bronchial blocker was again confirmed by auscultation of the chest and by fibreoptic bronchoscopy.

Eyes were carefully protected. All pressure points were adequately padded to avoid pressure sores. Appropriate patient warming devices were applied. IV fluid 5% Dextrose was given at 4ml/kg/hr, plus Ringer Lactate at 6ml/kg/hr as maintenance. 1 pediatric PRBC 150 ml was transfused. Urine output was adequate and ABG was acceptable within normal limits. Multimodal analgesia was provided with iv Fentanyl 2mcg/kg, PCM 15 mg/kg, iv Diclofenac 1 mg/kg. Surgical wound was infilterated with 0.25% Bupivacaine.

Total duration of surgery was 4.0 hours. At the end of surgery chest drain was put. Bronchial blocker was removed. Lungs were fully expanded by manual ventilation. Anesthesia was reversed with inj Neostigmine 1 mg and inj Glycopyrollate 0.4 mg. Trachea was extubated smoothly. It was uneventful.

DISCUSSION

Neuroblastoma is the most common extracranial solid malignancy of childhood accounting for 5-8% incidence and 15% mortality among pediatric tumours[9]. It is embryonal tumour of sympathetic nervous system and can originate anywhere along the sympathetic chain affecting neonates, infants or children. It can manifest as small asymptomatic mass or as a large tumour with major vascular encasement, spinal or bone marrow involvement. Anesthesia takes an integral part, from diagnosis to the challenges of treatment, providing sedation and pain control, GA for surgery, intensive and palliative care. Most common surgical approach is posterior- lateral thoracotomy, which provides good exposure and allows a safe tumour resection.

The basic approach to OLV in young children is through endobronchial intubation or placement of bronchial blocker. One must consider anatomical implications for OLV.

The left mainstem bronchus is smaller than right mainstem bronchus and requires an ETT half size smaller for endobronchial intubation.

The distance from the carina to the take-off of the left upper lobe bronchus is typically 3 times the distance from the carina to the take-off of the right upper lobe.

The take-off of the right upper lobe remains very close to the carina < 1cm in patients upto 8 years of age which makes lung isolation more challenging with a much smaller range for optimal device placement.

In children <8 years of age, clinician should consider reducing ETT size by 0.5 mm ID for left sided endobronchial intubation. It can be complicated by partial or almost complete occlusion of ETT by blood or other secretions during thoracic procedures leading to difficulty in oxygenation and ventilation.

Extraluminal placement of Bronchial Blocker remains the only viable option to perform lung isolation in children <2 years of age. Bronchial blockers are more likely to be displaced when compared to endobronchial intubation.

Fogarty catheter and Arndt bronchial blocker represent two older alternatives bronchial blockers for OLV in children. A Fogarty catheter is not designed for use in the airway, as it is equipped with a high-pressure, low-volume balloon; it may be difficult to secure and does not have a lumen for application of continuous positive airway pressure[10].

Recently 5F Fuji uniblocker, Univent tube and EZblocker have been introduced. EZ blocker has not been approved by FDA for OLV in children.

In children >3 years of age safe intraluminal 5F bronchial blocker can be used. 2.2mm flexible fibreoptic bronchoscope (FFB) requires at least 4.5mm ID ETT to accommodate both the blocker and FFB.

Double lumen tubes (DLT) should not be used in children <8 years of age as the smallest DLT available is 26F with ED between 8.7 and 9.3 mm which corresponds to 6.5 ETT[11].

- S.H Wald, *et al* [1] described the use of Arndt 5 French (Fr) paediatric endobronchial blocker, for single lung ventilation. The blocker and the fibreoptic scope were placed through their respective ports in the multi-port airway adapter provided. The inner filament at the end of the blocker was then looped over the fibreoptic scope and the adapter was connected to the tracheal tube and breathing circuit. The fibreoptic scope was advanced under videoscopic guidance into the desired mainstem bronchus and then the blocker was advanced past the fibreoptic scope. The balloon was then inflated under fibreoptic visualization, the scope removed, and the bronchial port was tightened.
- Hammer, *et al.* [2,3] described bronchial blockade using an end hole, balloon wedge catheter. The bronchus on the operated side is initially intubated with a tracheal tube. A guidewire is then advanced blindly through the tracheal tube into the target bronchus. The tracheal tube is then removed, and the blocker is threaded over the guidewire into the target bronchus. The tracheal tube was again placed into the trachea by the side of the catheter.
- Joseph D Tobias [4] described previously the use of the adult 9 Fr Arndt bronchial blocker in two children aged 9 and 10 yr.
- Yun, *et al* [5] reported successful single lung ventilation in a 14-yr-old using the paediatric 5 Fr bronchial blocker and Hammer and colleagues published a case report involving a 4-yr-old and a 17-month old patient.
- Harvey, *et al* [6] described the use of bronchial blocker placed outside a single lumen tube in 43 years old female patient presented for thoracoscopic left lung biopsy for suspected carcinoma with restricted mouth opening.
- Nino, *et al* [7] described the use of 8/22f bronchial blocker to rescue an ill fitting double lumen tube in 71years old patient with left upper lobe adenocarcinoma posted for left pneumonectomy.

CONCLUSION:

Placement of these devices may not be easy even in expert hands. Various techniques have been described for successful placement of bronchial blockers. Placement of bronchial blocker outside the tracheal tube can be achieved by direct visualization of the bronchus using a rigid bronchoscope, but the use of this technique may prolong laryngoscopy, bronchoscopy, and increase the risk of hypoxia and trauma to the upper airway. Existing methods for single lung ventilation are either impossible to use in small children (double lumen endobronchial tubes) or inconsistently successful (Fogarty catheter, endobronchial intubation). Our experience suggests that the pediatric blocker can be used as a consistent, safe method of single lung ventilation in most young children

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