


## CASE REPORT

# Bronchial carcinoid tumor managed with bronchial artery embolization before endobronchial resection: A case report

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## Abstract

Endobronchial resection using a bronchoscope is often selected as treatment for carcinoid tumors located in the central airways. However, massive bleeding is one of the most serious complications during bronchoscopic surgery. Here, we report the case of a 77-year-old female with a typical carcinoid tumor located in the right truncus intermedius who underwent bronchial artery embolization (BAE) one day before endobronchial intervention using a flexible bronchoscope. The tumor was successfully resected without bleeding. BAE prior to endobronchial resection of carcinoid tumors may be useful for reducing the risk of bleeding.

## KEYWORDS

bleeding, bronchial artery embolization, bronchoscopy, carcinoid tumor, endobronchial surgery

## INTRODUCTION

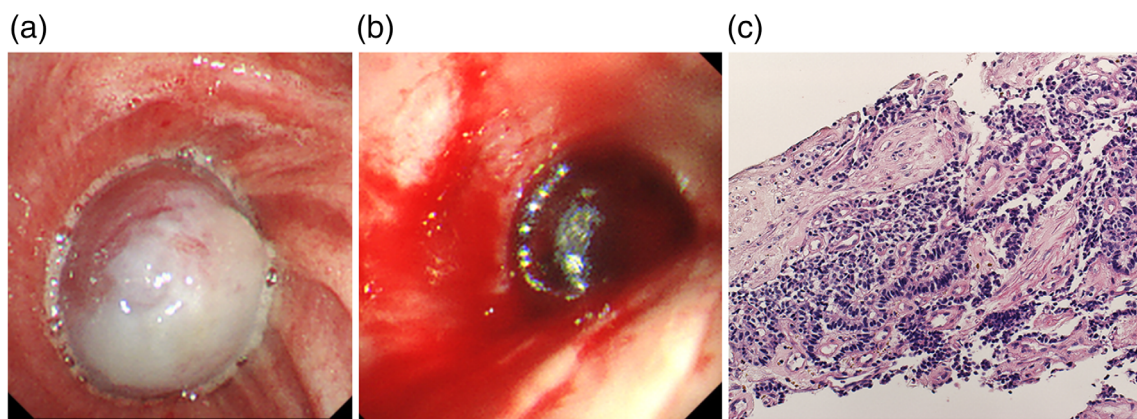
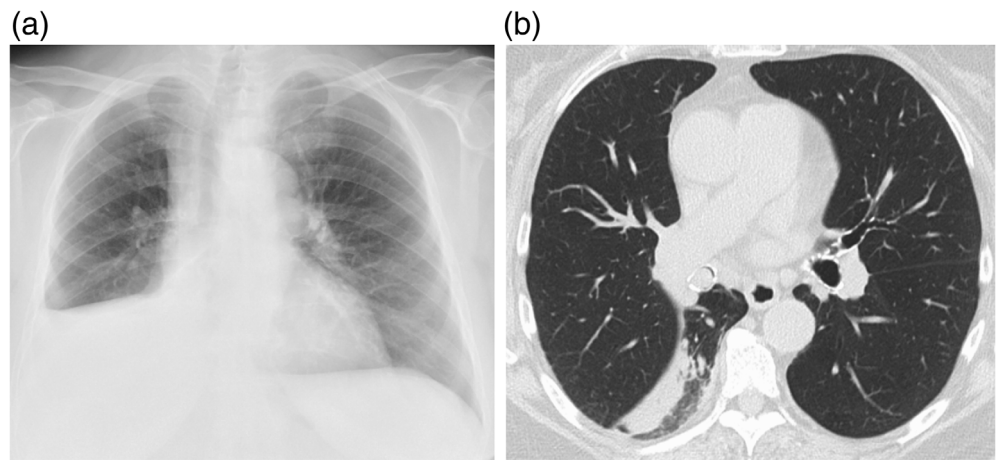
Carcinoid tumors are relatively rare neuroendocrine malignancies.<sup>1,2</sup> It has been reported that approximately 70% of pulmonary carcinoid tumors are located in the major bronchi.<sup>1</sup> The standard treatment for carcinoid tumors is surgical resection,<sup>3</sup> and there is growing evidence for endobronchial resection as another treatment strategy for typical bronchial carcinoid tumors.<sup>4</sup> However, one of the serious complications during endobronchial resection is major bleeding.<sup>1,5,6</sup> It has been reported that prior bronchial artery embolization (BAE) was able to prevent major bleeding in five patients with bronchial carcinoids who underwent endobronchial resection.<sup>7</sup> However, experience with the combination of BAE and endobronchial resection for bronchial carcinoid tumors is still limited. Here, we describe a case of a bronchial carcinoid tumor managed with BAE followed by endobronchial resection.

## CASE REPORT

A 77-year-old-woman was referred to the Department of Respiratory Medicine and Allergology, Aichi Medical

University Hospital, due to fever and an abnormal shadow on a chest X-ray. She had never smoked and had been previously treated with antihypertensive drugs. A chest X-ray showed an elevated right diaphragm (Figure 1(a)). Chest computed tomography (CT) demonstrated a mass with a diameter of 10 mm in the right truncus intermedius with a collapse of the right lower lobe (Figure 1(b)). An elevated white blood cell count (11 600/ $\mu$ l) and serum C-reactive protein (14.3 mg/dl) together with chest CT findings indicated pneumonia due to obstruction of the central bronchus. She was admitted to our hospital, and the pneumonia was treated with sulbactam-ampicillin. A transbronchial biopsy was then performed using a flexible bronchoscope. The bronchoscopy revealed a smooth polypoidal mass obstructing the right truncus intermedius (Figure 2(a)). Endobronchial biopsies were performed but were complicated by moderate bleeding (Figure 2(b)) which was successfully stopped by direct administration of epinephrine solution. The histopathology of the bronchial biopsy demonstrated features consistent with a typical carcinoid tumor (Figure 2(c)). The Ki-67 antibody labeling index was less than 1%. Images of <sup>18</sup>F-FDG-positron emission tomography/CT showed slight uptake of <sup>18</sup>F-FDG in the carcinoid tumor with no definite distant disease or metastases in lymph nodes.

**FIGURE 1** (a) Chest X-ray showed an elevated right diaphragm with consolidation and the trachea shifted to the right. (b) Chest computed tomography showed a mass (10 mm in diameter) in the right truncus intermedius and partial collapse of the right lower lobe



**FIGURE 2** Bronchoscopic findings revealed a polypoid mass with a smooth surface on the right truncus intermedius (a) and mild bleeding after the biopsy using forceps (b). (c) Histopathology of the specimen (hematoxylin–eosin) obtained by endobronchial biopsy. Characteristics of a typical carcinoid tumor, cells with eosinophilic cytoplasm and round nuclei forming a tubular structure, were observed

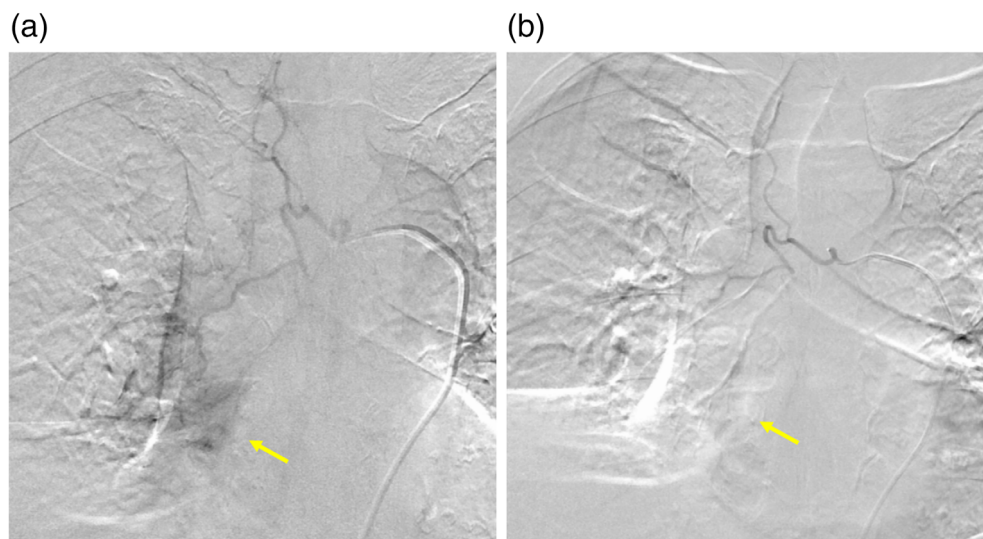
Surgical resection of the right middle and lower lobes was considered challenging because of her age and the risk of massive bleeding. Given the surgical risk, BAE followed by endobronchial resection was selected. Six weeks after bronchial biopsy, the patient was readmitted to the hospital. Angiography and BAE were performed by specialized interventional radiologists. Arteriography of the common branch of the right bronchial artery and the intercostal artery showed an enhanced mass (Figure 3(a)). The feeding arteries were successfully embolized using a gelatin sponge (Figure 3 (b)). The following day, bronchoscopy revealed that the surface of the mass was colored dark green (Figure 4(a)). The tumor was resected with a high-frequency snare and subsequent argon plasma coagulation (APC) via a flexible bronchoscope without bleeding. Figure 4(b) shows the bronchoscopic image after resection and application of APC. The histopathology of the resected tumor showed sparse cells due to ischemic change (Figure 4(c)). Follow-up bronchoscopy five weeks later demonstrated no obvious recurrence of the tumor.

## DISCUSSION

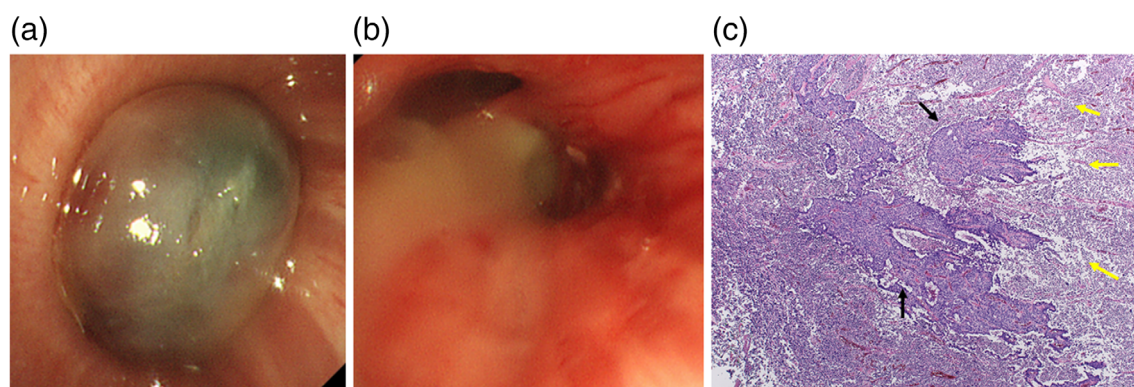
Here, we present the case of an elderly woman with a bronchial carcinoid tumor who underwent BAE, followed by endobronchial resection using a flexible bronchoscope. It has been suggested that multimodal intervention with sequential BAE and endobronchial resection using a rigid bronchoscope may be useful for treatment of carcinoid tumors in the central airways.<sup>7,8</sup>

The efficacy of endobronchial treatment for tumors of the tracheobronchial tree including carcinoid tumors has been previously reported.<sup>4,8–10</sup> Reuling et al. proposed that patients with purely intraluminal tumors <20 mm in diameter on CT scan are good candidates for successful endobronchial treatment for bronchial carcinoid tumors.<sup>11</sup> The endobronchial approach is also undertaken when pneumonectomy or invasive surgery is necessary.<sup>8</sup> Our case met these proposed criteria.

In 1990, Diaz-Jimenez et al. reported that two of 14 carcinoid cases had bleeding of more than 250 ml during endobronchial laser treatment.<sup>10</sup> The complication of massive bleeding during bronchoscopic surgery remains a major



**FIGURE 3** (a) Arteriography of a common branch of the right bronchial artery and the intercostal artery was performed. The stained mass is observed (arrow). (b) The mass was invisible after the embolization



**FIGURE 4** (a) A bronchoscopic finding of a carcinoid tumor one day after the bronchial artery embolization. The surface of the carcinoid tumor was dark green. (b) A bronchoscopic finding after resection with a high-frequency snare. Purulent sputum was observed in the right lower branch without bleeding. (c) Histopathology of the resected tumor (hematoxylin–eosin) showed ischemic change due to a microcirculatory disorder (yellow arrows). Black arrows indicate remaining intact components of the carcinoid tumor

concern in recent publications.<sup>5,6</sup> Indeed, in our case, initial bronchoscopy revealed mild hemorrhaging on the tumor surface (Figure 2(b)), and epinephrine solution was applied to stop the bleeding after endobronchial biopsy of the tumor.

Reducing the risk of bleeding as much as possible is an objective. BAE is a minimally invasive and useful technique for hemoptysis in various diseases including carcinoid tumors.<sup>5</sup> Moreover, the effectiveness of BAE before endobronchial intervention has also been reported in bronchial tumors such as carcinoid tumors and metastasis of hypervascularized renal cell carcinoma.<sup>7,8,12</sup> In the present case, the angiographic images showed that the mass enhanced by contrast medium became invisible after embolization (Figure 3). The subsequent bronchoscopy showed that the tumor was colored dark green with a transparent surface (Figure 4(a)). Moreover, the histopathology of the resected tumor demonstrated an ischemic change (Figure 4(c)). These findings strongly suggest that BAE prior to endobronchial

resection may be useful to reduce the vasculature surrounding the tumor and reduce the high risk of bleeding in our case.

In conclusion, we performed BAE in order to prevent massive bleeding during the endobronchial resection of a bronchial carcinoid tumor. The effectiveness of BAE for reduction of tumor hypervascularity was demonstrated by radiological, bronchoscopic, and histopathological findings. A large prospective clinical trial to define the benefit of combination of BAE and endobronchial surgery is warranted.

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#### CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

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