Successful Kissing Balloon Expandable Stent Graft Treatment for a Right Common Carotid Pseudoaneurysm Caused by Tracheotomy

Justice O. Agyei[1,4], Cynthia Alvarez[3], Azher Iqbal[5], Andrew A. Fanous[1,4], Adnan H. Siddiqui[1,2,4-7]

Key words
- Carotid pseudoaneurysm
- Carotid stent
- Kissing balloon
- Tracheotomy complication

Abbreviations and Acronyms
CCA: Common carotid artery

From the [1]Department of Neurosurgery, Jacobs School of Medicine and Biomedical Sciences at the University at Buffalo, Buffalo; [2]Department of Radiology, Jacobs School of Medicine and Biomedical Sciences at the University at Buffalo, Buffalo; [3]Jacobs School of Medicine and Biomedical Sciences at the University at Buffalo, Buffalo; [4]Department of Neurosurgery, Gates Vascular Institute at Kaleida Health, Buffalo; [5]Department of Vascular and Interventional Radiology, Buffalo General Medical Center at Kaleida Health, Buffalo; [6]Canon Stroke and Vascular Research Center at the University at Buffalo, Buffalo; and [7]Jacobs Institute, Buffalo, New York, USA

To whom correspondence should be addressed:
Adnan H. Siddiqui, M.D., Ph.D.
[E-mail: asiddiqui@ubns.com]

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BACKGROUND: **A rare complication following tracheotomy is common carotid artery (CCA) pseudoaneurysm. Treatment modalities for CCA pseudoaneurysm include surgical repair and single-artery balloon-covered stent graft technique. We describe successful treatment of tracheotomy-related CCA pseudoaneurysm with the "kissing balloon" expandable stent graft technique.**

CASE DESCRIPTION: **We successfully implemented the kissing balloon expandable stent graft technique for treatment of a large, narrow-necked, bilobed CCA pseudoaneurysm that arose owing to a tracheotomy complication. The pseudoaneurysm was detected while performing a diagnostic angiogram of the aortic arch and surrounding vessels. The stent was deployed while the 2 balloons were introduced in a kissing manner such that they faced one another to avoid occlusion of either branch of the innominate artery coming into contact; 1 balloon was inflated at the origin of the right subclavian artery, and the other was inflated at the right innominate artery simultaneously. The pseudoaneurysm was successfully contained; normal blood flow was restored in the CCA. The balloons were deflated and withdrawn. The patient remained neurologically intact after the procedure.**

CONCLUSIONS: **The kissing balloon technique is a safe and effective alternative to surgical repair, as it prevents morbidities associated with the surgical procedure. Also, this technique decreases the risk of major side-branch occlusion associated with the single-artery balloon-covered stent graft technique.**

INTRODUCTION

Tracheotomy is commonly performed in patients who require long-term airway support and to help patients transition from mechanical ventilation to unassisted breathing. Although uncommon, complications after tracheotomy have been reported, including infections, dysphagia, emphysema, and hemorrhage.[1] A less common complication of tracheotomy is carotid artery injury leading to a pseudoaneurysm.[2] The standard treatment of carotid artery pseudoaneurysms involves surgical repair that includes ligation of the carotid artery, a potential bypass procedure, and arterial reconstruction.[3] However, there has been a shift in recent years toward less invasive endovascular intervention involving stent graft treatment while maintaining patency of the artery.[4,5] A patient with hemoptysis 5 weeks after tracheotomy that was due to a right common carotid artery (CCA) pseudoaneurysm is presented. The patient was treated with a kissing balloon expandable stent graft, a technique that has been shown to yield success rates equal to those for single-vessel coronary angioplasty and to minimize the risk of major side-branch occlusion.[6] The purpose of this report is to discuss the use of the kissing balloon technique outside of the coronary vasculature, present postoperative course findings, and provide a unique way to treat a rare complication.

CASE DESCRIPTION

The University at Buffalo does not require institutional review board approval for the report of a single case. Informed consent was obtained from the patient.

Examination

A 71-year-old man with a history of thymic cancer presented with self-limited episodes of hemoptysis through his tracheostomy 5 weeks after tracheotomy. A chest x-ray was negative for abnormalities. Computed tomography angiography revealed an intimal flap within the right CCA that was suggestive of a dissection (Figures 1 and 2) and an outpouching from the proximal right carotid artery that resembled a pseudoaneurysm (Figure 3). In addition, there was ill-defined subcutaneous air surrounding the tracheostomy site and within the soft tissue in the retrosternal region, enclosing the origin of the great vessels of the mediastinum. These findings suggested a possible vascular pathology. Given these results, diagnostic aortic arch arteriography, selective right innominate arteriography, angioplasty of the right innominate and subclavian arteries, and stent placement were planned.

Treatment

The patient was placed in a supine position and prepared and draped in the usual

Figure 1. Computed tomography angiogram coronal view shows an abnormality in the right common carotid artery with a possible intimal flap concerning for carotid dissection (*arrow*).

sterile fashion. Using a micropuncture technique, an 0.018-inch guidewire was used to access the right common femoral artery under ultrasound guidance. A 5-F dilator catheter was placed over the guidewire and inserted into the central circulation. A 0.035-inch guidewire was then advanced over the dilator, and the dilator was removed and replaced with a short 5-F, 10-cm vascular sheath. The sheath was flushed with normal saline. A 5-F Omni Flush catheter (AngioDynamics Inc., Latham, New York, USA) was advanced over a Bentson guidewire (Cook Medical, Bloomington, Indiana, USA) and positioned in the proximal ascending aorta. A thoracic arch aortogram was obtained and revealed a normal aortic pattern and a large abnormal blush of contrast material in the region of the distal right innominate artery (Figure 4). The Omni Flush catheter was then traded over the wire for a 5-F angled glide catheter and advanced into the right innominate artery. The arteriogram at this position displayed a narrow-necked, bilobed pseudoaneurysm of the proximal right CCA, measuring 26.2 mm × 18.9 mm in greatest diameter (Figure 5).

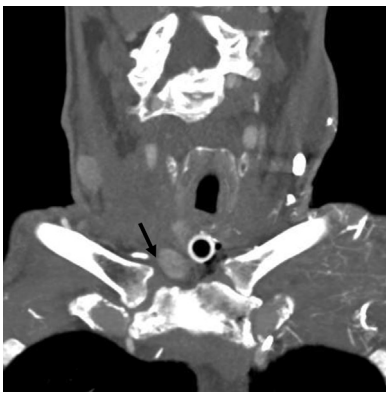

Figure 2. Computed tomography angiogram coronal view. *Arrow* points to a vascular lesion arising from the right common carotid artery, a probable pseudoaneurysm.

Ultrasound examination of the right brachial artery showed the vessel to be patent. An 0.018-inch guidewire was inserted using a micropuncture technique, and a 4-F dilator was advanced over the guidewire. A 0.035-inch guidewire was advanced over the dilator, which was replaced with a 6-F, 10-cm vascular sheath. A right subclavian arteriogram was performed through the sheath demonstrating the take-off of the right CCA and the origin of the pseudoaneurysm adjacent to the right CCA ostium. Multiple arteriographic images were obtained and reviewed. Along with additional evaluation of the right CCA, the decision was made to use a balloon-expandable covered stent graft. A 9 mm × 38 mm iCAST stent (Atrium Medical Corp., Hudson, New Hampshire, USA) was chosen.

The patient received 5000 units of heparin, and the activated coagulation time was monitored with a goal of >250 seconds. The balloon-expandable covered stent was deployed while inflating a separate10 mm × 40 mm compliant balloon at the origin of the right subclavian artery in a kissing-balloon fashion, with both balloons coming into contact at the most distal region of the brachiocephalic artery (Figure 6). This technique was preferred because simultaneous inflation of the balloon in the subclavian artery prevents the balloon-expanded stent from occluding the adjacent subclavian artery. In this case, it ensured the patency of both the CCA and the subclavian artery, while maintaining the size and volume of the vessels as well as occluding the pseudoaneurysm. After stent placement, an arteriogram from the catheter tip at the right innominate artery demonstrated a widely patent right CCA with stent and complete exclusion of the previously identified large bilobed pseudoaneurysm in addition to a widely patent subclavian artery (Figure 7). The balloons were deflated and removed. The effect of the heparin was reversed with 25 mg protamine. The patient was placed on aspirin and clopidogrel.

Figure 3. Computed tomography angiogram axial view. *Black arrow* points to an outpouching arising from the right common carotid artery suspicious for a pseudoaneurysm. *White arrow* points to peritracheal emphysema surrounding the lesion.

Postoperative Course

The patient tolerated all procedures well and woke up without apparent complications. He remained at his preoperative

Figure 4. Aortic arch angiogram anteroposterior projection. *Arrow* points to large abnormal blush of contrast material in the region of the distal right innominate artery suspicious for a pseudoaneurysm in the proximal right common carotid artery.