Bronchial Artery Embolization before Interventional Bronchoscopy to Avoid Uncontrollable Bleeding: A Case Report of Endobronchial Metastasis of Renal Cell Carcinoma

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Abstract

Extreme caution should be taken to avoid uncontrollable bleeding in treating hypervascular tumors via bronchoscope. We report two cases of endobronchial metastasis of renal cell carcinoma treated with bronchial artery embolization (BAE) before endoscopic treatments. The intraluminal lesions were removed swiftly and safely. Although arterial embolization is not always efficacious in cases of tracheal lesions, BAE is effective for tumors located in the carina, bilateral main bronchus or intermediate bronchus. The addition of BAE before endoscopic tumor removal should be considered a treatment option in patients suffering from airway obstructions due to hypervascular tumors such as renal cell carcinoma.

Key words: bronchial artery embolization, interventional bronchoscopy, endobronchial metastasis, renal cell carcinoma, uncontrollable bleeding, rigid bronchoscope

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Introduction

Interventional bronchoscopy, including laser resection (1) and stent placement (2), has been established as a palliative treatment for malignant obstructive tracheobronchial diseases. Silicone stents are usually placed by using a rigid bronchoscope under general anesthesia (3). These stents inhibit tumor ingrowth, and their irritation to adjacent healthy tissue is minimal (3-6). At present, silicone stents are the most widely used stents worldwide.

A silicon stent requires tumor removal before placement because the stent cannot expand by itself. The preferred procedures for tumor removal are laser resection or electrocoagulation by virtue of their safety. Although it has been reported that hemorrhaging in laser resection is not a major cause of death during or after tumor removal (7-11), this complication may become lethal once it occurs. Therefore, extreme caution should be taken, especially in endoscopic treatments against hypervascular tumors, to avoid uncontrollable massive bleeding. This report highlights bronchial artery embolization (BAE) just before stent placement in cases of bronchial obstruction by metastatic renal cell carcinoma, which is hypervascular and hemorrhagic.

Case Report

Patient 1

A 75-year-old man suffering hemoptysis visited our department as an outpatient. He was suffering from metastatic renal cell carcinoma, and had been treated in the urology department of our hospital since 1988. He had had his left kidney removed and was receiving interleukin-2 at the time. A chest computed tomography (CT) showed many metastatic nodules and a tumor that occluded his intermediate

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bronchus (Fig. 1A). Bronchoscopy was performed to confirm the existence of the occlusive tumor (Fig. 1B). We thought that this lesion was the cause of his symptoms, and planned tumor removal and stent placement to inhibit tumor re-growth in his airway. During the interventional bronchoscopy, the possibility of uncontrollable bleeding was a concern because his endobronchial metastatic lesion was due to renal cell carcinoma and was expected to be a hypervascular and hemorrhagic tumor. To our knowledge, there have been very few reports about therapeutic procedures dealing with endobronchial metastasis (EBM) of renal cell carcinoma. Although the argon plasma coagulator (APC) seemed to be a sufficient instrument for successful tumor removal, we thought of adding BAE before endoscopic tumor removal to minimize the bleeding. The right middle and lower lobe bronchial arteries were occluded by interventional radiologists using sterile gelatin embolization material (Gelpart®; Nippon Kayaku Co., Ltd., Tokyo, Japan) that is commercially available as an embolic agent (Fig. 2). The tumor removal and stent placement were performed on the same day as, and just after, BAE. The tumor in the bronchial lumen was removed safely using only forceps, and a silicone straight stent (TM stent®; Fuji Systems Corp., Tokyo, Japan) was successfully positioned in his intermediate bronchus (Fig. 3). The APC was rarely used during the procedure because the BAE sufficiently reduced the bleeding during tumor removal. In our hospital this is the first experience with the use of BAE before interventional bronchoscopy.

**Patient 2**

A 44-year-old woman suffering dyspnea and cough visited our department. She was suffering from metastatic renal
cell carcinoma, and had been treated in the urology department of our hospital since 2004. She had been receiving interleukin-2. The chest CT showed many metastatic nodules and a subcarinal lymphatic metastatic lesion. Moreover, the metastatic lymph node showed extranodular invasions and occluded her intermediate bronchus (Fig. 4). We decided to treat her using the same technique as we used for Patient 1. The right upper and lower lobe bronchial arteries were occluded using Gelpart®. The tumor in the bronchial lumen was removed safely with only forceps and a TM stent® was placed in her intermediate bronchus on the day after BAE. Again, the APC was very rarely used during tumor removal.

Discussion

We present two cases of EBM of renal cell carcinoma whose airway obstructions were safely relieved using an endoscopic procedure after BAE. Since BAE was quite sufficient for controlling the bleeding during tumor removal, another hemostatic instrument was almost never needed in either case, despite our having prepared an electrocoagulation system.

The most common extrathoracic malignancies associated with EBM are breast, renal and colorectal carcinomas (12). Although pulmonary metastasis from extrapulmonary malignancies are common, reports of endobronchial invasion are rare. Moreover, to our knowledge there is no standard therapeutic procedure for EBM. The therapeutic strategy for EBM is determined by characteristics of the primary tumor: biological behavior, the anatomic location of lesions, evidence of other metastatic sites and the patient’s performance status (13). Treatments and management include surgical excision and local radiotherapy [especially intraluminal brachytherapy (14)], chemotherapy and transbronchial endoscopic procedures. The endoscopic treatments include many therapeutic procedures such as photodynamic therapy, electrocoagulation, forceps, intra-tumoral ethanol injection, diathermic snares, prosthetic stents, and laser-debulking therapy (15). Among these procedures, we often select electrocoagulation and forceps or diathermic snares with or without stent placement, because of their convenience and safety.

In this report, we added BAE before the usual bronchoscopic treatments. We were concerned about uncontrollable bleeding, as we judged the EBM lesions as metastases of renal cell carcinoma and hypervascular in general. Other conventional procedures, chemotherapy and local radiotherapy, were excluded from the patients’ intraluminal-therapeutic strategy because these treatments were not thought to be effective against metastatic lesions of renal cell carcinoma. Sakumoto et al reported the usefulness and safety of diathermic snares in palliative treatments for EBM of renal cell carcinoma (16). Although diathermic snares are useful in cases of polypoid lesion with a small base attachment, the instruments are not always useful for flat lesions or for those with large base attachments (17). In these cases, other techniques, including electrocoagulation or the use of lasers, may be more effective and convenient (3). Sakumoto et al discussed bleeding as the most serious complication in their report (16), and sometimes a blood transfusion was needed for patients suffering gastrointestinal metastasis of renal cell carcinoma (18). Thus, in the endoscopic treatments of airway obstructions due to metastatic renal cell carcinoma, preparations for massive bleeding are essential.

Although there is no consensus about indication of BAE before endoscopic treatments, we always consider BAE except for the airway stenosis caused by esophageal cancer. In cases of esophageal cancer, it is comparatively easy to make a rigid bronchoscope go through the stenotic lesion and, moreover, the volume of bleeding is expected to be less during the procedure on an empirical basis. On the other hand, the arterial blood supply to the esophagus is complicated and it would be very difficult to detect an engaged artery such as the trachea described below. The upper esophagus is supplied by branches of the superior and inferior thyroid ar-
teries the midesophagus is supplied by branches of the bronchial and right intercostal arteries and descending aorta, and the distal esophagus by branches of the left gastric, left inferior phrenic, and splenic arteries (19).

BAE was performed by interventional radiologists in our hospital using Gel파트® as an embolic agent in a standard procedure (20) without any complications. The success or failure of BAE might depend on the anatomic location of the airway obstruction to prevent active bleeding during tumor removal. Almost all of the blood flowing to the thoracic end of the trachea, bilateral main bronchus and intermediate bronchus is supplied by the bronchial arteries. In the present two cases the blood of the intraluminal lesions might have been supplied mainly by the bronchial arteries, since the airway obstructions were located in the intermediate bronchus of each patient. Detection and embolization of the feeding arteries in our patients’ lesions were relatively simple, swift and precise. On the other hand, arterial embolization is not always effective in the case of a tracheal lesion.

Blood is supplied to the trachea mainly by inferior thyroid arteries, while the bronchial arteries also supply its thoracic end (21). Moreover, lots of branches, such as the inferior laryngeal arteries, internal thoracic arteries, tracheal branches of the descending aorta or brachiocephalic arteries, sometimes supply blood to the tracheal lesions (21). Detection and embolization of the feeding arteries might be very complicated in case of tracheal lesions. In fact, we encountered another case of severe obstructions with tracheal, carinal and bilateral main bronchial lesions due to metastatic colon cancer. In that case, the airway stenosis of carinal and bilateral main bronchial lesions was very critical; we prepared percutaneous cardiopulmonary support (PCPS) during the endoscopic treatments. Prior to tumor resection, we had attempted to identify and embolize feeding arteries in addition to the bronchial artery as much as possible. However, the arteries feeding the tracheal lesion could not be detected during the arterial embolization. Moreover, we anticipated that the bleeding from the tracheal lesion might not be severe because the primary disease was colon cancer. Thus, the tracheal-tumor removal was performed without arterial embolization. Unexpectedly, owing to the heparinization of PCPS without arterial embolization, the tracheal lumen was filled with blood during the removal of the tracheal lesion, although we were eventually able to remove the tumor. Therefore, BAE alone or even with embolization of other detectable arteries may not control bleeding from the tracheal lesion. Meanwhile, the lesions located in the carina and bilateral main bronchus could be removed easily using the same procedure presented in this report. We propose that the BAE has satisfactory effects for avoiding massive bleeding when EBM are located in the carina, bilateral main bronchi or intermediate bronchi.

Complications in BAE are uncommon and have diminished over time as the use of nonionic contrast media and micro-catheters have become more routine (22, 23). Complication during and after BAE include chest pain, dysphagia, subintimal dissection of the aorta, transient cortical blindness, and pulmonary infarct. However, the most serious complication is spinal cord injury (23-25). Fortunately, we experienced no major complications in our patients. Wang et al reported a major complication of spinal cord infarction likely as a result of the choice of particle size (26). Although it is generally accepted that the presence of radicular spinal arteries at diagnostic angiography are not an absolute contraindication to embolization (27), it had been recommended that particles larger than 200 μm be used for embolization to prevent non-target embolization of spinal feeding vessels and passage of particles through bronchopulmonary shunts (25). Severe non-target embolization could have been avoided because we used Gel파트® (1,000 μm) as an embolization material. In conclusion, BAE should be considered an option before endoscopic treatment in patients suffering airway obstructions due to hypervascular tumors such as renal cell carcinoma.

The authors state that they have no Conflict of Interest (COI).

References