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Our Experience of Placement of Airway Sems in Three Different Scenarios of Lung and Esophageal Malignancy

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Abstract

Malignant central airway obstruction refers to the obstruction of the trachea, and right or left main bronchus due to neoplastic growth. The airway is generally compromised by ~50% at presentation when the patient develops symptoms. Diagnosis is done by flexible bronchoscopy and imaging. However, treatment is challenging due to recurrence, and increased vascularity of tumors, owing to dreaded complications of bleeding and airway compromise. Tracheoesophageal fistula is an abnormal communication of the trachea with the esophagus. It occurs in advanced stages of esophageal and lung malignancy. Bronchoscopy and airway stenting is the palliative treatment option due to the advanced stage of the disease. We present three different case scenarios of thoracic malignancies who underwent airway stenting.

Keywords
- central airway obstruction
- endobronchial stenting
- tracheoesophageal fistula
- SEMS

Background

Central airway obstruction can be of benign or malignant etiology, of which malignancy is the more common cause. Malignant central airway obstruction occurs in ~20 to 30% of patients with lung cancer and is usually associated with poor prognosis. Timely therapeutic intervention, endobronchial debulking and tracheobrochial stenting give immediate relief to the patient by improving the airway lumen and hence a better quality of life.

Tracheoesophageal fistula (TEF) is a pathological communication of the trachea and the esophagus. It can be congenital or acquired. It can be further classified as benign etiology or malignant etiology. Thoracic malignancy such as carcinoma lung or esophagus can lead to TEF by direct extension of the tumor, as a result of surgery, chemotherapy, radiotherapy or pre-existing stent erosion into the adjacent structures. Due to the advanced stage of malignancy, most patients will be eligible only for palliative procedures such as endobronchial stenting as compared with surgery. Hereby, we present three such scenarios of tracheobronchial stenting for palliative purpose.

Case Presentation

Case 1

A woman in her late 40s presented with a diagnosis of carcinoma middle one-third of the esophagus with systemic hypertension presented with a history of cough, expectoration, and exertional dyspnea since 4 weeks. Expectoration was mucoid in consistency, nonfoul smelling, and not blood-stained. There were no complaints of fever, chest pain, orthopnea, or paroxysmal dyspnea. She also had complaints of dysphagia, generalized weakness, and loss of weight. Her dysphagia was more to solids than liquids. She

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was diagnosed with squamous cell carcinoma esophagus 1 year ago for which she had received radiotherapy and chemotherapy. On examination, she had a saturation of 90% in room air, a heart rate of 100 bpm, a respiratory rate of 25 breaths per min, biphasic stridor, and respiratory distress. She had made multiple hospital visits for recurrent respiratory infections and was under follow-up with her oncologist for regular chemotherapy and radiation therapy. She underwent a diagnostic bronchoscopy in her local hospital that revealed the central airway obstruction secondary to the extension of the esophageal growth into the trachea. She was referred to our center for further management of the endotracheal obstruction.

All relevant investigations were done. A blood workup showed leukocytosis. Liver and renal function tests were within normal limits. CECT showed soft tissue density-enhancing mass lesion measuring $20 \times 23 \times 27$ mm in the upper thoracic esophagus at D1 and D2 levels. Anteriorly, it is seen infiltrating the tracheal lumen causing luminal stenosis

The patient was started on oxygen via nasal cannula at 2 L/min, antibiotics, steroids and bronchodilator nebulization. Oxygen tapered to room air gradually. Repeat CT thorax and 3D reconstruction of the central airways were done to find out the extent of the lesion. The lesion was located at a distance of 52.9 mm from the subglottis and the extent of the lesion was 17.2 mm. The lesion caused a near-total occlusion of the trachea leaving behind a narrow opening of 2.4 mm for ventilation (►**Figs. 1**–**2**) A flexible self-expanding metallic stent of 6 cm in length was chosen to have a margin of 2 cm on either side of the lesion. The patient was intubated with the rigid tracheoscope under general anesthesia in the operating room. Under direct vision with the telescope, the guidewire was passed through the narrow lumen beyond the lesion and a self-expanding stent was deployed. (►**Fig. 3**) The patient was extubated on the table, she tolerated the procedure well. Post-procedure repeat CT thorax was done to assess the stent expansion and placement. Tracheal lumen patency was re-established. The patient's respiratory distress reduced and was discharged the next day on steroids, antibiotics, and antihypertensives. She was advised to follow up on her chemotherapy and radiotherapy course.

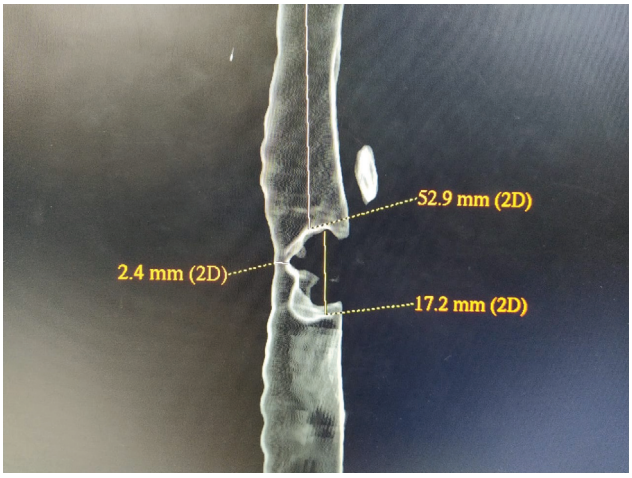

Fig. 1 Pre procedure airway measurements – Distance of the stenosis from subglottis - 52.9 mm. Length of stenosis – 17.2 mm. The patent lumen at the stenosed part – 2.4 mm.

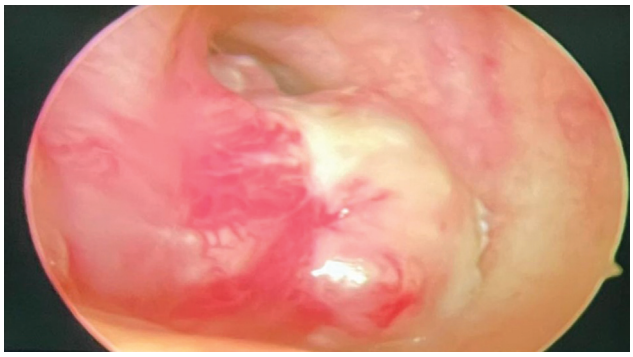

Fig. 2 Bronchoscopic view of the intraluminal growth in the trachea causing near-total obstruction.

The patient presented after 5 months of tracheal stent placement with complaints of cough and expectoration since 4 weeks. On examination, saturation was 95% in room air with bilateral equal air entry, and normal vesicular breath sounds. Repeat chest X-ray and repeat bronchoscopy were done, which confirmed the position of the stent. She was treated symptomatically and is undergoing regular chemotherapy.

Fig. 3 Post procedure – post endotracheal stenting CT thorax view of the stenosed part.

Case 2

The second case is about a female patient in her late 50s who presented with a history of cough, expectoration since 4 months. She had gradually progressive breathlessness since 2 months. She also had an evening rise in temperature and loss of weight. However, there was no dysphagia, hoarseness of voice, or abdominal complaints. On examination, oxygen saturation was 98% in room air, pulse rate was 90 bpm, blood pressure was 120/80 mmHg, respiratory rate was 20 breaths per min. Respiratory system examination revealed bilateral equal air entry, no added sounds. Patient had undergone flexible bronchoscopy in another hospital which diagnosed an intraluminal growth in the lower end of the trachea causing luminal narrowing histopathologically diagnosed as nonsmall cell lung cancer – squamous cell carcinoma. CT thorax and image 3D reconstruction of the central airways was performed to confirm the obstruction, examine for distal airway patency, and find the extent of the lesion. The intraluminal lesion was located in the lower end of the trachea arising from the right later wall of the trachea. The lesion extended for 22.4 mm with the narrowest part of the lumen measuring 1.3 mm. Under general anesthesia, rigid bronchoscopic intubation was done, a flexible bronchoscope was used to pass the guidewire beyond the lesion. Self-expanding metallic stent deployed under fluoroscopic guidance. It is worth noting the difficulty while deploying the stent that the stent was getting deployed much proximally as expected. The stent had to be withdrawn out through the rigid bronchoscope to be reloaded and redeployed much distally to the expected stent placement location. The stent position was confirmed by a flexible bronchoscope and chest X-ray. Tracheal lumen re-established thereby immediately relieving the patient's symptoms (►**Fig. 4**). The patient was referred to a medical oncologist for further management.

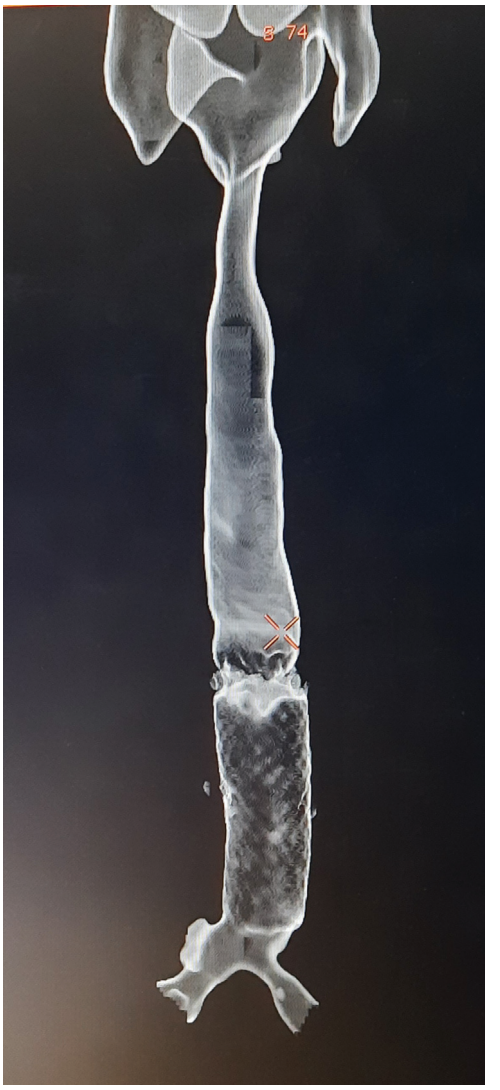

Fig. 4 Re-established lumen after endotracheal stenting.

Case 3

The third case was a male patient in his sixth decade presented with a cough since 1 month, vomiting since 1 month, fever episodes on, and off since 1 week. The patient also had a history of weight loss and loss of appetite. On examination, he had an oxygen saturation at 96% in room air, pulse rate was 95 beats per min, and respiratory rate was 18 breaths per min. Respiratory system examination revealed equal air entry bilaterally and crepitations in infra scapular and mammary areas. Upper gastrointestinal scopy was done with a biopsy from the middle-third of the esophagus, which turned out to be squamous cell carcinoma. The patient was referred to look for a trachea esophageal fistula. Flexible bronchoscopy was done, which showed a fistulous opening connecting the trachea and esophagus at the lower end of the trachea just above the carina (►**Figs. 5** and **6**). Rigid bronchoscopy was done under general anesthesia. The challenge during the stent placement was that after deployment of the stent, the polyvinyl bead at the distal end of the stent deployer dislodged and remained behind in the airway. The polyvinyl bead of the stent deployer had to be removed. Because the conical part was difficult to grasp with rigid forceps, fogarty balloon was passed distal to it and slowly withdrawn. The stent was reloaded and deployed under fluoroscopic guidance (►**Fig. 7**). The rent in the airway was covered by the stent. The patient's presenting symptoms reduced.

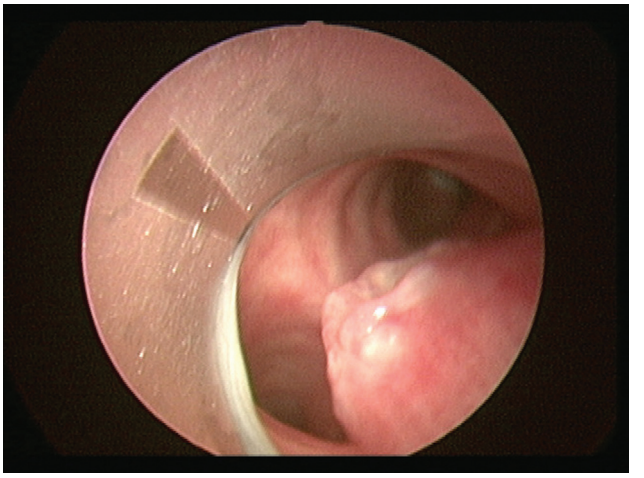

Fig. 5 Tracheo esophageal fistula in the lower end of the trachea.

Fig. 6 Conical distal end piece of the stent deployer.

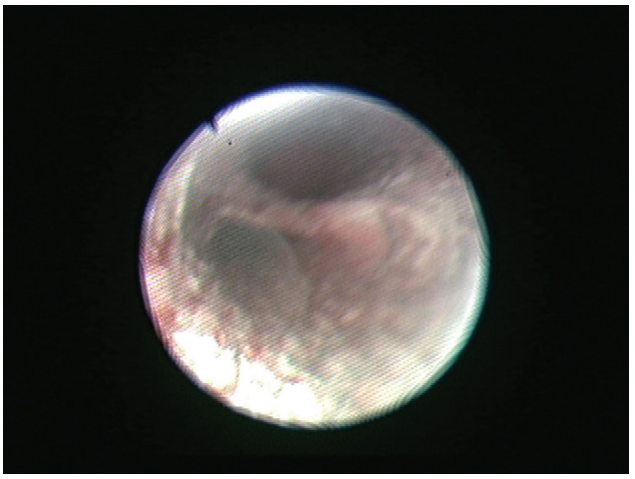

Fig. 7 Endo luminal view of Y stent after deployment.

Discussion

Malignant central airway obstruction refers to a neoplastic narrowing of the trachea, right and left main bronchus. Obstructive lesions are classified into intraluminal (intrinsic), extraluminal (extrinsic), or a combination of both. The neoplastic etiology can be a primary lung tumor or adjacent tumors such as esophageal, laryngeal, mediastinal tumors, or lymphoma. Symptoms are dyspnea, cough, hemoptysis, wheezing, or post obstruction pneumonia. Our patient had cough, wheezing, exertional dyspnea along with swallowing difficulty.

Diagnosis is by flexible bronchoscopic examination and visualization of the trachea bronchial obstruction. Once diagnosed, treatment is challenging due to the following reasons a) difficult to debulk the tumor with a flexible bronchoscope owing to bleeding and the need for rigid bronchoscopy and b) the risk of airway compromise and need for a pre-decided plan of hemostasis such as electrocautery and APC.[1] The aim of treatment in malignant central airway obstruction is to re-establish the patency of the airway lumen. In case of an intrinsic obstruction, this can be achieved by tumor debulking by cryoprobe, multiple biopsies, and coring the tumor with the beveled edge of the tracheobronchoscope. To maintain patency and prevent the lumen to be compromised, a tracheobronchial stent may be placed. In case of an extrinsic compression causing airway luminal narrowing, the patient benefits by the placement of an airway stent along with treating the cause.[2] In our case, the patient underwent a check bronchoscopy with flexible bronchoscope, followed by rigid bronchoscopy and tracheal stenting with a self-expanding metallic stent.

A rigid tracheo-bronchoscope is the instrument of choice in case of airway manipulation due to its larger lumen and ability to use varied instruments along with ventilation.[2] Because the lesion of interest in our case was in the mid-part of the trachea, a rigid tracheoscope was used.

Airway stents have an important role in rapid and effective symptom-relieving in central airway obstruction. Stents can be silicone, metallic, or hybrid material. Further metallic stents are classified into uncovered, covered, and partially covered stents. The choice of stent depends on the patient's pathology.[3] Metallic stents are difficult to remove as compared with silicone stents due to the ingrowth of granuloma and tumor tissue around the stent. The general consensus is that metallic stents are used in malignant obstruction as the stent will be left in place for the rest of the patient's lifetime, whereas silicone stents can be removed easily in the benign condition once the cause is treated. The US FDA recommends against using metallic stents in benign conditions.[4] The commonest type of stent being used around the world is the covered self-expandable metal stents (SEMS). Covered SEMS mean use was 44%, followed by the silicone stents (37%), Y stents (15%), uncovered SEMS (12%), and Montgomery T tube (5%).[5]

TEF often occurs with tracheal and esophageal malignancies. Approximately 5 to 15% of patients develop TEF due to esophageal malignancy, while 1% are caused by bronchogenic carcinoma.[6] Patients usually present with cough while having food or fluids, purulent bronchitis, and pneumonia. In view of advanced disease in malignancy patients, surgery is often not possible. Such patients are ideal for tracheal stenting with or without esophageal stenting.

Learning Points/Take Home Messages

- Malignant central airway obstruction is a common occurrence.
- SEMS placement provides immediate symptom relief in lung malignancy with central airway obstruction and tracheoesophageal fistula on palliative care.
- It establishes airway patency and improves the quality of life.

Conflict of Interest
None declared.

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