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Anaesthetic management of a paediatric case of Bronchopleural fistula posted for open thoracotomy with decortication

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Abstract
Bronchopleural fistula (BPF) is a sinus tract between the mainstem, lobar or segmental bronchus and the pleural space leading to an air leak from the lung into the pleural space. It is associated with significant morbidity and mortality. Managing mechanical ventilation in patient with BPF is a challenging situation for anaesthesiologist. Mean airway pressure should be kept minimal in BPF to reduce air leak flows. This case was more challenging because in paediatric patients' minimum peak end expiratory pressures (PEEP) should be maintained to prevent atelectasis. Also one lung ventilation which is ideally adviced in BPF is difficult in paediatric patients due to wide variety of pathology, non-availability or limited sizes of lung isolation devices. We report a paediatric case with right sided Broncho pleural fistula posted for open thoracotomy with decortication, successfully managed under general +epidural anaesthesia.

Keywords: Broncho pleural fistula, pneumonia, open thoracotomy, mechanical ventilation, and paediatric

Introduction
Bronchopleural fistula is potentially a life threatening condition. In mechanically ventilated patients the disease course is more complicated, leading to incomplete lung expansion, air leak causing loss of effective tidal volume and PEEP, CO2 retention leading to respiratory acidosis, tension pneumothorax, decreased pulmonary gas exchange and prolonged ventilatory support [1]. Large air leaks of 1-16 L/min cause auto triggering of ventilator leading to hyperventilation and prolonged action of sedatives and neuromuscular blockers [3]. To reduce air leak, airway pressure should be less than critical opening pressure of fistula. To facilitate this; minimal or no PEEP, low peak airway pressure, low minute ventilation and shorter inspiratory time are recommended [5]. Changes in respiratory physiology should be taken into consideration while ventilating paediatric patients. Paediatric patients have low lung parenchyma compliance, low functional residual capacity, high airway resistance and high closing volume making them more susceptible to develop atelectasis [6]. To avoid atelectasis; low tidal volume, high PEEP and alveolar recruitment are advised. But higher PEEP and alveolar recruitment manoeuvres can further exaggerate air leak in case of BPF. Lung isolation is not always necessary in paediatric population and procedures can be done with conventional tracheal intubation [2]. Also children are more susceptible to hypoxia during one lung ventilation in lateral decubitus position [7].

Case presentation
1-year-old female patient with right sided Broncho pleural fistula presented with pneumonia and empyema posted for right open thoracotomy with decortication. Patient had history of cough, fever and breathlessness since 2 weeks. She was known case of pneumonia and was on antibiotic treatment. Patient had one episode of supraventricular tachycardia and was started on tablet propranolol 2.5 mg BD. There was no significant birth and surgical history. On physical examination, general condition was moderate with adequate nourishment. Patient was alert. Airway assessment showed paediatric airway with all teeth present. On respiratory system examination, chest movements were bilaterally equal, dull note was present on right side and on auscultation air entry was decreased on the right side. On air oxygen saturation was 97%. ICD was in situ since 9 days.

Fig 1: Pre-operative with ICD In situ

X-ray chest showed right sided Haziness with ICD in situ. CT chest showed right sided pneumothorax with ICD in situ, atelectatic collapse of right lower lobe and right pleural thickening. USG chest showed areas of atelectasis on right side. ECG showed sinus tachycardia and 2D echo findings were normal. Platelet count was 36,000/microliter at the time of admission, 2 units random donor platelet (RDP) transfusion was given and pre operatively platelet count was 1, 50,000/microliter. Serum potassium was 2.7 mmol/l, for which correction was done. All other routine investigations were normal.

Fig 2: Pre-operative Chest X-ray with ICD in situ

The risk of anaesthetic technique (general anaesthesia and its complications like tension pneumothorax, aspiration pneumonia and hypoxemia; post-operative intensive care, post-operative mechanical ventilation) was explained to the parents. Blood was cross matched and reserved. Informed, written, valid high risk consent was taken. Post-operative intensive care and post-operative mechanical ventilation consent was taken.

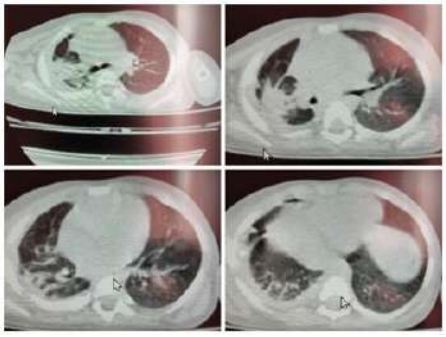

Fig 3: Preoperative HRCT-Consolidation, pneumonia and empyema

Discussion of management

Preoperative optimisation was done by nebulising the patient with bronchodilator and mucolytic agents to improve pulmonary reserve, antibiotic coverage was given to reduce infection. In the pre-operative room IV access of patient was checked. Patient was sedated with ketamine. Patient was shifted to operation theatre and multi parameter monitors were attached. Premedication and antibiotic was given as per institutional protocol. DNS was started. 2 units pcv was arranged. Patient was pre oxygenated with 100% FiO2 for 5mins. Induced with Injection protocol and atracurium. Intubated with un cuffed endotracheal tube no. 3. Bilateral air entry checked by auscultation. Tube was fixed and throat pack was placed. Intraoperatively patient was maintained on oxygen (1L/min), nitrous oxide (1L/min), sevoflurane (mac 1) and atracurium. Ventilator was set to PCV (pressure controlled ventilation) mode. Pin sp - 25 cm H2O, PEEP - 4 cm H2O, RR -18 breaths/min, P-max 30 cm H2O and MV 1-2 L/min was maintained. Left lateral decubitus position was given.

Fig 4: Post intubation

Fig 5: Epidural Catheter in situ

Preparation was taken for regional block (epidural). Under all aseptic precautions, intervertebral space was identified by tracing the spine from upwards. Epidural space was located at the level of T9-T10 using 19 G Tuohy's needle by loss of resistance technique to air, 22 G epidural catheter was introduced and fixed at 6cms. Inj. Lox + Adr 2% 2cc test dose given and catheter placement confirmed

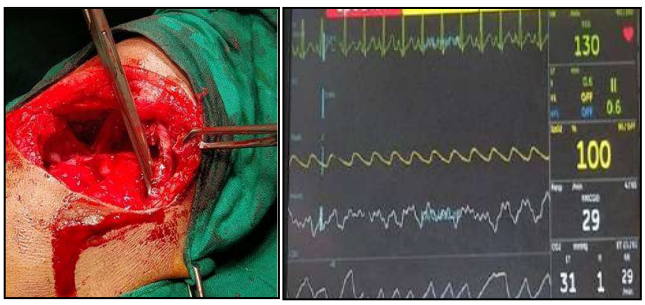

Fig 6, 7: Intraoperative vitals Open Thoracotomy

Duration of surgery was 90 mins. Intraoperative 300 ml DNS and 1 unit PCV was given, urine output was 20 ml. Patient was haemo dynamically stable intraoperatively. Post operatively patient was shifted intubated to PICU and mechanically ventilated for 24 hrs. Epidural top ups given for postoperative analgesia using 0.125% bupivacaine. Extubated on POD 1. Epidural catheter was removed after 72 hrs.

Fig 8: Post-operative

Conclusion

Inspite of all the challenges we were able to manage this case under general and epidural anaesthesia with proper planning, pre-operative optimization and meticulous care. By keeping minimal physiological PEEP of 4 cm H2O, low peak inspiratory pressures and low minute ventilation we tried to reduce air leak as much as possible and at the same time there were no signs of atelectasis. Keeping all the emergency drugs ready, case was successfully managed under general anaesthesia. Although one lung anaesthesia was not attempted due to non-availability of compatible equipment's, there was no spillage or soiling of contralateral lung.

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