CASE REPORT

Management of right upper airway patency by a silicon stent in a case of endobronchial metastasis

Ran Shioi a, Masanori Yasuo a, Atsuhi Ushiki a, Tsuyoshi Tanabe a, Kenji Tsushima a, Masayuki Hanaoka a, Keishi Kubo a, Hideaki Moteki b, Yutaka Takumi b, Satoshi Kawakami c, Masahiro Kurozumi c, Yoshiki Hirose d

First Department of Internal Medicine, Shinshu University School of Medicine, 3-1-1 Asahi, Matsumoto, Nagano 390-8621, Japan
Department of Otorhynolaryngology, Shinshu University School of Medicine, Matsumoto 390-8621, Japan
Department of Radiology, Shinshu University School of Medicine, Matsumoto 390-8621, Japan
Department of Respiratory Medicine, Ina Central Hospital, Ina 396-0021, Japan

Summary

Background: Endobronchial metastasis from an extrapulmonary malignancy is relatively rare. There have been no previous reports of airway stenting to salvage right upper lobe airway patency.

Case report: This report describes a 76-year-old male who suffered from a huge endobronchial tumor with a history of renal cell carcinoma (RCC). The endobronchial tumor was thought to have invaded the right main bronchus from a metastasis of the lung parenchyma and the tumor was estimated to have considerable vascularity by contrast enhanced computed tomography. The patient underwent external irradiation, endobronchial tumor reduction with a flexible bronchoscope, transcatheter bronchial arterial embolization and then a successful endobronchial tumor resection by rigid bronchoscopy. The endobronchial tumor resection was mainly achieved using an electrosurgical snare. Furthermore, a Y-shaped Dumon stent was implanted at the bifurcation of the right upper lobe bronchus and bronchus intermedius for the management of complete right airway patency.

Conclusions: The tumor was successfully resected using a multidisciplinary approach and a novel method of silicone stent placement using the usual rigid bronchoscopic technique was employed to maintain complete right airway patency.

ª 2008 Elsevier Ltd. All rights reserved.

Introduction

Endobronchial metastases from extrapulmonary tumors are uncommon. The frequency of endobronchial/endotracheal
metastasis is variable by definition. It varies from 2 to 50 percent of airway involvement with solid tumor metastasis to the lungs.1,2 However, regardless of the definition, the frequency of endobronchial involvement by different primary tumors seems the same. Breast, colorectal and renal carcinoma are the common tumors associated with metastatic involvement of an airway.1–3 Recently, a few authors have attempted to define endobronchial metastasis.2,4 According to these reports and other recent studies, the term ‘endotracheal/endobronchial metastasis’ tends to include both direct metastasis to the tracheobronchus and tracheobronchial invasion. The interval from the diagnosis of the primary neoplasm to the appearance of the endotracheal/endobronchial metastases is relatively long (3–5 years).1–5 On the other hand, the median survival for patients following the diagnosis of the metastasis was relatively short (9–19 months).1–5 Even though, the manifestation reflects a far-advanced stage, some studies have reported long-term survival.1,2 It should be emphasized that treatment plans must be individualized.2

Recently, therapeutic bronchoscopy using a rigid and flexible bronchoscope is widely performed in many countries. The efficacy and usefulness of this procedure are also widely accepted. A statement on ‘interventional pulmonology’ that includes these procedures has presented several issues.6,7 An electrocautery snare and APC are among the techniques of interventional pulmonology. Increasingly, electrocautery and APC are replacing laser therapy as the methods of choice for coagulation or vaporization in the airways due to their lower cost, less cumbersome setup, easier use and more favorable safety profile.6,7 Coagulation, cutting, vaporization and all combinations can be performed with mechanical debulking for quick airway recanalization. Significant residual extraluminal stenosis or airway wall collapse can be managed by stent placement.6,7 The effectiveness and safety of these procedures have also been reported.8,9

This report describes a case of RCC that metastasized and severely invaded the right main bronchus. A multidisciplinary approach was employed to successfully restore complete right airway patency by the implantation of a Y-shaped Dumon stent at the bifurcation of the right upper and bronchus intermedius.

Case report

A 76-year-old male was referred to the hospital for endobronchial therapy. He had a history of a right renal resection due to RCC in 1997. He had received medical follow-up until 1999. He also had diabetes mellitus, hypertension and hyperlipidemia since 2001. On October 2006, a right hilar abnormal shadow was observed by chest X-ray at a health screening. Chest computed tomography (CT) revealed a 5 mm nodule in the right S2 and a right hilar lymph adenopathy about 3.5 cm diameter. These lesions were considered metastatic pulmonary tumors from the RCC because of his history and because the tumor appeared well enhanced on contrast enhanced CT. He was treated with interferon therapy. The metastatic tumor was stable until August 2006. However, chest CT in November 2006 revealed tumor growth. He did not wish to receive any further systemic therapy at that time. In February 2008, he felt a shortness of breath. Chest CT and flexible bronchoscopy showed a polypoid tumor at the right main bronchus, plural right lung metastasis and mediastinal lymphadenopathies. The polypoid tumor almost completely obstructed the right main bronchus. He agreed to the necessity of endobronchial tumor resection with an electrosurgical snare etc. He was admitted to the hospital in March 2008. Although his general condition was relatively good, he had been experiencing hypoxia and required 5 l/min oxygen inhalation by face mask. He had no severe renal dysfunction and had slight anemia. A chest X-ray on admission revealed complete atelectasis in his right lung (Fig. 1A). At that time, flexible bronchoscopy showed a huge polypoid lesion at the right main bronchus and the tumor protruded to the trachea (Fig. 2A). Contrast enhanced chest CT unveiled considerable tumor enhancement and the polypoid lesion

![Figure 1](image1.png)

**Figure 1** A. Chest X-ray on admission. Complete right atelectasis was seen. B. After stent implantation. Y-shaped Dumon stent (arrow) was implanted on the carina between the right upper lobe bronchus and bronchus intermedius, and complete right lung air inflation was achieved.
had invaded from a metastasis in the lung parenchyma (right S2; Fig. 3A). Due to the high risk of massive hemorrhage other supportive therapies were needed before an endobronchial tumor resection could be performed. First, he received external irradiation (30 Gy). After the irradiation, tumor enhancement was slightly reduced on chest CT; however the tumor had further protruded to the trachea (Fig. 3B) and his dyspnea was worsened. A partial tumor resection was performed by electrosurgical snare with a flexible bronchoscope and argon plasma coagulation (APC) was attempted for further tumor volume reduction (Fig. 2B). Although his respiratory symptoms were temporarily resolved, tumor protrusion was seen again after one week. The electrosurgical snare and APC were repeated and a tumor resection by rigid bronchoscopy was planned for after the administration of bronchial arterial embolization (BAE). The BAE was performed the day before a total tumor resection. Bronchial arteriography detected at least two feeder arteries. These two arteries were successfully embolized by gelatin sponge particles (Spongell®, Astellas Pharma Inc., Tokyo, Japan; Fig. 4A and B). A total endobronchial tumor resection was performed by rigid bronchoscopy. Five applications of an electrosurgical snare and several bursts of APC (for hemostasis) were introduced, and the tumor was completely resected. Only mild to moderate bleeding was observed during this maneuver. After the resection, the site of tumor invasion was identified. The site was the proximal orifice of the right upper branch (Fig. 2C). Several additional bursts of APC were applied at the site of invasion to prevent tumor re-invasion. A Y-shaped Dumon stent (NOVATECH, La Ciotat, France) was implanted at the bifurcation of the right upper bronchus and bronchus intermedius. This manner of implantation provided complete maintenance of right lung airway patency and complete lung air inflation was seen by chest X-ray (Fig. 1B). After 10 days, the patient was discharged without an oxygen supply.

**Methods**

The endobronchial electrosurgical snare (and APC) procedure was performed using a flexible bronchoscope. For flexible bronchoscopy, local anesthesia and conscious sedation with intramuscular injection of pethidine hydrochloride was administered before the procedure. Topical anesthesia was achieved by the endobronchial instillation of 2% lidocaine. For rigid bronchoscopy, general anesthesia was administered in the operating room. The pulse oximetry saturation, resting pulse, blood pressure and electrocardiograms were monitored during these procedures. An electrosurgical snare procedure was performed using an ICC200 (Erbe Elektromedizin; Tuebingen, Germany). To remove the tumor, a surgical snare (SD-7C-1, Olympus, Tokyo, Japan) was placed into the working channel of the flexible bronchoscope (BF 1T-260, Olympus). A flexible-monopolar Teflon tube with a 1.5-mm diameter, 150-cm length fitted into the working channel of the flexible bronchoscope was used to administer the APC.

**Discussion**

This report describes the use of multidisciplinary interventional endoscopy to perform an endobronchial resection of a severe metastasized RCC in the right main bronchus. These endobronchial therapeutic modalities provided complete airway patency and improved the quality of life in a patient with a metastatic endobronchial tumor who had advanced RCC.

The frequency of endobronchial metastasis is variable (from 2 to 50%) based on its definition.1 If the definition includes invasion of tracheobronchial structures by parenchymal or lymph node masses, the frequency will be high.1 Recently, the modes of the metastatic patterns have been used to differentiate endobronchial metastasis from extrathoracic malignancies.2,4 These reports include not only primary (direct) metastasis but also secondary metastasis.2,4 No correlations have been detected between the mode and the prognosis and the differentiation is not the same.

Breast cancer, RCC and colorectal carcinoma are the most frequent cancers responsible for endobronchial metastasis.1–4 The most common symptoms are coughing and hemoptysis followed by dyspnea and wheezing.1–5 The most commonly reported findings on chest X-rays include atelectasis, hilar enlargement and multiple or single nodules.2,4 Chest CT can more precisely reveal...
parenchymal and hilar-mediastinal lymphadenopathies than chest X-ray. In the present case, the invasion from the pulmonary metastasis to the bronchus was clearly indicated by chest CT. However, chest CT is not always able to demonstrate luminal metastasis, especially direct metastasis.

The treatment of endobronchial metastasis from extrathoracic malignancies must be planned according to the histology of the primary tumor, location of the lesion in the bronchial tree, number of lesions, evidence of other metastatic sites and performance status of the patient. Multiple therapeutic modalities have been reported, including surgery, external irradiation, chemotherapy, brachytherapy, laser debulking and hormonal therapy. Katsimbri et al. reported five cases that were treated with external irradiation, which achieved symptomatic improvement in all five cases; however, this result was only sustained for a few months. Systemic treatment also tends to provide no significant improvement either in symptoms or survival. The current case also failed to achieve either a symptomatic or a radiographical improvement with both kinds of therapies.

Because contrast enhancement chest CT indicated that the tumor was a prominent hypervascular lesion the
strategy was to diminish the risk of a massive hemorrhage before endobronchial intervention. At first, external irradiation was performed. This therapy showed some necrotic effects on the tumor surface however no volume reduction effect was seen. The most effective pre-treatment in this case was BAE. This therapy achieved not only embolization of the feeding arteries but also volume reduction (probably due to tumor necrosis). Chest CT after BAE showed partial air inflation in the patient’s right lung. The administration of BAE against hemorrhage from an endobronchial tumor has been reported previously but the current case is the first case in the English medical literature to describe the treatment before an endobronchial tumor resection. The BAE was successfully performed and only moderate bleeding was seen during the endobronchial resection. An electrosurgical snare and APC with a flexible bronchoscope was used for the tumor resection and hemostasis under rigid bronchoscopy. Tumor debulking by rigid bronchoscopy was attempted initially, but it could not be performed because moderate bleeding occurred and APC was applied for hemostasis. Five applications of the electrosurgical snare and several bursts of APC were successfully and safely performed and then the tumor was almost completely resected.

Stent implantation is frequently administered to maintain airway patency. The indications for stent implantation to the airway have been established and stabilizing airway patency after endoscopic removal of intraluminally growing cancer is one of the indications for the stent implantation. A Y-shaped stent is usually applied for longer stenosis and obstructions involving the carinal region and the usefulness is well known. This shape also has the advantage of preventing migration. In the current case, tumor invasion had occurred from the bifurcation of the right upper and bronchus intermedius. If the Y-shaped Dumon stent had been implanted at carina, tumor re-invasion could occur and if a metallic stent had been implanted at the right main bronchus for preventing tumor re-invasion, the right upper lobe would have been exposed. To solve this problem, a Y-shaped Dumon stent was implanted at the bifurcation of the right upper bronchus and bronchus intermedius. This maneuver was successfully performed using the usual Dumon stent and rigid bronchoscopic techniques and complete airway patency was finally established.

**Conclusions**

Tumor resection and stent implantation was successfully performed to treat a huge and hypervascular endobronchial metastasis of RCC. A multidisciplinary approach achieved successful airway patency. Furthermore, a novel strategy of implantation of a Y-shaped Dumon stent at the bifurcation of the right upper lobe bronchus and bronchus intermedius was applied.

**Conflict of interest statement**

We declare that we have no potential conflict of interest related to the article.

**Acknowledgements**

The authors thank Dr. Masahide Oki (Nagoya Medical Center, Japan) for valuable advice on the implantation of a Y-shaped silicone stent at the carina between the right upper lobe and bronchus intermedius.
References


