Anesthetic management of a patient with tracheal stenosis is challenging. Though we have newer imaging modalities like multislice, three-dimensional computerized tomography, virtual bronchoscopy to determine the size and anatomy of the airway, it is difficult to accurately predict the distensibility of the trachea with the available preoperative tests. With our experience in this case, we believe that newer imaging modalities are just an adjunct in the assessment of the compromised airway in case of dynamic compression. Clinical assessment is very important in deciding the plan of management.

Key words: Dynamic tracheal compression, imaging modalities, mid tracheal stenosis

Introduction

Anesthetic management of a patient with tracheal stenosis is challenging. During initial presentations, they may be misdiagnosed to have bronchial asthma as they present with inspiratory stridor and/or expiratory wheezing. It is difficult to accurately predict the distensibility of the trachea even with an array of preoperative tests like Flow — Volume loop, Computerized Tomography (CT), and Bronchoscopy.

Case Report

A 45 year old female, with body mass index (BMI) 24 Kg/cm², presented to our hospital with shortness of breath on lying supine for the past 3 months, more so when lying on right side, hence she preferred to sleep on the left side. She had two episodes of hemoptysis. She had been able to perform her daily activities without any distress.

She was treated elsewhere as bronchial asthma and referred to our center for evaluation of hemoptysis. On examination, she was found to have a swelling in the left lobe of the thyroid, compressing and pushing the trachea to the right. Auscultation of her chest revealed bilateral inspiratory and expiratory wheezing. CT of the neck and thorax revealed an enlarged left lobe of thyroid measuring 3.4 × 3.3 × 3.4 cm with dense nodular calcification, causing short segment external compression and tracheal luminal narrowing. The stenosis extended from upper margins of C7 to T2 vertebrae, with a length of 3.1 cm and minimal diameter of 0.31 cm [Figure 1]. Fine needle aspiration cytology (FNAC) of the swelling revealed colloid goiter and she was posted for a left hemithyroidectomy.

Room air arterial blood gas analysis showed Partial pressure of arterial oxygen (PaO₂) of 80.5 mmHg, PaCO₂ of 41 mmHg, pH of 7.41. Pulmonary function tests could not be performed because of hemoptysis.

Preoperative fiberoptic bronchoscopy with a 4.8 mm bronchoscope revealed tracheal compression by extraluminal mass with a smooth margin 1.5 cm below the glottis. Tracheal lumen was narrowed by 80% [Figure 2]. The bronchoscope could not be passed beyond the narrowed segment.

When the patient was explained about the risks and options, she was not willing for any major resection or procedure. After written informed consent, patient was nebulized with 5 ml of 4% lignocaine and pre oxygenated with 100% O₂ for 10 min through a nasopharyngeal airway. She was placed
supine with a slight left tilt. Intravenously (IV), Glycopyrrolate 0.2 mg, incremental doses of midazolam (2 mg) and fentanyl (100 μg) were given. A 4.5 mm fiberoptic bronchoscope (FOB) threaded through a 5 mm internal diameter (ID) microlaryngeal tracheal tube (MLT) was passed nasally. The FOB was introduced close to the mass, and gently pushed past the obstruction. Lower part of trachea and carina were visualized. There was no bleeding or tumor debris visualized. The MLT was advanced over the FOB. A little resistance was noted but the tube could be passed below the mass without undue force. The FOB was withdrawn and trachea ventilated with a tidal volume of 450 ml, 8 breaths /min, and I: E = 1:3. The left lobe of the thyroid being stony hard and densely adherent to trachea could not be completely resected. As the patient was not willing for tracheal resection and reconstruction, an isthmectomy and release of fibrotic tissue around the trachea was done. Before closure, the 5.0 mm (ID) MLT was replaced with a 6.0 mm ID MLT over an Aintree Intubating Catheter. As this could be passed without any resistance, it was followed by the passage of a 7.0 mm ID endotracheal tube with little resistance. Postoperatively, patient was electively ventilated, anticipating airway edema. Under steroid cover, 24 h later, the patient was extubated over a tube exchanger, with standby tracheostomy. She had no respiratory distress and was discharged on the 6th postoperative day. Histopathology report revealed papillary carcinoma. As the patient did not want any major definitive surgery; she was referred to a regional cancer institute for further management.

Discussion

While anesthetizing patients with tracheal stenosis, despite having newer imaging modalities like multi-slice, three-dimensional CT, virtual bronchoscopy to determine the size and anatomy of the airway, it is difficult to accurately predict the distensibility of the trachea with the available preoperative tests. Preoperative assessments of airway size and collapsibility may not be perfect in predicting patency of the airway and ease of ventilation during general anesthesia. On one hand, it is important to maintain a patent airway till it is secured with an endotracheal tube. On the other, it is important not to over-estimate the airway narrowing as this will result in the patient being ventilated with an unnecessarily small endotracheal tube. Pulmonary function tests are useful in the functional assessment of obstruction, but were contraindicated in our patient because of hemoptysis.

The ability to compensate breathing through a narrow airway may be better during general anesthesia than during wakefulness, because behavioral influences such as anxiety are eliminated and oxygen consumption reduced. However, Azizkhan et al., reported total collapse of the airway by mediastinal masses causing >50% narrowing of the trachea. Hence, we decided to proceed with awake intubation, with adequate sedation. This helped, as we were able to pass the FOB beyond the mass when it was not possible during the preoperative bronchoscopy.

The presence of hypercapnia preoperatively, in the absence of respiratory pathology, strongly suggests the potential for failure of both spontaneous and mechanical ventilation during general anesthesia. The absence of hypercapnia in our patient was reassuring.

Critical fixed narrowing through which anesthetized patients can breathe spontaneously without increase in partial pressure of carbon dioxide in the blood (PaCO₂) is 4.0-4.5 mm ID. As our patient was maintaining normocapnia, we assumed that her dynamic airway would be at least this wide.

As the tracheal diameter varies with respiration, it is inaccurate to rely on static CT images in cases of external...
compression. Toyoto et al., used a 5.5 mm ID reinforced endotracheal tube with an external diameter of 7.5 mm in their patient whose CT image showed the narrowest portion as being 2.6 mm. [7]

The serial passage of increasing sizes of endotracheal tubes was similar to dilatation of stenosis under direct vision. The isthmectomy and release of fibrotic bands also decreased the external compression of the trachea and increased the airway caliber post surgery and we were able to provide symptom relief. This also made the anterior surface of the trachea accessible for a low tracheostomy, which was not possible preoperatively.

In conclusion, newer imaging modalities are just an adjunct in the assessment of the compromised airway in case of dynamic compression. Our experience is with a single case and probably, only randomized control trials can answer the question whether newer imaging modalities really help airway assessment in dynamic tracheal compression or not.

Clinical assessment will, however, remain very important in deciding the plan of management.

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