Case Report

Lung separation through tracheostomy site. is it feasiable by endobronchial blocker in ICU?

Abstract

Background: Bronchopleural fistula (BPF) is a connection between the bronchus and pleural spaces resulting into severe ventilation-perfusion mismatch. Patient may deteriorate very rapidly due to difficulty in ventilation in a large fistula. In ICU setting lung separation or blockage of fistula with bronchial blocker is a useful adjunct to save the life.

Case report: A 26years old male, was admitted to the ICU following repair of the left diaphragmatic hernia for elective post op mechanical ventilation. In the course of ICU patient get tracheostomy done. He later developed empyema thoracis and iaterogenically developed a large BPF that lead to refractory hypoxemia. Patient was hemodynamically unstable and could not be ventilated leading to fall in saturation and rise in CO2. The condition was managed by blocking the leak through Arndt endobronchial blocker and his life was saved. This endobronchial blocker placement helped as a salvage bridge to stabilize the patient. After the patient was stable, he was taken to operation theatre for a definite management.

Discussion: Ventilation is often challenging in a cases of large BPF on mechanical ventilation. Acute decompensation and severe hypoxia can be fatal if not treated in time. There are different methods for lung separation and closure of fistula but in ICU setting in critically ill and tracheostomised patients, very limited options are available. In tracheostomised patients, Arndt endobrochial blocker is a useful adjunct in a desaturating patient to save the life. The use of endobronchial blocker is feasible and can be life saving in critically ill patient. It provides time to optimise the condition before the definite management. Endobronchial blocker can be used as a bridge and salvage therapy.

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Introduction

Bronchopleural fistula is a connection between the bronchus and pleural spaces resulting into severe ventilation-perfusion mismatch. In intensive care settings, BPFs may develop due to multiple etiologies like post pneumonectomy, post-lobectomy, empyema thoracis, ARDS or iatrogenic. Though small BPFs usually heal spontaneously but large BPFs may require medical or surgical management to prevent morbidity and mortality. In such cases lung separation techniques are required for adequate ventilation and to reduce leaks through fistula. Here we report a case in which an endobronchial blocker was used to control leak from BPF in an intensive care setting successfully.

Case report

A 26years old male was admitted to the ICU following repair of the left diaphragmatic hernia for elective post op mechanical ventilation. On further course in the ICU, the patient developed pneumonic changes in the left lung and had weaning failure with expected prolonged ventilation. He underwent percutaneous dilatational tracheostomy. The pneumonia worsened during the course with development of associated empyema thoracis of the left lung for which a chest tube was inserted. On fourteenth day the patient complicated with loculated pneumothorax in upper left pocket – evident on X ray chest, and had oxygen desaturation. A second ICD tube was placed to control pneumothorax. However, it turned out to be a Bronchopleural fistula with a leak during both inspiration and expiration. The patient's condition deteriorated rapidly and he developed refractory hypoxia with sever hypercarbia due to loss of large tidal volume. The patient became hemodynamically unstable and required inotropic support. The patient couldn't be ventilated because of high peak pressure. Patient was not fit for transfer to operation theatre as the SPO_2 is very low and CO_2 was very high. It was decided to close the fistula with help of bronchial blocker as other methods were not feasible. The left lung was quickly blocked with Arndt endobronchial blocker and reinforced endotracheal tube in right bronchus under flexible fibreoptic bronchoscope. The bronchial blocker was introduced in left upper bronchus and inflated leading to stoppage of bubbling through the chest tube. It lead to improved oxygen saturation with better ventilation and perfusion. The reinforced endotracheal tube was introduced from tracheostomy site whereas Fiberoptic bronchoscope was inserted through oral route. Then Arndt endobronchial blocker was also introduced through the tracheostomy wound along side of ETT extra-axially and guided into the left bronchus with the help of fiberoptic bronchoscope. Further on lower tidal volume, lower respiratory rate, minimal PEEP and lower inspiratory time strategy of ventilation lead to effective CO_2 washout. After one hour of ventilation Po_2 improved and CO_2 washed out. Following hemodynamic stabilization he was taken to the OT for surgical management. So the management with bronchial blocker as salvage therapy proved to be a life saving procedure. Later in the fourth week of ICU stay, patient developed septic shock and in spite of our best efforts the patient expired.

Discussion

Ventilation is often challenging in a cases of large BPF on mechanical ventilation. An acute decompensation and severe hypoxia can be fatal if not treated in time. A large leak often requires surgical interventions to manage such cases. However, surgical intervention may get delayed due to myriad reasons. In such scenarios, it is prudent to control BPF temporarily within settings of ICU and to optimise the condition of the patient. The above case highlights the safety and feasibility of using Endobronchial blocker through tracheostomy in

conjunction with reinforced Endotracheal tube as a bridge therapy. Often, these patients are trachostomised and this site can be used for lung separation. The data about the feasibility of such procedure within the ICU is limited. Though, the use of endobronchial blocker or Double Lumen Tube (DLT) is common in the operation theatres, it is seldom preferred in acute emergencies within the ICU. Kabon et al used an endobronchial blocker for management of massive hemothorax in ICU setting before angiographic embolisation[i] and showed usefulness of endobronchial blocker to maintain hemodynamic instability during transfer.

Lung separation in a tracheostomised patient can be achieved by different methods like using specially designed short DLT for tracheostomised patient (Naurake DLT)[ii] , Fogarty catheter, Univent endotracheal tube, TCU bronchial blocker or Arndt endobronchial blocker.[iii] Conventional DLTs are difficult to insert in acute hypoxemic patient and a large tracheostomy site preclude its application. A conventional DLT placed through a tracheostomy stoma may get displaced due to long length and short airway. Short DLT (Naurake) is preferred for tracheostomised patients. Univent tube is a conventional endotracheal tube with second lumen containing a thin coaxial blocker. However, both the are not universally available within the ICU. Fogarty embolectomy catheters have high pressure cuff which may further injure the bronchus. Arndt endobronchial blocker is a balloon tipped catheter with inner lumen containing nylon loop which can be used for attaching fiberoptic bronchoscope and is often the choice. Shin et al. reported use of modified long ETT for lung separation in case of BPF.[iv] Santini et al. used a modified double lumen ETT for one lung ventilation and closure of BPF[v] while Oturba et al. used an Arndt endobronchial blocker for one lung ventilation in case of small BPF successfully[vi] In the present case, we preferred use of reinforced endotracheal tube since it provides necessary flexibility and can be inserted through tracheostomy site easily. So, first inserted reinforced endotracheal tube in the right brochus under bronchoscopic guidance and Arndt endobronchial blocker in the left upper bronchus under bronchoscopy and separation was achieved.

As it was difficult to maintain saturation and hemodynamics, one lung ventilation was planned to prevent contamination of other lung and to temporarily close the BPF effectively buying some time for further management. The target was to decrease ventilation perfusion mismatch and save the life of patient. Ventilation strategy is a challenge in the cases of BPF and using a bronchial blocker is an effective technique for successful one lung ventilation. Low tidal volume, low respiratory rate, minimal PEEP and low inspiratory time ventilatory strategy provides additional support in the cases of BPF.[vii]

Conclusion

In a patient with BPF having acute hemodynamic instability and severe hypoxia, the use of, endobronchial blocker is feasible and can be life saving. It provides time to optimise the condition before the definite management. An endobronchial blocker can be used as a bridge and salvage therapy.

Acknowledgments

None.

Conflicts of interest

None.

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