

**Case  
Report**

# Aortic Stent-Graft for a Giant Bronchial Artery Aneurysm with Ultrashort Neck

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**Bronchial artery aneurysms are rarely encountered, but they can cause life-threatening hemorrhages when they rupture. The authors report a case of a giant bronchial artery aneurysm with ultrashort neck in a 73-year-old woman who presented with massive hemoptysis. The aneurysm was successfully treated by a combination of transcatheter arterial embolization and aortic stent-graft placement, and the patient made an uneventful recovery. Follow-up computed tomography (CT) obtained 24 months after aortic stent-graft placement confirmed continued exclusion of the aneurysm, with no evidence of an endoleak.**

**Keywords:** bronchial artery, aneurysm, stent-graft

## Introduction

Bronchial artery aneurysms are rare but potentially life-threatening when they rupture.<sup>1)</sup> Conventional therapies include surgical resection of the aneurysm with thoracotomy or transcatheter bronchial arterial embolization (BAE). However, surgery may not be feasible if the patient has a poor pulmonary function, and transcatheter BAE may be difficult if the aneurysm is located close to the thoracic aorta.

We report a case of a giant bronchial artery aneurysm with ultrashort neck in a 73-year-old woman that was

successfully treated by transcatheter BAE followed by thoracic aortic stent-graft placement.

## Case Report

A 73-year-old woman, with a history of bronchiectasis and recurrent hemoptysis, was admitted to our hospital because of massive hemoptysis (about 500 cc). At presentation, blood pressure and pulse rate were 150/90 mmHg and 120 beats per minute. Chest radiography revealed bronchiectasis with consolidation in the left lower lobe. She underwent endotracheal intubation with a double lumen tracheobronchial tube to secure a blood-free airway and to allow an optional bronchoscopic approach. A contrast-enhanced thoracic computed tomography (CT) scan showed a 3.2 cm-sized homogeneously enhancing vascular structure adjacent to the descending thoracic aorta, which aroused suspicion of an aneurysm. Tortuous and dilated bronchial arteries were present around the aneurysm and severe bronchiectasis was noted in left lower lobe (**Fig. 1a**). Volume rendering and three-dimensional reformation images revealed an aneurysm arising from the most proximal portion of the left bronchial artery with an ultrashort and narrow neck at its

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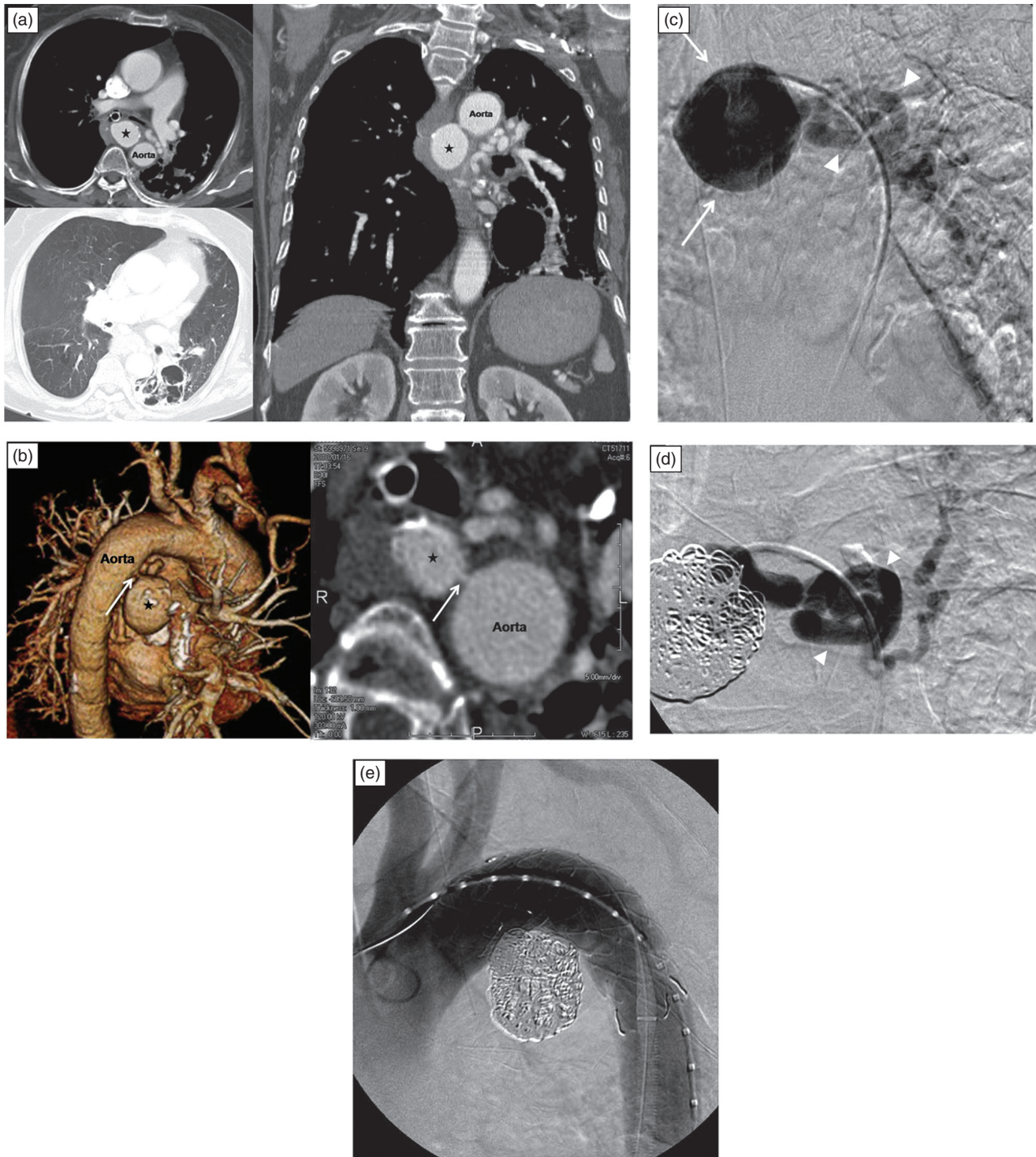
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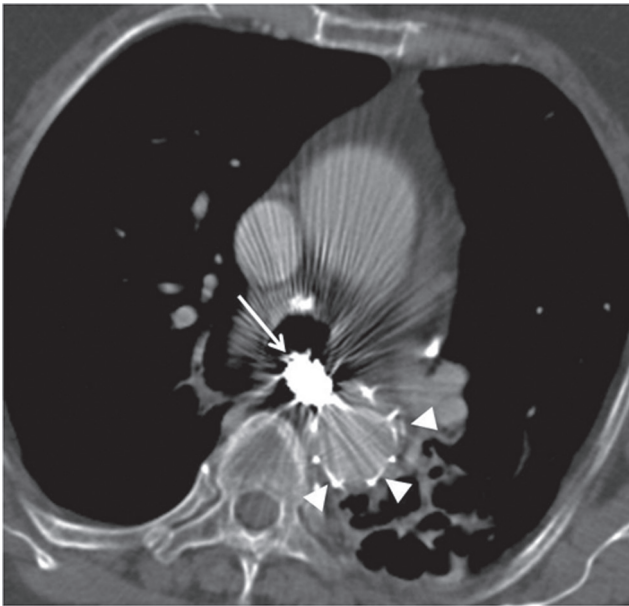
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**Fig 1** (a) Axial and coronal chest CT images showing a 3.2 cm-sized enhancing vascular structure (asterisks) adjacent to the descending aorta. Lung window setting image showing severe bronchiectasis in the left lower lobe. (b) A volume rendering image and a 3-dimensional reformation image showing the bronchial artery aneurysm (asterisks) arising from the descending aorta. The aneurysm had an ultrashort and narrow neck (arrows) with 1.6 mm in diameter and 1.8 mm in length. (c) Selective left bronchial arteriogram identified a giant bronchial artery aneurysm (arrows) and a tortuous outflow branch (arrowheads). (d) After transcatheter arterial embolization with polyvinyl alcohol particles, gelfoam particles and microcoils, contrast opacification of outflow branch persists (arrowheads). (e) After aortic stent graft placement, no contrast opacification was observed within the aneurysm.



**Fig. 2** Follow-up CT obtained 24 months after the placement of an aortic stent-graft (arrowheads) shows complete resolution of the aneurysm. The diameter of the aneurysmal sac is decreased to 2.4 cm. Note the beam hardening artifact caused by the microcoils (arrow).

origin from the aorta. The luminal diameter and length of the neck of the aneurysm were 1.6 mm and 1.8 mm, respectively (**Fig. 1b**).

Angiography was performed to confirm the diagnosis and to facilitate the planning of endovascular treatment. Selective left bronchial arteriogram provided a definitive diagnosis of a giant bronchial artery aneurysm arising near the origin of the left bronchial artery and a tortuous outflow branch from the aneurysm (**Fig. 1c**). Because selective catheterization of the outflow branch failed, 500  $\mu\text{m}$ –700  $\mu\text{m}$  polyvinyl alcohol (PVA) particles and gelfoam particles were released through a catheter placed within the aneurysmal sac. Coil embolization of the aneurysm using forty microcoils, ranging in size from 6  $\times$  14 mm to 10  $\times$  14 mm, followed. The completion angiogram showed marked regression of blood flow into the aneurysm, but persistent contrast opacification of the distal bronchial artery (**Fig. 1d**). Selective transcatheter embolization of the orifice of the aneurysm was technically difficult due to its short and narrow neck with acute angle. Expecting thrombus formation within the aneurysmal sac, we did not perform an additional procedure. Nine days after the procedure, she was referred again due to hemoptysis. Left bronchial arteriogram showed persistent outflow opacification. We decide to place an aortic stent-graft because transcatheter BAE was not feasible

due to the absence of an adequate aneurysmal neck. A 30  $\times$  100 mm thoracic aortic stent-graft (Seal, S&G Biotech Inc., Korea) was deployed across the origin of the bronchial artery aneurysm (**Fig. 1e**). Completion aortography showed complete exclusion of the bronchial artery aneurysm. Follow up CT obtained 24 months after stent-graft deployment revealed complete resolution of the aneurysm with decrease in size (**Fig. 2**). During this 2-year period, the patient enjoyed good health.

## Discussion

Bronchial artery aneurysms occur rarely and are detected in fewer than 1% of all patients who undergo selective bronchial arteriography. They are usually found in cases of pulmonary tuberculosis, bronchiectasis, or recurrent bronchopulmonary inflammation. These aneurysms can be congenital, as in the context of pulmonary sequestration or pulmonary artery agenesis, or they can be acquired, due to atherosclerosis, trauma, or Osler-Weber-Rendu disease. It has been proposed that bronchial artery aneurysms are caused by focal weakening or injury of the vessel wall, although increased bronchial arterial flow might also play a role.<sup>1,2)</sup>

Two approaches are used to treat bronchial artery aneurysms, namely, surgical resection or ligation of the lesion and BAE. The surgical approach reliably eliminates the lesion, but may be unsuitable in patients at high risk that cannot tolerate thoracotomy.<sup>2)</sup> Transcatheter BAE is being increasingly applied to treat bronchial artery aneurysms because it is less invasive and offers successful aneurysm exclusion with shorter hospital stays.<sup>3)</sup> However, collateral vessels, incomplete embolization, and arterial re-canalization may cause revascularization of the aneurysm. In addition, complete embolization of the afferent artery is difficult when the vascular segment between the bronchial artery aneurysm and the aorta is short.<sup>2,4)</sup> In our patient, a conventional surgical approach to the aneurysm was potentially problematic because of her age and reduced pulmonary function. Initially, we attempted transcatheter BAE using PVA particles, gelfoam particles, and microcoils. The procedure reduced blood flow into the aneurysm, but residual contrast opacification persisted.

Aortic stent-graft placement provides another type of interventional therapy. The stent-graft effectively seals the orifice of the bronchial artery and isolates blood flow to the aneurysm. An aortic stent-graft provides an effective means for treating aneurysms close to the aorta,

**Table 1** Bronchial artery aneurysms treated with an aortic stent-graft in the English literature

	Sex/Age	Underlying disease	Origin	Size (mm)	Rupture	Symptom	Treatment	Outcome	Follow up Duration
Sakai (5) (1998)	M/72	Bronchiectasis	Left	25	No	Hemoptysis	Coil embolization + stent-graft	Complete thrombosis	7 months
Kasashima (9) (2003)	M/79	Pulmonary tuberculosis	Left	60 × 55	No	Hoarseness	Stent-graft	Complete thrombosis	18 months
Sanchez (6) (2007)	F/69	Pulmonary tuberculosis	Right, left	40	No	Dysphagia	Stent-graft + fibrin sealant	Complete thrombosis	3 days
Tsolaki (3) (2007)	F/76	Bronchiectasis	Right	40	No	None	Stent-graft + right thyrocervical trunk embolization	Ligation of thyrocervical trunk due to endoleak	15 months
Takahashi (7) (2010)	M/74	Bronchiectasis	NA	60	No	None	Coil embolization + stent-graft	Complete thrombosis	6 months
Hu (8) (2011)	M/67	Hypertension	Right	40 × 30	Yes	Chest pain	Sodium polymannuronate and gelfoam particle embolization + stent-graft	Complete thrombosis	12 months
Present case	F/73	Bronchiectasis	Left	32	No	Hemoptysis	PVA particles, gelfoam particles and coil embolization + stent-graft	Complete resolution	24 months

NA: not available; PVA: polyvinyl alcohol



or giant aneurysms that cannot be adequately packed. Efferent branches must also be occluded to avoid retrograde filling.<sup>5,6)</sup> Various embolic materials have been used to treat bronchial artery aneurysms, such as, steel coils, gelatin particles, fibrin sealant, and PVA particles.<sup>5-8)</sup> The advantage of using transcatheter BAE and an aortic stent-graft in combination, as opposed to transcatheter BAE only, is that it blocks blood flow into the aneurysm and prevents the development of potential collateral arteries arising from the thoracic aorta.<sup>8)</sup> Up to now, six cases of bronchial aneurysm treated with aortic stent-graft have been reported in the English literature.<sup>3,5-9)</sup> Five of them were treated by transcatheter BAE plus aortic stent-graft placement.<sup>3,5-8)</sup> On the other hand, Kasashima, et al.<sup>9)</sup> used an aortic stent-graft only. They could not pass the catheter into the bronchial artery because the root of the bronchial artery was deviated and narrowed due to compression by the aneurysm. Reported cases and the present case are summarized in the (**Table 1**).

In the present case, we successfully treated a giant bronchial artery aneurysm with ultrashort neck using a combination of thoracic aortic stent-graft and transcatheter BAE. The stent-graft remained in its proper position without an endoleak or migration for more than 24 months.

### Disclosure Statement

The authors certify that there is no actual or potential conflict of interest in relation to this article.

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