Case Report

Covered stent graft for treatment of a pseudoaneurysm and carotid blowout syndrome

Nazli Janjua, MD; Ammar Alkawi, MD; Alexandros L. Georgiadis, MD; Jawad F. Kirmani, MD; Adnan I. Qureshi, MD

Zeenat Qureshi Stroke Research Center, Department of Neurology and Neurosciences, University of Medicine and Dentistry of New Jersey

Abstract

Background: Carotid blowout syndrome with pseudoaneurysm, a rapidly progressive pathology, may present emergently with massive oral hemorrhage. Use of an endograft prosthesis offers a treatment strategy with salvation of the carotid artery.

Case History: A 55 year old man with advanced squamous cell carcinoma of the head and neck presented with recurrent transoral hemorrhage, requiring endovascular treatment.

Technical Report: Coil embolization was initially performed with little impact on the hemorrhage. A 7 x 40 mm Fluency® Plus covered stent (Bard Peripheral Vascular, Tempe, Arizona, USA) was placed and was supplemented by a second 8 x 40 mm Fluency Plus stent, with resulting cessation of active contrast extravasation.

Discussion: The risks and benefits of various treatment options of carotid pseudoaneurysm with blowout are discussed including the use or omission of antiplatelet and anticoagulant regimens, with reference to previously reported cases.

Conclusion: Tandem, overlapping covered stent placement in the common carotid artery is feasible and offers a treatment option for carotid blowout syndrome. Risks of aggravation of hemorrhage versus long-term thromboembolic events without antiplatelet therapy must be considered in cases of active ongoing hemorrhage.

Keywords: stent graft, pseudoaneurysm, carotid blowout syndrome

J Vasc Interv Neurol 2008; 1(1):5-8

Abbreviations, in the order used in this report.

PTFE:	polytetrafluoroethylene
ICA:	internal carotid artery
CCA:	common carotid artery
ECA:	external carotid artery
CFA:	common femoral artery

Correspondent: *Nazli Janjua, MD; Department of Neurology, Long Island College Hospital, 339 Hicks St., Brooklyn, NY 11201; USA; sophiaj786@gmail.com*

Commercial products, in the order referenced in this report.

Fluency® Plus	Bard Peripheral Vascular, Tempe, Arizona, USA
Embosphere®	Biosphere Medical Inc., Rockland, Massachusetts, USA
Contour®	Target Therapeutics, Fremont, California, USA
Berenstein Liquid Coil®	Boston Scientific, Marlborough, Massachusetts, USA
Envoy®	Cordis Corp, Miami Lakes, Florida, USA
V18	Boston Scientific, Natick, Massachusetts, USA
Gluglielmi	Boston Scientific, Natick, Massachusetts, USA
Allstar™	ACS, Temecula, California, USA
Amplatz Goose Neck™	Microvena Corp., White Bear Lake, Minnesota, USA
EN Snare®	Medical Device Technologies Inc., Gaineseville, Florida, USA
FilterWire EZ™	Boston Scientific, Natick, Massachusetts, USA

Introduction

Traumatic pseudoaneurysm formation of the carotid artery and the associated carotid blowout syndrome represent one of the earliest pathologies encountered in the field of interventional neurology.[1] Treatment strategies include parent vessel sacrifice with detachable balloons or coils, coil embolization of the pseudoaneurysm, or stent graft placement.[2,3] The use of a polytetrafluoroethylene (PTFE)-covered stents has been described for treatment of pseudoaneurysms of the intracranial internal carotid artery (ICA).[4-6] PTFE-covered stents and polyethylene terephthalate endograft prostheses have also been successfully used for treatment of traumatic pseudoaneurysms of the cervical ICA[2,7-15] and common carotid artery (CCA).[8,15-17] More complex procedures have entailed operators manually fashioning PTFE graft material on the balloon catheters.[18] However, experience is limited, particu-

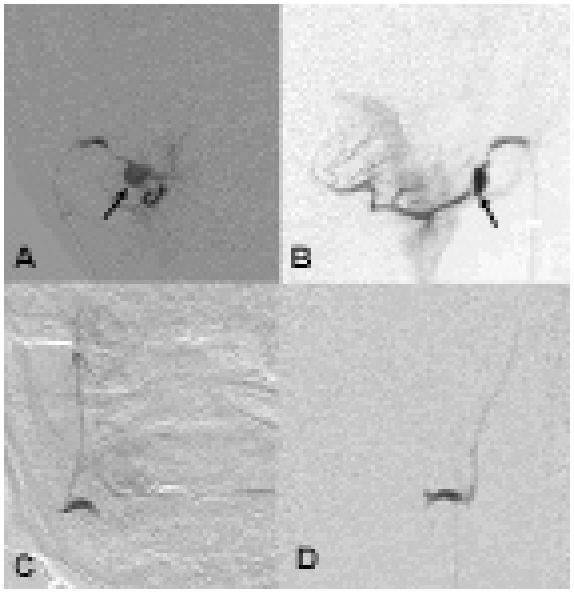

Figure 1. Angiography demonstrated pseudoaneurysm formation (arrow) of the right lingual artery shown here in the anterioposterior (A) and lateral (B) planes. After embolization with 300-500 micron Embosphere microspheres, there is no distal filling of the lingual artery from the point of the pseudoaneurysm (C-D). The right facial and left internal maxillary arteries (not shown) were also embolized.

larly in the setting of acute blow-out syndrome. We describe our experience using a *Fluency Plus* PTFE covered stent for the treatment of a CCA blowout and pseudoaneurysm in a patient with squamous cell carcinoma of the neck.

Case History

The patient, a 55 year old man, had presented one month prior to this admission with massive transoral hemorrhage. Manual oral packing was placed until endovascular embolization could be performed. At that time head and neck angiography of the bilateral external carotid arteries (ECAs) revealed a pseudoaneurysm on the proximal right lingual artery (Figure 1), which was embolized using 300-500 micron *Embosphere* microspheres. Additionally, the right facial and left internal maxillary arteries were also embolized. The patient experienced no further bleeding after removal of the oral packs the next day.

One month later the patient was again admitted with massive oral hemorrhage, with slowed but continued exsanguination despite oral packing. Repeat angiography showed no recanalization of the previously embolized right lingual pseudoaneurysm, with no significant vascular blush in relation to the right facial and left internal maxillary arteries. Because of the severity of the oral hemorrhage, empiric embolization was performed on the right internal maxillary, left facial, and left lingual arteries using 150 to 300 micron *Contour* polyvinyl alcohol particles. Additionally, two 2.5 x 10 mm *Berenstein Liquid Coils* were delivered in the left facial artery (Figure 2). Oral packing was removed immediately after the conclusion of the procedure, with no evidence of hemorrhage.

Four hours later the patient experienced recurrent oral hemorrhage. Oral packing was replaced and surgical carotid ligation was initially planned. On further discussion with the otolaryngology consultants, endovascular options were reconsidered given the patient's critical condition and the high morbidity risk of an open surgical procedure.

Technical Report

The patient was maintained under general anesthesia using midazolam, fentanyl, and cisatracurium. Digital subtraction angiography via a 6 French right common femoral artery (CFA) sheath was again performed, using a 6 French Simmons 2 *Envoy* catheter. Given the severe tortuosity of the patient's aortic arch and great vessels, a *V18* control wire was placed coaxially in the guide catheter for additional support to allow catheter placement in the ECA. Cervical views of the right CCA revealed pseudoaneurysm formation and massive blowout of the CCA proximal to the bifurcation (Figure 3A). Active extravasation to the midline region of the oral cavity was noted on angiography and unremitting oral hemorrhage ensued during the procedure despite oral packing. Given the need for immediate hemostasis, and the ready availability of *Gluglielmi* detachable coils, we proceeded with coil embolization of the pseudoaneurysm. Two consecutive 6 mm x 15 cm detachable coils were successfully deployed, slowing filling in the pseudoaneurysm and arresting contrast extravasation (Figure 3B).

In preparation for stent placement, left CFA access was secured and a 5 French Simmons 2 diagnostic catheter was advanced over a 0.035" Terumo glide wire. The catheter was reconstituted in the aortic arch and the right CCA was selected for arteriography. Next the right CFA sheath was exchanged for a 7 x 40 mm *Fluency Plus* covered stent delivery system which was advanced over an *Allstar* 0.014" microwire and deployed in the proximal CCA, partially covering the ECA origin, leaving the orifice of the ICA uncovered. Oral packing was removed in the angiography suite with no resumption of transoral hemorrhage. During advancement of the stent delivery system, there was inadvertent capture and dislodgement of the previously detached coils (Figure 3C). The stent delivery system was replaced with a 9 French right CFA sheath and the *Envoy* catheter was again used for access to the right CCA. Multiple attempts at coil retrieval using the *Allstar* wire, a 4 *Amplatz Goose Neck* snare and a 10 mm *EN Snare* device as well as a *FilterWire EZ* distal protection device

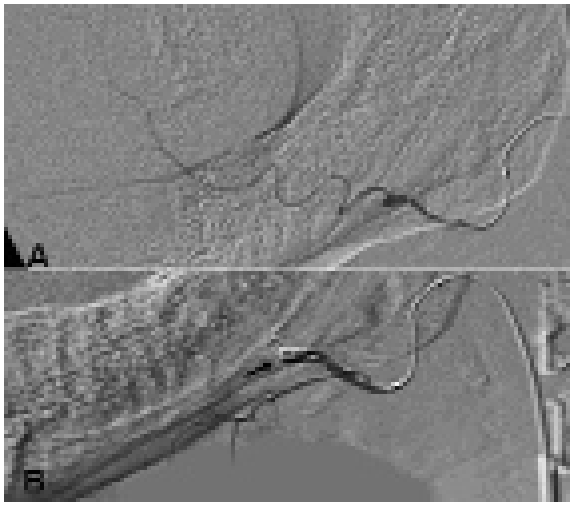

Figure 2. Right facial artery angiogram seen pre- (A) and post- (B) embolization. After deployment of two pushable coils (arrow), there is no distal filling of the facial artery.

Figure 3. The initial lateral projection of right common carotid artery angiogram demonstrates pseudoaneurysm formation with blowout of the carotid wall (arrow, A). After placement of two *Guglielmi* detachable coils (arrow, B), there is diminished filling of the aneurysmal sac. After the placement of the first covered stent, extravasation is arrested. Arrows mark the proximal and distal markers of the stent (C). During stent deployment, there is trapping of the previously detached coils in the external carotid artery (arrowhead). During attempts to retrieved the dislodged coils, oral hemorrhage resumes and pseudoaneurysm formation is again seen angiographically (D). A second covered stent is deployed, arresting active hemorrhage (E). Arrows mark the proximal and distal markers of the second stent seen in the unsubtracted image (F), placed distally to the initial stent, also marked by an arrowhead at its distal marker (the proximal marker is cut off from the image).

were unsuccessful. During attempted coil retrieval, extravasation from the pseudoaneurysm was again noted (Figure 3D). Oral packing was urgently replaced and the right CFA sheath was exchanged for a second 8 x 40 mm *Fluency Plus* stent delivery system which was again advanced over the *Allstar* wire and deployed just distal to the first stent (Figure 3E), successfully achieving hemostatic control. No overt bleeding was observed after the procedure. The patient was subsequently transferred to the intensive care unit.

Due to the patient's advanced cancer and severe multiple medical comorbidities, the family subsequently opted for comfort care. Oral packing was thus maintained to avoid the need for further aggressive procedures or invasive treatment should rehemorrhage occur. The patient expired one week later from cardiopulmonary collapse.

Discussion

Covered endograft prostheses offer a treatment option for endovascular repair of vessel wall injury, otherwise surgically inaccessible or inoperable. Other reports of cervical and intracranial covered stent placement have been cited in the literature.[4-17] Points of emphasis in our case include the use of tandem common carotid stents placed in one setting and the use of covered stents without periprocedural antiplatelet or anticoagulant regimens in a patient with active life-threatening bleeding. Another treatment option that was considered, but deemed less appropriate in this case, was detachable balloon occlusion of the CCA, which would carry the grave risk of possible cerebral infarction. Coil embolization of the pseudoaneurysm sac is another option, and we initiated that procedure, but found it to be time-consuming and thus less efficacious while active hemorrhage was ongoing.

In any situation in which covered stents are deployed, care must be taken to avoid bifurcatory points, with the possibility of occlusion of branch vessel orifice. Such risk of these devices limits locations where they may be used. Most of the aforementioned case reports describe the use of covered stents in the cervical ICA, from which no branches arise. The main concern in our case was to avoid occlusion of the ICA origin. Even with our second stent, placed just distal to the site of the first stent, the origin of the ICA was unaffected. With placement closer to the bifurcation of the CCA, change in flow dynamics away from the ICA was a potential concern. However, our final angiographic images showed adequate flow through the ICA to the intracranial circulation. It is possible also, that the displaced coils in the ECA inadvertently aided flow to the unobstructed ICA.

Our experience in this case includes some technical lessons. One is that immediate placement of a second covered stent within a previously deployed stent proved feasible and without consequence in our patient. Another is the complexity of interchanging the delivery system of the stent device securing femoral hemostasis, and providing an adequately sized femoral introducer sheath to allow introduction of guiding catheters needed for other aspects of the procedure (e.g., coil placement and coil retrieval). Ultimately, due to a total of three femoral interchanges, a 10 French femoral introducer sheath was required and left in place until the next day to secure groin hemostasis.

Another major concern in this case was the inability to use antiplatelet agents or bolus doses of heparin during the procedure, due to his active, severe oral hemorrhage. In general, the use of these agents during placement of covered stents is highly recommended, due to the known thrombogenicity of these stents.[7,19] In our patient, with his critical hemorrhage and the severity of his clinical state, the risk of antiplatelet or anticoagulation therapy would have far outweighed the risk of possible thromboembolism from the stent. The patient's severe clinical condition led to a decision by the family to withdraw care; thus, there was no opportunity for long-term follow-up to assess the real risk of thromboembolic cerebral events without antiplatelet medication. Had the patient survived, the plan of management might have been similar to that described by Amar et al.[7]; i.e., institution of antiplatelet therapy on the first or second postoperative day, pending demonstration of adequate hemostasis without oral packing.

Conclusion

We present a case of tandem CCA stent-graft endoprostheses in a patient with active oral hemorrhage due to carotid blowout syndrome and pseudoaneurysm formation, to illustrate the feasibility of tandem, overlapping covered stent placement in the CCA. Not using antiplatelet or anticoagulants did not have any immediate thromboembolic consequences. A longer follow-up may have been instructive but was not possible in this case.

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