CASE REPORT

Low tracheal tumor and airway management: An anesthetic challenge

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ABSTRACT

We describe a case presenting with tracheal tumor wherein a Microlaryngeal tube was advanced into the trachea distal to the tumor for primary airway control followed by cannulation of both endobronchial lumen with 5.5 mm endotracheal tubes to provide independent lung ventilation post tracheal transection using Y-connector attached to anesthesia machine. The plan was formulated to provide maximal surgical access to the trachea while providing adequate ventilation at the same time. A 32 yrs non smoker male, complaining of cough, progressive dyspnea and hemoptysis was diagnosed to have a broad based mass in the trachea on computed tomography of chest. Bronchoscopy of the upper airway confirmed presence of the mass at a distance of 9 cms from the vocal cords, obstructing the tracheal lumen by three fourth of the diameter. The patient was scheduled to undergo the resection of the mass through anterolateral thoracotomy. We recommend the use of extralong, soft, small sized microlaryngeal surgery tube in tumors proximal to carina, for securing the airway before the transection of trachea and bilateral endobronchial intubation with small sized cuffed endotracheal tubes for maintenance of ventilation after the transection of trachea in patients with mass in the lower trachea.

Key words: *Anesthetic management, Microlaryngeal Tube, tracheal tumour*

INTRODUCTION

Primary tracheal tumors are rare with an estimated incidence of 2.7 new cases per million per year.[1] Patients usually present with nonspecific symptoms followed by progressive airway obstruction thus necessitating treatment. Tumor resection followed by tracheal anastomosis is considered to be the definitive treatment for both malignant as well as benign tumors.[2] Since airway is shared by both surgeon and anesthesiologist during tracheal resection, it is imperative to maintain ventilation, while allowing free surgical access at the same time.[3] It is therefore important to anticipate problems and formulate airway management options in the preoperative period for successful perioperative anesthetic management.

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CASE REPORT

The patient has given consent for the clinical details of the case to be published in a medical journal.

A 32-year-old male weighing 70 kg presented to Respiratory Medicine department of our hospital with a history of cough, progressive dyspnea and hemoptysis. Dyspnea was positional in nature, relieved in lateral and sitting position. The patient was a chronic smoker and had quit smoking 1 year back. Auscultation of the chest revealed bilateral monophonic wheeze and conducted sounds. The chest X-ray revealed loss of lung volume and collapse of the lower lobe on the left side. The arterial blood gas analysis at the time of admission revealed PaO_2 of 54.4 mmHg on room air which improved to 71 mmHg after nebulization and bronchodilator therapy. Preoperative pulmonary function tests revealed obstructive ventilation defects with reduced vital capacity, and flow volume loops demonstrated flow limitation during both phases of respiration. Computed tomography scan of the neck and thorax revealed a 21 mm × 17 mm × 15 mm broad base mass arising from the left posterolateral wall of the trachea, occluding the tracheal lumen by 80% and located 1.5 cm

proximal to carina [Figure 1]. Preoperative bronchoscopy confirmed a tracheal mass 9 cm from the vocal cords obstructing approximately three-fourth of the tracheal lumen [Figure 2]. It was possible to negotiate a 6.0 mm outer diameter bronchoscope (Pentax video bronchoscope EB-1570, Pentax Corporation, Europe GmbH) through the space available in posterolateral aspect, beyond which the carina was clearly visible and free of any infiltration. An apparently vascular mass did not bleed on fine needle aspiration biopsy. The tissue biopsy revealed the mass to be an adenocarcinoma and therefore the patient was scheduled for resection of the tumor with primary anastomosis of the trachea through right anterolateral thoracotomy. The airway was evaluated as Mallampati class I and other biochemical and hematological parameters were normal. Patient received a course of broad spectrum antibiotics, bronchodilator therapy and nebulization preoperatively.

Since it was possible to negotiate a 6.0 mm bronchoscope beyond the tumor on preoperative bronchoscopy, it was decided to place 32 cm long 5.5 mm internal diameter micro laryngeal surgery (MLS, Ivory polyvinyl chloride [PVC]) tube distal to the tumor for primary airway control. Alternatives in case of failure to negotiate the growth were also kept in mind. Therefore, a set of graduated rigid bronchoscopes with the presence of an experienced otorhinolaryngologist was ensured until the primary control of airway was attained.

Standard noninvasive monitoring was done using anesthesia monitor (S/5™ critical care monitor, Datex Ohmeda, Helsinki, Finland). An arterial cannula was placed in the left radial artery for invasive blood pressure monitoring and arterial gas analysis. Awake fiberoptic intubation was done after topical anesthesia of the upper airway in a position in which patient reported least discomfort that is, 30° head up and slight right up tilt. Under fiberoptic guidance, a 5.5 mm ID MLS tube was placed distal to the growth but proximal to carina. After confirming the placement through fiberoptic bronchoscope (FOB), the patient was anesthetized and paralyzed with injection propofol 2 mg/kg, fentanyl 2 μg/kg and vecuronium 0.1 mg/kg. Prior to the positioning, patient started desaturating with SpO_2 falling to 70%. On auscultation, breath sounds were absent on the left side. Thinking that the endotracheal tube (ETT) might have migrated to the right main stem bronchus, the tube was withdrawn gradually till bilateral breath sounds were present. The SpO_2 gradually improved to 95%. Fiberoptic examination revealed the MLS tube still distal to the tumor and proximal to carina. Patient was positioned as desired for the surgery. Anesthesia was maintained in air: O_2 with FiO_2 0.5, propofol infusion at 3-4 mg/kg/h and fentanyl infusion at 2 μg/kg/h. After anterolateral thoracotomy and surgical exposure, tracheal wall was incised below the tumor and a sterile 5.0 mm cuffed PVC ETT was placed in left main stem bronchus (MSB) by the operating surgeon and connected through a Bain's circuit (enclosed in a sterile drape) to a separate anesthesia workstation for ventilation of the left lung. Likewise, a sterile 5.0 mm cuffed tube was placed in the right MSB. Now bilateral ventilation was instituted through endobronchial tubes connected to Y-connector attached to anesthesia workstation [Figure 3]. The ETT's inserted in this manner provided adequate ventilation while preventing the spillage of blood and debris into the distal airways at the same time. Meanwhile, the orotracheal MLS tube was withdrawn proximal to the tumor and a 4 cm length of the trachea inclusive of the tumor was excised with primary anastomosis of the trachea. On closure of the trachea, endobronchial tubes were removed one by one and ventilation resumed through the oral MLS tube. The entire perioperative period was uneventful and trachea extubated at the completion of surgery with the resumption of spontaneous respiration. Neck flexion was maintained

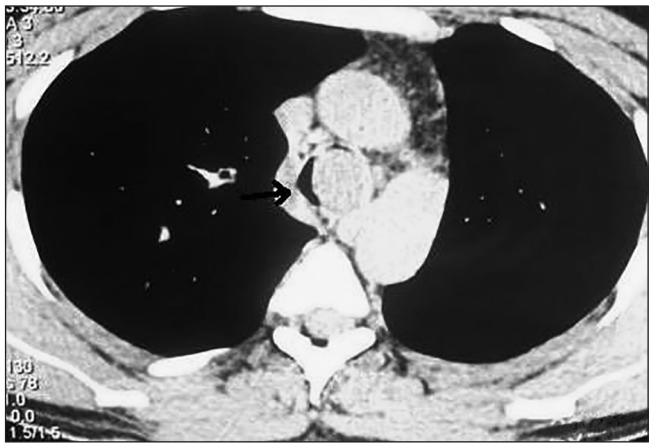

Figure 1: Contrast enhanced computed tomography chest showing 21 mm × 17 mm × 15 mm mass in the trachea

Figure 2: Preoperative bronchoscopy showing pedunculated mass arising from the left wall of trachea lumen

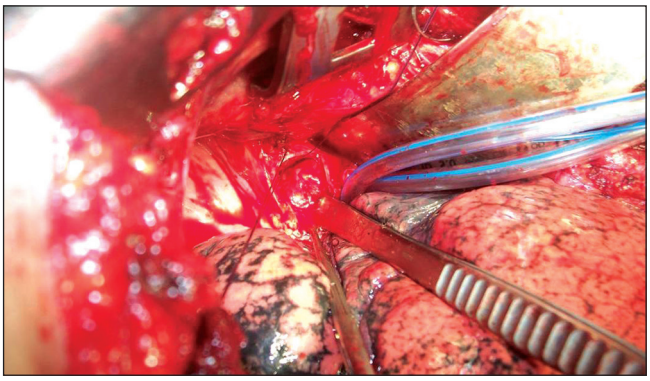

Figure 3: Bilateral endobronchial tubes *in situ*

at an angle of 15° to minimize the tension on the tracheal anastomosis.

The patient was transferred to intensive care unit (ICU) and was kept on noninvasive ventilation (iPAP 8 mmHg and ePAP 5 mmHg) for 48 h to prevent postoperative atelectasis and later on oxygen through venturi face mask (FiO_2 0.5). The patient was subsequently discharged from the ICU on 6th postoperative day. Histopathology of the tumor revealed an adenoid cystic carcinoma. Postoperative bronchoscopy revealed healed operative site.

DISCUSSION

Primary tumors of trachea are relatively uncommon, presenting as a therapeutic challenge to the clinician. Most of the primary tracheal tumors are malignant, generally squamous cell or adenoid cystic carcinomas and comprise 75% of all the tumors of trachea.[4,5]

Tracheal resection and reconstruction with primary anastomosis is the definitive treatment for managing tumors of trachea.[6,7] Anesthetic management for tracheal resection is unique because of narrowed airway diameter and the challenge of maintaining ventilation during the perioperative period.[7] Therapeutic bronchoscopy, laser (Nd:YAG or CO_2), photodynamic therapy, cryotherapy, endobronchial brachytherapy or stenting are used to palliate unresectable tumors.[3,4,8,9]

In the present case, preoperative laser resection of the tumors was not considered because it would have required multiple sessions. Preoperative chemotherapy has variable results in adenoid cystic carcinoma of head and neck, hence was not administered.[10]

Anesthesiologist involved in the perioperative care of patients with central airway obstruction must be aware of the techniques that allow maximal surgical access to the airway with minimal interference by the ETT while ensuring adequate ventilation and oxygenation at the same time.[11] Various techniques have been described to achieve the same in patients with lower tracheal mass. The conventional method is by passing the ETT beyond the growth or placing the tip of the ETT above the growth while maintaining spontaneous ventilation.[12,13] Other techniques include high frequency jet ventilation,[14] rigid bronchoscopy and removal of the tumor,[8] combined use of Fogarty catheter, FOB and ETT,[15] laryngeal mask airway[16] and cardiopulmonary bypass.[17-19] However cardio pulmonary bypass (CPB) for tracheal resection may produce CPB-related complications and may be reserved for some special cases such as for patients with acute respiratory distress.

In the present case, since a 6.0 mm bronchoscope could be negotiated beyond the growth from the posterolateral side, therefore the internal diameter of the ETT required to bypass the growth ought to be less than outer diameter of bronchoscope to minimize the mechanical deformation of the tumor. Further the growth was situated at a distance of 9 cm from the vocal cords; therefore, an ETT with sufficient length to bypass the same was necessary. Therefore, primarily MLS tube was chosen for initial intubation distal to tumor because of its extra length (32 cm) as compared to PVC tube. Since it is comparatively soft it is less likely to be traumatic to the growth. It has a larger cuff which provides better contact and seal and less movement with positive pressure ventilation. Search of the literature did not reveal the use of MLS tube for securing the definitive airway for low tracheal tumor. Intubation of both MSB was done to achieve bilateral ventilation through Y-connector attached to anesthesia machine. Bilateral MSB intubation was done as the patient did not tolerate one-lung ventilation by endobronchial placement of MLS tube at the time of positioning of the patient. In a similar report, Theman *et al*. have described the use of bilateral endobronchial intubation in two cases using two anesthesia machines in a carinal tumor.[20] There has been a previous report of use of bilateral endobronchial microlaryngeal tubes for maintenance of ventilation in large trachea- esophageal fistula at the level of carina.[21]

Early extubation is desirable in these cases to avoid tension on the suture line by the ETT cuff and adverse effects of mechanical ventilation. Since the patient fulfilled the extubation criteria, same was done in the present case.[3]

CONCLUSION

We recommend the use of extralong, soft, small sized MLS tube in tumors proximal to carina, for securing the airway before the transection of trachea and bilateral endobronchial intubation with small sized cuffed ETTs

for maintenance of ventilation after the transection of trachea in patients with mass in the lower trachea. Good communication, coordination and cooperation between the surgeon and the anesthesiologist are mandatory throughout the perioperative period for a successful outcome. However, the anesthesiologist should have knowledge of other airway management techniques and be ready with an alternative plan in case of failure.

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