

Anaesthetic management of primary repair of complete right bronchial rupture following blunt chest trauma

Santosh, Saiyed Anjum, Meena Reema, Chand Kishan Vyas

Department of Anaesthesia and Critical Care,
Sawai Man Singh Medical College and
Hospital, Jaipur, Rajasthan, India

Correspondence to Santosh, Senior Resident,
MD, Anaesthesia, SMS Medical College,
C/o M.S. Ola, Vikas Nagar, Pilani Road,
Jhunjhunu, Rajasthan, India
Tel: +91-01596220334;
E-mail: drsanchoudhary@gmail.com

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Tracheobronchial injury is a rare incidence after blunt trauma injury. Isolated complete bronchial tear is very rare. If it is not managed properly and timely, it can lead to significant morbidity and mortality. Clinical manifestations of tracheobronchial injury include persistent pneumothorax, subcutaneous emphysema, pneumomediastinum and respiratory insufficiency. Anaesthesiologists face challenges while securing the airway, controlling oxygenation, managing one-lung ventilation and maintaining anaesthesia during airway surgery. The preferred airway management technique is to intubate the healthy bronchus with a single-lumen or double-lumen endotracheal tube. We report successful anaesthetic management of complete traumatic rupture of the right main bronchus at the carina in adult male patients by using a left-sided double-lumen endotracheal tube. After induction, right thoracotomy was performed and bronchial transection was repaired successfully. Early correct diagnosis and proper repair can lead to excellent outcome.

Keywords:

bronchial transection, double-lumen endotracheal tube, tracheobronchial injury

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Introduction

Tracheobronchial injury (TBI) is a rare incidence after blunt chest injury. The incidence of TBI is around 0.7–2.8% according to different investigators [1]. Blunt trauma to the chest resulting in injury to the trachea and major bronchi is usually missed. The diagnosis is made only in 25–68% of the cases [2]. These injuries are 10 times more common in adults than in children because of the hard bone contour in adults as compared with pliable chest wall in children [3]. The right main bronchus is affected more often than the left (26 and 17.5%, respectively) [4]. Deceleration injury from blunt chest trauma typically occurs at the transition zone between the fixed and mobile bronchus, within 2.5 cm of the carina [5]. Diagnosis is confirmed by fiberoptic bronchoscopy or by computerized tomography (CT) scan of the chest. TBI poses many challenges to the anaesthesiologist while maintaining anaesthesia during thoracotomy and repair of airway injury. The preferred airway management technique is to intubate the healthy bronchus with a single-lumen or double-lumen endotracheal tube (DLT). We report successful anaesthetic management of complete traumatic rupture of the right main bronchus in adult male patients by using a left-sided DLT.

patient went to a private hospital with chief complaints of difficulty in breathing, increased respiratory rate, and chest pain on the right side. After examination, an intercostal drain tube was put on the right second intercostal space for pneumothorax but the patient did not get complete relief from symptoms and was therefore referred to our centre. The patient was maintaining saturation up to 90% on air at the time of presentation. After admission, the patient was kept in a semi-ICU with oxygen supplementation through a simple face mask with monitoring of vitals. Routine blood investigations were normal. The chest radiograph showed right pneumothorax (Fig. 1). CT of the thorax revealed abrupt cutoff of the right main bronchus just beyond the origin from the carina, complete collapse of the right lung field, and surgical emphysema without rib fracture (Fig. 2). Arterial blood gas (ABG) analysis showed moderate hypoxemia.

After detailed examination, the patient was planned for surgery to repair the right bronchial injury. He was kept in a semi-ICU with oxygen supplementation through a simple face mask and monitoring of vitals. A thorough preanaesthetic checkup was carried out. On auscultation there was absent air entry on the right

Case report

A 21-year-old man presented to the emergency room following a motor vehicle accident 5 days back. The

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Figure 1



Chest radiograph showing right pneumothorax.

side of the chest. Airway examination was carried out to identify difficulties in DLT insertion. Mouth opening was adequate, with Mallampati grade I. The patient was taken to the operating room and monitors were attached. One wide-bore peripheral line, right internal jugular line, and right femoral arterial line for ABG and invasive blood pressure were secured. Blood pressure was 110/70, pulse was 94/min, saturation was 90%, PaO₂ was 70 mmHg, and PCO₂ was 40 mmHg. The patient was preoxygenated, and premedicated with 0.2 mg of glycopyrrolate, 1 mg of midazolam, and fentanyl at 1 µg/kg. Induction was done with thiopentone sodium 300 mg, and ventilation was started at low tidal volume using Bain's breathing circuit, keeping the inter costal drain (ICD) tube declamped. The patient was intubated with a 37-Fr gauge left-sided DLT after complete relaxation with 100 mg succinylcholine. During confirmation of DLT, there was no chest expansion and no air entry on the right side. After tracheal lumen clamping there was good air entry on the left side of the chest. After confirmation of adequate ventilation on the left side, the DLT was secured and the patient was positioned in the right thoracotomy position. After positioning, reconfirmation of proper placement of DLT was done by auscultation (as we do not have a paediatric fiberoptic bronchoscope). From the start the patient was put on one-lung ventilation. Surgery was started, and anaesthesia was maintained with isoflurane in 100% O₂ and atracurium. Right thoracotomy was performed. The right lung was collapsed and abrupt cutoff of the right main bronchus just beyond the origin from the carina was observed. Because of this the right lung was not ventilated and we faced problems in confirmation of the DLT position.

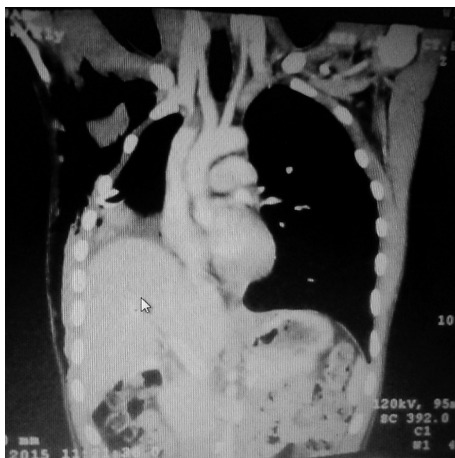
Anastomosis was done between the carina and the right bronchus. Pedical graft of the intercostal muscle

was used to strengthen the repaired suture line. The tracheal lumen was declamped and ventilation was continued. The right lung was inflated, and checking for leaks from the anastomotic site was carried out. Both lungs were ventilated with saturation of 98–99%. After repair, no air leak was noticed with positive pressure ventilation. The chest was closed after two ICD insertions: the first in the second intercostal space and the second in the fifth intercostal space. The patient was extubated after confirming adequate respiratory efforts and complete reversal. He was shifted to the ICU for further monitoring. Serial ABG showed improvement in gas exchange. The first ICD was removed on the third day and the second ICD on the fifth day. On the third postoperative day, follow-up chest X-ray (CXR) was advised, which showed full expansion of the lungs.

Discussion

An isolated bronchial tear without rib fracture is a very rare condition, which was encountered in our case. Difficulties in diagnosis may cause delay in treatment [6]. Presentation of unexplained dyspnoea, recurrent pneumonia and unresolved pneumothorax even with ICD in a patient with a previous history of trauma should raise suspicion of missed bronchial injury. Skiagrams and CT scans show the lung drop below the level of the carina if the bronchus is completely transected, and it is a pathognomonic radiological sign (lung fallen sign) as we have found in our case. Because of delayed diagnosis these injuries lead to significant morbidity and mortality. Patients with TBI require urgent control of the airway, and evacuation of blood and air from the pleural space by intercostal drainage [6]. Patients presenting with respiratory distress and persistent air leak usually require exploratory surgery. Recommended methods of one-lung ventilation are balloon-tipped bronchial blockers, univent tubes, DLT, and single-lumen endotracheal tube (ETT) [7]. Commonly used techniques are single-lumen ETT and DLT. Hosalli *et al.* [8] used an ETT for primary repair of TBI following blunt chest trauma. Management with endotracheal intubation and positive pressure is likely to cause air leakage and produce further deterioration of pulmonary function [8]. We used DLT in our case because it ensured adequate ventilation and facilitated the surgical procedure, and high pressure on suture lines was avoided. After repair it allowed ventilation of both lungs and helped us in finding an air leak at the surgical sight and allowed complete expansion of the collapsed lung. During surgery, ABG is recommended because hypoxemia is common with the use of DLT, but in our case we did not encounter hypoxemia. After surgery, early extubation is recommended in

Figure 2



Computerized tomography (CT) thorax revealing abrupt cutoff of right main bronchus just beyond the origin.

cases of TBI to avoid additional complications caused by the tube, elevated endotracheal pressure during artificial ventilation, or repeated suctioning [7]. If the patient is haemodynamically unstable and requires postoperative ventilation it should be done with low tidal volume and hyperventilation (keep PCO_2 between 35 and 45 mmHg). DLT should always be replaced with a single-lumen ETT before starting postoperative ventilation.

Conclusion

Early diagnosis and proper management of bronchial injury can improve the outcome. During anaesthesia a

DLT has the main role in airway management. Good communication between the anaesthesiologist and the surgeon improves patient safety and surgical outcome.

Take home message

The possibility of bronchial tear should always be considered in a patient with blunt chest trauma with respiratory distress. Early diagnosis and treatment can cause significant decrease in morbidity and mortality.

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Conflicts of interest

There are no conflicts of interest.

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