Institution of cardiopulmonary bypass in an awake patient for resection of tracheal tumor causing near total luminal obstruction

Madam,

Anesthetic management in patients with tracheal tumors has always been challenging. Several techniques such as high-frequency jet ventilation, low tracheostomy, laser excision are described to maintain ventilation in patients with tracheal tumors.[1,2] Most of these techniques are futile in the presence of carinal tumors causing occlusion of the tracheal and bronchial lumens. Anesthetic management of these patients carries a high risk for airway catastrophes. Here, we describe the successful management of a case of near total obstruction of trachea under femorofemoral bypass.

A 38-year-old female weighing 35 kg with no comorbidity presented to the hospital with gradually increasing breathlessness of 3 years duration. It had increased significantly in the last 1 month. She was unable to assume recumbent position because of severe respiratory distress. She was being mistreated as a patient of asthma in the past. There was no history of hemoptysis, chest pain, palpitation, dysphagia, or pedal edema. On examination, she was found to be grossly dyspneic, able to breathe only in sitting position. There was grossly reduced breath sounds, increased expiration time and diffuse wheeze in bilateral lung fields. Chest X-ray showed hyperinflated lungs with areas of atelectasis in the basal regions. Computed tomography of chest revealed a well circumscribed homogenously enhancing intratracheal lesion just proximal to the carina causing 95% obstruction of the tracheal lumen with postobstruction atelectasis and endobronchiolitis of the right lower lobe [Figure 1]. Preoperative bronchoscopy was not attempted owing to the risk of injury to the tumor leading to edema or bleeding and further compromise of lumen. The patient was posted for resection of tumor and reconstruction of trachea through sternotomy approach.

After thorough counseling about the surgical procedure and risk associated with the airway management, a written informed consent was taken. Because of the near total occlusion of trachea and inability of the patient to lie down, surgery was planned under femorofemoral bypass in sitting position. In the operation theater, the patient was positioned with a 45° head-up tilt which was the maximum she could tolerate for comfortable breathing.

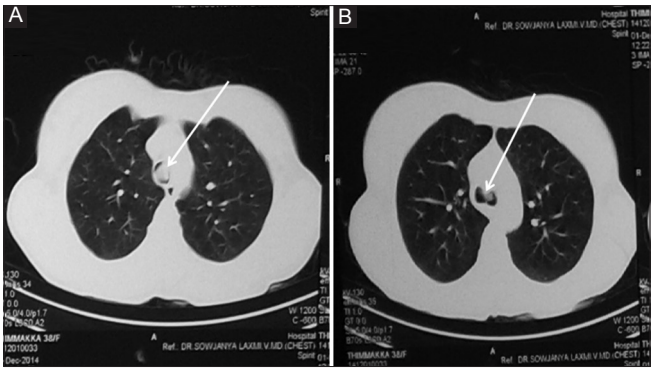

Figure 1: Computed tomography scan chest-white arrow in Panel A shows near total obstruction of tracheal lumen and Partial obstruction of both bronchial lumens at the level of carina in Panel B

After securing intravenous line and a left radial artery catheter, right femoral nerve block was administered. A wedge was put under the right hip to reduce the flexion of hip joint thus making femoral cannulation easier. Central line was inserted in head-up position with precautions to prevent air entrainment. After adequate heparinization, right femorofemoral bypass was established. Injection fentanyl 200 mcg, midazolam 5 mg, propofol 100 mg, and rocuronium 70 mg were added to the pump prime for anesthesia induction and muscle relaxation, respectively. Higher doses of drugs were given keeping in mind the dilutional effect of cardiopulmonary bypass (CPB). Only 60% flow could be achieved with the femorofemoral bypass which was insufficient for adequate gas exchange. Thus, the patient was intubated (2 min after the initiation of CPB to ensure adequacy of anesthesia and muscle relaxation) in an upright position to ventilate the lungs. The length of the endotracheal tube (ETT) only up till the cuff was passed inside the larynx taking care not to impinge on the tumor. The ventilation through the ETT resulted in high airway pressures. Lowering the head end resulted in complete obstruction of the airway with absolute inability to ventilate the lungs. As SpO_2 gradually dropped to 85%, rapid sternotomy was done in 30° head up position. The right atrium was then cannulated to achieve total flows with a beating heart atriofemoral bypass. The adequate gas exchange was achieved.

Under CPB, dissection was done to bring trachea with its bifurcation into view [Figure 2]. The trachea was opened, and the tumor was found to be arising from anterior wall and was causing near total occlusion of the lumen. Three tracheal cartilage were resected along with the tumor. Inferior pulmonary ligaments were released, and trachea was reconstructed by end to end anastomosis. The patient was smoothly weaned off bypass and heparin was reversed with protamine. After adequate hemostasis, sternum, and the inguinal incisions were closed in layers. Postoperatively, she was mechanically ventilated with strategies (low tidal volume

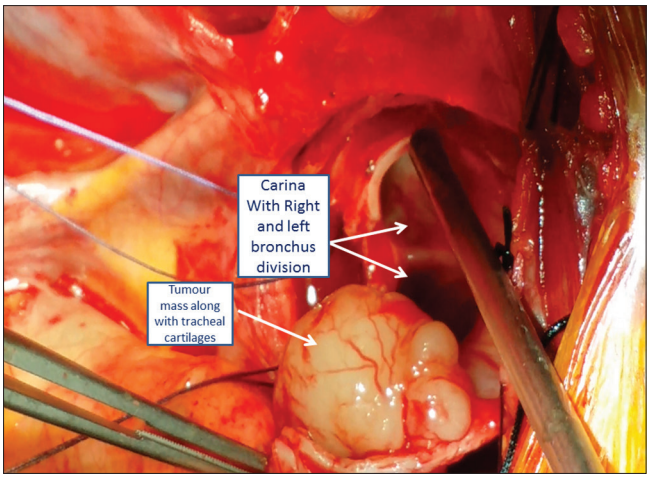

Figure 2: Intraoperative image of tumor with tracheal cartilages and the carina

and high respiratory rate) to lower the airway pressures so that injury to tracheal suture line is minimal. Further, repeated suctioning of the endotracheal tube was also avoided. She was extubated 12 h later in the intensive care unit, and there was no evidence of tracheomalacia. Histopathology report revealed the tumor to be a adenoid cystic carcinoma.

Patients were discharged on day 6 and were sent for radiotherapy as adenoid cystic carcinoma is highly radiosensitive. She was doing well at 6 months follow-up without any evidence of tracheal stenosis.

The primary tracheal tumor is rare. Annual incidence is only 0.142/1 lakh population, of which only 28% occurs in females.[3] Squamous cell carcinoma is the most common histological variant, next being adenoid cystic carcinoma.[3] Adenoid cystic carcinoma, also known as cylindroma is a malignant and slow growing tumor with a relatively good prognosis.[4]

The institution of presurgical femorofemoral bypass under local anesthesia in awake patients is less often described for tracheal tumors causing near-total tracheal occlusion though it has been described for other causes.[5,6] CPB is a safe alternative for avoiding airway disasters and adverse outcomes in patients with total or near total obstruction.[7-9] We went on femorofemoral bypass in sitting position because of absolute inability of the patient to lie down. Femorofemoral bypas in sitting position can have several problems like kinking of venous cannula and inadequate venous return. However, even on making the patient supine, we could not achieve full flows. As the gaseous exchange deteriorated due to inadequate flows and inability to ventilate, we opted for immediate sternotomy and atriofemoral bypass.

CPB provides the surgeon a hassle free time for adequate resection. Most cases described in literature have a short bypass time as cross field ventilation is established after sternotomy. Crossfield ventilation refers to ventilating the trachea distal to the obstruction or tumor once trachea is transected. This method leads to early weaning from bypass. However in our case the tumor being carinal, cross field ventilation was difficult to achieve. Moreover, release of inferior pulmonary ligaments for carinal reconstruction and end to end anastomosis required collapsed lungs and bloodless field. Thus, we could start ventilation and weaning of bypass only after resection of tumor and reconstruction of trachea.

The option of ventilation through tracheostomy and/or endobronchial ventilation was ruled out due to the site of tumor and degree of obstruction. Alternate methods of oxygenation like jet ventilation were also not considered because this may cause dislodgement of a part of tumor or may change position of tumor leading to further obstruction. Moreover, high-frequency jet ventilation may cause inadequate time for expiration leading to risk of air trapping and pneumothorax. Laser or endoscopic excision was not opted as any bleeding during the procedure or tumor edema during manipulation can be catastrophic.

Since the nature of tumor was not known preoperatively a complete excision with good margin involving 3 tracheal cartilages was done. The carinal reconstruction was done with release of inferior pulmonary ligaments which provides extra length for end to end anastomosis.

Careful planning is required to avoid airway catastrophes in tracheal tumor patients. The institution of femorofemoral bypass in an awake patient under femoral nerve block and local anesthesia is a safe, efficient, and reliable method for anesthetizing these patients.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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References

1. Satoh M, Hirabayashi Y, Seo N. Spontaneous breathing combined with high frequency ventilation during bronchoscopic resection of a large tracheal tumour. Br J Anaesth 2002;89:641-3.
2. Gao H, Ding X, Wei D, Cheng P, Su X, Liu H, *et al.* Endoscopic management of benign tracheobronchial tumors. J Thorac Dis 2011;3:255-61.
3. Honings J, van Dijck JA, Verhagen AF, van der Heijden HF, Marres HA. Incidence and treatment of tracheal cancer: A nationwide study in the Netherlands. Ann Surg Oncol 2007;14:968-76.
4. Blanco Orozco AI, Ginel Cañamaque A, Sánchez Navarro JM, Torres Cansino M. Adenoid cystic carcinoma of respiratory airways: Course and treatment. Arch Bronconeumol 1999;35:257-60.
5. Tempe DK, Arya R, Dubey S, Khanna S, Tomar AS, Grover V, *et al.* Mediastinal mass resection: Femorofemoral cardiopulmonary bypass before induction of anesthesia in the management of airway obstruction. J Cardiothorac Vasc Anesth 2001;15:233-6.
6. Tempe DK, Khanna S, Dubey S, Nigam M. Use of femoral-femoral cardiopulmonary bypass for urgent aortic valve replacement in a patient with critical aortic stenosis and left ventricular dysfunction. J Cardiothorac Vasc Anesth 2001;15:477-9.
7. Rosa P Jr., Johnson EA, Barcia PJ. The impossible airway: A plan. Chest 1996;109:1649-50.
8. Maziak DE, Todd TR, Keshavjee SH, Winton TL, Van Nostrand P, Pearson FG. Adenoid cystic carcinoma of the airway: Thirty-two-year experience. J Thorac Cardiovasc Surg 1996;112:1522-31.
9. Takeda S, Miyoshi S, Omori K, Okumura M, Matsuda H. Surgical rescue for life-threatening hypoxemia caused by a mediastinal tumor. Ann Thorac Surg 1999;68:2324-6.

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