Unique technique of rescue ventilation in malignant critical airway obstruction during airway stenting

Sir,

A 58-year-old chronic smoker presented with progressive respiratory distress, facial puffiness and stridor for 20 days. Examination revealed facial plethora, neck swelling and inspiratory stridor. Chest radiology and contrast-enhanced tomogram (CECT) were suggestive of left hilar mass \((11 \times 9 \times 11 \text{ cm})\) causing central airway obstruction (CAO) with mediastinal invasion and liver metastases. Video bronchoscopy (VB) showed more than 70% luminal obstruction and mucosal infiltrations starting from the middle one-third of trachea extending up to carina and main bronchi. The involved segment had the shortest diameter of 4.3 mm as measured by CT scan. Endobronchial ultrasound (EBUS)-guided trans bronchial needle aspiration (TBNA) from left para-tracheal lymph node and liver biopsy were suggestive of squamous cell carcinoma.

Patient was started on chemotherapy and planned for palliative radiotherapy, but respiratory distress kept worsening. Elective tracheal stenting was planned but evening before the procedure, the patient’s respiratory distress worsened even further. Therefore, emergency self-expanding metallic stent (SEMS) placement was planned via flexible bronchoscopy, as rigid bronchoscope and jet ventilation were not available at that point of time. SEMS has been successfully inserted previously as per literature using a flexible bronchoscope under minimal sedation, thus avoiding the need for general anaesthesia which is required for rigid bronchoscopy.\(^1\)

After taking consent, trans-nasal VB was performed under procedural sedation using dexmedetomidine \((0.7 \, \mu g/kg/h)\). As soon as bronchoscope reached mid-trachea, patient developed hypoxia with increased cardio-respiratory work. None of the devices like nasopharyngeal airway and pharyngeal catheters helped; therefore, ventilation through cricothyroidotomy was tried as the anterior wall of trachea was not infiltrated but the patient did not improve as it had a small single port which kept getting blocked.

To combat this, a tube or catheter was needed which was malleable enough to minimise the injury to the airway and had at least 4 mm lumen to facilitate oxygenation and ventilation.\(^2\) Along with that, it had to be resilient enough so that it would not get torn during manipulation of scope and deployer. Various catheters were considered like central line, foley’s catheter, but...
ultimately the choice was narrowed down to 12Fr (4 mm) dialysis catheter, which is tough, malleable and has adequate calibre to facilitate ventilation. Through cricothyroidotomy, the guidewire was inserted and 12Fr dialysis catheter of length 13.5 cm was railroaded over a guidewire till it reached middle one-third of trachea, i.e., 6.5 cm below cricothyroid membrane. It was connected to the Bain circuit using a 2 ml syringe fixed over an endotracheal tube connector [Figure 1].

The procedure was reinitiated where VB and deployer were used to insert Y-SEMS. There was no peri-procedural desaturation as in the previous attempt. Stenting was completed uneventfully and respiratory distress decreased significantly [Figure 2].

Multiple factors contribute to respiratory distress during bronchoscopic interventions and when the lumen itself is critically obstructed, it becomes even more challenging. The bronchoscope itself reduces the cross-sectional area of the airway, leading to airflow limitation. Sedative drugs could lead to hypoventilation and/or upper airway obstruction. As the airway lumen decreases beyond the critical diameter of 4.0 mm especially during the procedure, resistance might increase rapidly as explained by Poiseuille’s law, which states that resistance through a tube is inversely proportional to the fourth power of internal diameter.[2] Increasing work of breathing leads to fatigue and respiratory arrest; hence, to make the procedure successful, we needed rescue ventilation.

There were few feasible options like using transnasal humidified rapid-insufflation ventilatory exchange (THRIVE) and jet ventilation which could have helped but were not available.[3,4] Another option was trans tracheal catheter (TTC), if available would have been close to the ideal choice; its non-availability and single port for ventilation were the points against using it. Additionally one TTC costed around Rs 20,000, while the dialysis catheter costed just Rs 4000.[5] Another option was to use the working channel of bronchoscope for oxygen supplementation but it had
been used in the past only in healthy volunteers and moreover, there would be no channel for suction and instrumentations.[6] Endotracheal intubation for ventilation could not help as it would have been very difficult to pass bronchoscope through the side of an endotracheal tube through swollen vocal cords.

Although using a dialysis catheter for oxygenation and ventilation was not an ideal option during airway stenting, it was the best option considering the scenario in a resource-limited setting. It may be repeatable in cases of compromised airways where rigid bronchoscopy and jet ventilation are not available or in regions where a patient needs to be shifted to a higher centre.

**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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