

Removal of Endobronchially Placed Vascular Self-Expandable Metallic Stent Using Flexible Bronchoscopy

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ABSTRACT

Self-expanding metallic stents (SEMS) are commonly placed in malignant airway obstruction and sometimes in benign obstruction. Complications from SEMS placement are common, especially after 30 days from deployment. SEMS removal can be complicated and often involves significant resources. We report a case of a 78-year-old man with small cell carcinoma who underwent placement of a Luminexx endovascular stent in his right main stem bronchus, complicated by stent migration after initiation of chemotherapy. Stent removal was performed by flexible bronchoscopy, utilizing forceps inserted via a working channel, as well as a goose neck snare operated parallel to the bronchoscope. The patient was discharged the same day with no complications.

INTRODUCTION

Self-expanding metallic stents (SEMS) are used frequently in palliative therapy of lung cancer patients with poor prognosis and poor response to therapy. SEMS also are employed in airway strictures after lung transplantation and in certain benign airway diseases.¹⁻⁴ Most common complications include stent migration, infection, and granulation although bleeding, stent fracture, tumor ingrowth, and restenosis occur as well. Most recent case series estimate the SEMS complication rate at 20% to 30%.⁵⁻⁶ Most complications occur after 30 days, and as such are more common in benign stenosis given patients' survival. The relative ease of SEMS placement created a large population of patients presenting with subsequent complications. Complications of SEMS removal have been described in literature.⁷⁻⁸ Removal of SEMS is usually more difficult than their placement. They can

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be removed with rigid or flexible bronchoscope, although rigid bronchoscope is utilized in the majority of published cases.⁹ With granulation and stenosis, debulking with neodymium-doped yttrium aluminium garnet (Nd:YAG) laser or argon plasma coagulation, cryotherapy and balloon dilation are usually effective.

CASE PRESENTATION

This is a case of a 78-year-old man who presented to a primary physician's office with worsening dyspnea. A computerized tomography (CT) scan showed significant narrowing of the right main stem bronchus secondary to a tumor in the right upper lobe. The patient was referred to interventional radiology from the primary care physician's office. Under fluoroscopic guidance, a noncovered SEMS Luminexx 14 mm x 4 cm stent (BARD Peripheral Vascular, Tempe, Arizona) was placed in the right main stem bronchus with improvement in patient's dyspnea.

Subsequently, the patient was referred to a pulmonologist who performed bronchoscopy. An endobronchial stent was noted in the right main stem bronchus. Malignant tissue was obtained by endobronchial biopsy performed on the tissue squeezing through the stent into the lumen. A diagnosis of small cell carcinoma was made; the patient was referred to oncology and started chemotherapy.

The patient then presented to ICU with neutropenic fever and worsening cough. A chest x-ray obtained on admission showed the stent migrating into the trachea with a significant decrease in the tumor size in the right upper lobe. Neutropenic fever was treated with antibiotics and Neupogen, and the patient was discharged a few days later.

Given the stent migration, the patient was taken to the operating room (OR) by pulmonary service in an outpatient manner 35 days after stent placement. Rigid bronchoscope was available

Figure 1. Luminexx Stent Migrating From Right Main Stem Bronchus Into the Trachea

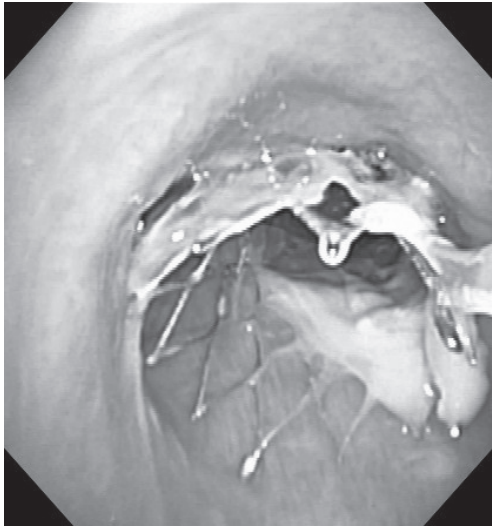


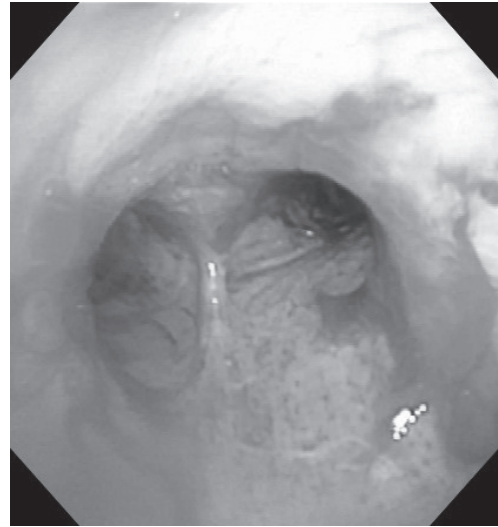
Figure 2. Stent Removal



Stent was grasped with forceps, directed into the goose neck snare and squeezed into a conical shape. Next, with twisting motion, the proximal portion of the stent was pulled into the endotracheal tube (ETT). ETT, bronchoscope with forceps and snare holding the stent were removed.

if needed. Moderate sedation with propofol was administered, and the patient was intubated with a size 10 endotracheal tube (ETT). An Olympus 1-T180 bronchoscope (Olympus Medical Systems, Tokyo, Japan) was inserted via ETT into the trachea and the stent was visualized (Figure 1). Olympus FB-211D forceps were used via the working channel to grasp the prongs. Next, an Amplatzer Goose Neck snare (ev3 Endovascular Inc, Plymouth, Minnesota) was inserted into the ETT parallel to the scope in order to squeeze the proximal portion of the stent into a more conical shape. The stent's prongs were guided into the snare with forceps. Next, the stent was slowly advanced into the distal end

Figure 3. Trachea and Carina After Reintubation



of the ETT and the bronchoscope; the ETT and the stent held by the snare and forceps were removed in toto (Figure 2). The patient was then reintubated and the bronchoscope was reinserted with only minimal bleeding noted at the stent site (Figure 3). Cryotherapy was applied to the right upper lobe tumor. The patient was then awakened and extubated, and he was discharged home on the same day.

The patient underwent a follow-up bronchoscopy 3 days later. An airway exam showed patent right main stem bronchus, and the cryotherapy-treated tissue that sloughed off was suctioned out.

At 10 months after the procedure (November 2015), the patient is alive and doing relatively well, considering his diagnosis.

DISCUSSION

SEMS have seen an increase in their use with broader access to flexible bronchoscopy and ease of deployment compared with silicone stents. SEMS are easily deployed even by an inexperienced operator. This is in contrast to SEMS removal, where difficulty of removal has been recognized and well described. Increased numbers of SEMS placements possibly also results in a number of SEMS deployed without right indications. Because of these concerns, proposed algorithms outlining indications for stent placement have been published by experts in the Interventional Pulmonology field, British Thoracic Society Guidelines and jointly by European Respiratory Society and American Thoracic Society.¹⁰⁻¹² Additionally, in case of benign obstructions, the indications are even narrower. This led the Food and Drug

Administration (FDA) to issue a black box warning recommending restraint in placing SEMS in benign obstructions.¹³ That warning stems from patients with benign obstructions living long enough to experience these complications. However, even in cases of malignant obstructions, airway stents are not cure-all, save-all devices, and they carry significant risk of complications even when managed at experienced medical centers.

In the case described above, the Luminexx vascular stent, which is not an airway stent, was placed by a physician with little experience in airway stenting, without fiberoptic guidance or debulking with tissue diagnosis that ordinarily are part of the guidelines for airway stent placement. The stent's structure differs from the dedicated pulmonary SEMS such as Ultraflex (Boston Scientific) or AREO (Merit Endotek) that have a built-in suture that, when pulled, facilitates easier removal by elongating the stent into a more conical shape. This approach was not possible in this particular case, as the Luminexx stent's prongs protrude outward. In fact, once deployed the stent is not designed for removal at all.

It is not the intention of this case report to discuss the events leading to the stent placement. Rather, we present an approach to a stent removal by an addition of a goose neck snare that was inserted parallel to the bronchoscope. The goose neck snare allowed for improved maneuverability and positioning of a stent that had no dedicated removal system and outward-pointing prongs. This facilitated squeezing the stent into a more conical shape for safe removal. The traditional approach to SEMS removal involves rigid bronchoscopy and considerable resources in terms of OR time, hospitalization, and need for general anesthesia. This can potentially lead to SEMS being left in place, since rigid bronchoscopy might not be readily available or the medical center might lack experienced clinicians.

There are only a limited number of reports describing the use of flexible bronchoscopy for SEMS removal.¹⁴⁻¹⁵ All of these publications report no adverse events and show that, with careful planning, flexible bronchoscopy can be a reasonable first step in SEMS removal. Even when faced with a stent that was not designed to be retrieved, the removal proved to be relatively easy and the patient experienced no complications. This suggests that a dedicated endobronchial SEMS is potentially easier to remove, especially in the short term.

In addition, this and other reports show that the relative ease of the SEMS removal in the very short term with a flexible bronchoscope supports the potential use of these stents as a bridge to a more definite therapy such as chemotherapy or radiation, with an intent of removing SEMS before anticipated complications occur after the 30-day period. If SEMS removal is not anticipated, a patient's predicted survival should play a major role in the decision whether to place the stent in the first place. Patients also should be made aware of the potential complication risks and their frequency, as well as the medical center's experience with

airway stenting. Finally, the best way to avoid SEMS complications is to avoid placing the stent in the first place if alternative therapies are available.

CONCLUSION

Removing an endobronchial self-expanding metallic stent can reasonably be approached with flexible bronchoscopy as the initial attempt. Use of a tool such as a goose neck snare inserted parallel to the bronchoscope might provide additional benefit in maneuvering and securing the stent. In addition, a similar technique could be adopted in retrieval of other foreign bodies that might prove difficult to grasp with a single tool such as a basket or forceps. SEMS placement should only be considered after all other alternatives have been exhausted.

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