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Case Report

Anaesthesia Section

Anaesthetic Management for Excision of Right Apical Carcinoma of Lung Encroaching in Thoracic Spine

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ABSTRACT

Airway management in thoracic surgeries is usually more difficult compared to in any other surgery. One Lung Ventilation (OLV) can be achieved for thoracic surgeries using various approaches like Double Lumen Tube (DLT), Bronchial Blockers (BB) and endobronchial tube. In BB, the procedure needs more precaution because of proneness to movement and displacement than DLT. In case of endobronchial tube, it is impossible to perform bronchoscopy, suction and Continuous Positive Airway Pressure (CPAP) for isolated lung. The present case report is of a 40-year-old male patient, who presented with right intrathoracic tumour encroaching thoracic segment of spinal cord and underwent excision of tumour through thoracotomy and laminectomy approach. Left-sided 37 French DLT was used to achieve OLV. After placing DLT the proper placement was evaluated by bronchoscope.

Keywords: Bronchial blocker, Bronchoscope, Double lumen tube, One lung ventilation, Thoracic surgeries

CASE REPORT

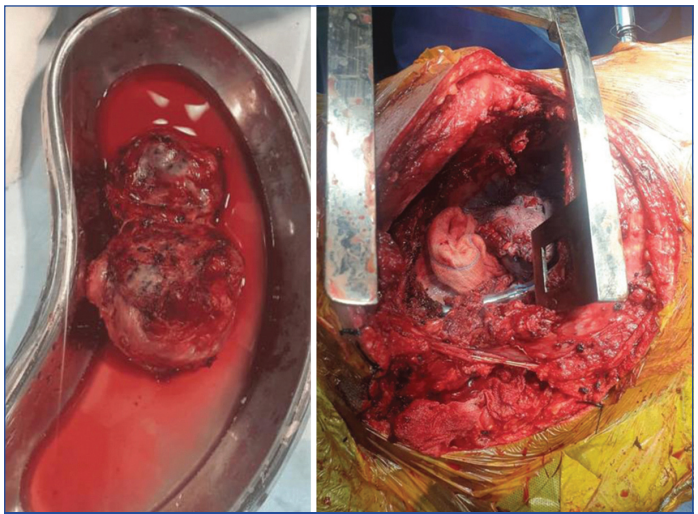
A 40-year-old male patient had visited with complaint of bilateral lower limb weakness for three months. On examination, he was of moderate built, weighing 60 kg and a height of 170 cm. Airway evaluation revealed adequate mouth opening with intact teeth and Malampatti Class 2.

Magnetic Resonance Imaging (MRI) spine was suggestive of a spinal cord tumour compressing the cord and extending into the thorax. Contrast Enhanced Computed Tomography (CECT) thorax was done suggestive of infiltrating lesion in the apical segment and upper lobe of the right lung causing erosive destruction of the head and posterior part of the second rib and lateral margin of D2 vertebral body, pedicle, lamina and the spinous process on right side. An excision of the tumour was planned through thoracotomy and laminectomy approach. After induction of anaesthesia the patient was intubated with 37 French left Double Lumen Tube (DLT) as shown in [Table/Fig-1].

[Table/Fig-1]: Placement of Double Lumen Tube (DLT).

Intubation was smooth and proper placement of DLT was evaluated by bronchoscope. The patient was initially ventilated by tracheal and bronchial lumen thereby ventilating both the lungs with tidal volume 500 mL and respiratory rate 16 cycles per minute. The patient was positioned on his left lateral side, and the correct positioning of the DLT was re-evaluated. Before opening the pleura, left One Lung Ventilation (OLV) was initiated with tidal volume of 250 mL, respiratory rate 24 per minute and a peak pressure of 40 cm of H2O. Right lung ventilation was stopped to facilitate successful excision of the tumour. The right lung was insufflated in between with 2 L of oxygen to prevent complete atelectasis of alveoli of the operative right lung. During manoeuvers on the airways, oxygen saturation was maintained up to 95% and simultaneously hypercapnia was established. Then both the lungs were ventilated with the initial ventilator settings to achieve adequate oxygenation and bilateral ventilation. Saturation improved to 98%. Thoracotomy was interrupted in between to perform laminectomy and so both the lungs were ventilated to avoid intraoperative hypoxia.

Successful excision of the tumour was achieved through thoracotomy and laminectomy approach [Table/Fig-2,3]. DLT was removed at the end of the procedure in operation theatre and 8.5 mm cuffed endotracheal tube was placed uneventfully and patient was shifted to recovery room for further observation. Postoperatively, the patient recovered well with out any wound complication. Histopathology of the tumour was suggestive of small cell carcinoma of the lung for which the patient was advised for further management.



[Table/Fig-2]: Image showing the excised tumour.
[Table/Fig-3]: Tumour encroaching the thoracic spine. (Images from left to right)

DISCUSSION

Lung isolation is required to achieve adequate exposure of the surgical field and to facilitate visualisation for collapsing the operative lung [1]. DLT, Bronchial Blockers (BB) are the two commonly used devices for OLV. The use of DLT is one of the most utilised strategies in lung isolation [2]. Airway management in thoracic surgery is very complicated and challenging which therefore mandates extensive skills even for expert anaesthesiologists [3]. In this case, OLV was achieved by using DLT. Throughout the procedure, the patient was kept in left lateral position. The use of DLT results in a low risk of movement after positioning and allows for continuous positive airway ventilation to the deflated lung. A BB is a device, which can be inserted down a tracheal tube after tracheal intubation, can also meet the needs of lung isolation. A BB with a spontaneous collapse takes longer to deflate the operative lung and does not provide equivalent surgical exposure compared to DLT [4]. Successful excision of tumour through thoracotomy and laminectomy approach was achieved by using left sided 37 French DLT facilitating surgical visualisation by collapsing the operative lung and with low risk of movement after positioning the patient in left lateral position.

Switching from two-lung ventilation to OLV is a challenging task. The changes observed during OLV are increase in shunt fraction, impaired oxygenation and hypoxaemia. Hypoxaemia during OLV is predicted from measurements of lung fraction, distribution of perfusion between the lungs, whether right or left lung is ventilated and whether the operation is performed in supine or lateral decubitus position [5].

In the present case, patient presented with the tumour in the apical segment of upper lobe of right lung causing erosive destruction of the head and posterior part of second rib and lateral margin of D2 vertebral body and spinous process on the right side. Patient was taken for excision of tumour through thoracotomy and laminectomy approach. In the index case, two different surgical procedures thoracotomy and laminectomy were performed as a single planned surgical intervention, and was achieved with DLT [Table/Fig-4].

[Table/Fig-4]: A 37 French left-sided Double Lumen Tube (DLT) with Y connector.

It emphasises that in thoracic surgery, in the face of anatomical variables, it is vital to understand the various airway management devices as well as be able to use the bronchoscope to handle all of the problems that may arise. The proper placement of DLT initially was evaluated by clinical auscultation of both the lungs, and was confirmed by fiberoptic bronchoscope [6].

As the patient was also presented with thoracic spine tumour, he was kept in left lateral position throughout the procedure. Intraoperative monitoring was done with pulse oximetry, End Tidal carbondioxide (ETCo2), Electrocardiogram (ECG), Central Venous Pressure (CVP) monitoring and arterial line. In a study done by Jain S et al., they used somatosensory evoked potential for monitoring during surgery as spine involvement was extensive [7]. The patient was initially ventilated by tracheal lumen, thereby ventilating both the lungs. On surgeons request right lung ventilation was stopped for the surgeon to perform successful thoracotomy. In order to prevent intraoperative hypoxia and atelectasis of alveoli of right lung it was insufflated with two litres of oxygen in between.

Left-sided DLT is more commonly used than right DLT due to some important anatomical variations. The left mainstem bronchus is much longer than the right one. Therefore, there is a greater margin of safety while positioning a left-sided DLT. The right upper lobe bronchus takes off from the right main bronchus 1.5-2 centimeters below the carina, therefore with right DLT there are high chances that the right upper lobe bronchus of getting occluded [8]. Left-sided DLT was used, which was preferable and indicated for performing right thoracotomy of patient with right upper lobe lung tumour extending the thoracic region.

The use of BB seems to be another unusual and alternative way thereby avoiding tube replacement at the end of procedure [9]. However, there are certain disadvantages of BBs because of small lumen, lungs inflate and deflate slowly, difficulty in insertion and more difficult to apply CPAP to the non dependent lung. In the study done by Logato MJ et al., thoracic epidural catheter was placed for intraoperative and postoperative analgesia [10]. But in the present case, there was no scope of placing epidural catheter for epidural analgesia in this patient due to the encroachment of intrathoracic tumour into thoracic spine.

Intraoperative placement of DLT provided an advantage of continuous positive airway ventilation to the deflated lung. As thoracotomy was interrupted by laminectomy, sufficient time was there to ventilate both the lungs and significant intraoperative hypoxia was prevented. This manoeuver was in the favor of on-table tracheal extubation, but anticipating the functional impairment of lung in view of thoracic spinal cord tumour involvement, extubation was avoided. In operative room after paralysing the patient with intravenous vecuronium 6 mg, DLT was replaced with 8.5 mm cuffed endotracheal tube. Ventilation continued and patient was shifted to Intensive Care Unit (ICU) for further observation. Postoperative analgesia was achieved by intravenous opioid fentanyl. Patient recovered well without any wound complication. In the study done by Mudarth M et al., postoperative analgesia for thoracotomy was achieved by continuous erector spinae plane block [11].

CONCLUSION(S)

In OLV, even the complete atelectasis of one lung does not hamper gas exchange to a considerable extent so this makes possible the wider use of OLV ventilation for intrathoracic surgeries. This unique surgery allowed us to achieve insufflation as well as ventilation of operative lung during laminectomy, thereby avoiding intraoperative hypoxia.

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