Coronatic Stent-Graft Deployment in the Treatment of Carotid Blowout

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Key words: carotid blowout, coronatic stent, balloon-expandable stent-graft, carotid artery rupture

Summary

"Carotid blowout syndrome" is defined as a hemorrhage caused by rupture of the carotid artery and its branches, and may be a severe complication of rhinopharyngeal carcinoma.

This study aimed to highlight the usefulness and versatility of endovascular stent-graft placement as a rescue treatment in life-threatening carotid blowout syndrome.

We describe the unconventional use of a 6×5 mm balloon-expandable coronatic covered stent in a patient with a diagnosis of spinocellular rhinopharyngeal carcinoma, followed by carotid blowout syndrome. Although long-term follow-up is needed to assess the eventuality of bleeding recurrence, the immediate clinical results were satisfactory.

Introduction

The "carotid blowout syndrome" (CBS) refers to the hemorrhage caused by rupture of the carotid artery or its branches, and may be a severe complication of rhinopharyngeal carcinoma. CBS is strongly associated with local invasion, radiation-induced necrosis and recurrent tumors for head-and-neck cancers¹.

The reported neurologic morbidity and mortality rates associated with this syndrome are 40% and 60% respectively³. Surgical management of CBS has proven technically difficult because exploration and repair of the previously irradiated field are challenging. Endovascular procedures, like embolization or stent deployment, are reported as a good alternative to

surgery. Stent-graft placement for CBS treatment seems the best choice to achieve hemostasis and to prevent neurologic morbidity¹. We describe a case of internal carotid blowout determined by a rhinopharyngeal tumour and successfully treated with a coronatic balloon expandable stent-graft.

Case Report

A 38-year-old woman smoker with a recent diagnosis of spinocellular rhinopharyngeal carcinoma and receiving chemotherapy was admitted to our hospital for massive pharyngeal hemorrhage, loss of consciousness and sphincter control.

Her recent anamnesis included several imaging studies which highlighted a 4×3 cm lesion with necrotic core, infiltrating and narrowing the left internal carotid artery and jugular vein, extending from the left tonsillary lodge to the parapharyngeal region, with evidence of invasion of the parotid gland, medial left pterygoid muscle, pterygopalatine fossa, middle ear, and mastoid cells, associated with bone erosion. Further imaging examinations and biopsies of the rhinopharynx had determined the stage of the lesion as T4N2M0 EBV/EBER negative. Conservative therapy including routine medication, blood transfusion and local compression showed no benefit on life parameters.

The patient was then referred to the angiographic suite of the Interventional Radiology Department to undergo an emergency angiography. A tetraval cerebral angiography obtained through a 5 Fr retrograde right trans-

Figure 1 A) Carotid angiogram, lateral projection. B,C) Angiography performed through injection of contrast media into the external carotid artery after the embolization of ECA branches, showing internal carotid artery blowout as bleeding source (arrow).

Figure 2 A) Bleeding and ICA vasospasm interruption after the deployment of the "Direct Stent" stent-graft. B) Recovery of internal carotid artery patency and perfusion of its distal branches. C) Left ACA patency not restored at the end of the procedure. The early venous filling and contrast material outlining the internal carotid artery along the skull base is due to a slight iatrogenic dissection.

femoral access, showed a severe narrowing of left ICA, probably due to local vasospasm, and angiographic signs interpreted as bleeding from the left ECA branches. Moreover the angiography obtained by injection of contrast media into right internal carotid artery showed a reduced representation of left intracranial vessels without visualization of the left ACA, supplied by a slow contralateral blood flow. It was thus decided to perform an embolization of the previously mentioned small distal ECA branches.

A 4 Fr 120 cm long Vertebral (Terumo, Tokyo, Japan) was then advanced over an 180 cm long angled standard guidewire (Terumo, Tokyo, Japan) into the left ECA followed by superselective catheterization of the small ECA branches with a Progreat catheter (Terumo, Tokyo, Japan) and superselective embolization of different vessels showing active bleeding, with 150, 250 and 350 μ m PVC particles (Contour, Boston scientific, Natick, US), was carried out. After a few minutes further angiography of the

left external carotid artery was performed, showing embolization of the distal ECA vessels and a partial resolution of ICA vasospasm (Figure 1A). A shade image of extravasal spreading of media contrast apparently not originating from distal ECA branches was noticed, so it was decided to perform a further left ICA angiography (Figure 1B). Having solved the ICA vasospasm, it was clear that the main pharyngeal bleeding source was a laceration of the distal third of the extracranial ICA, and the angiographic image previously interpreted as bleeding from ECA branches was a wrongly perceived blush of edematous nasopharyngeal mucosa (Figure 1C). An irregularly shaped narrowing of the proximal third of the carotid lumen, ascribed to intraluminal thrombosis, coexisted. To control the hemorrhage and to restore a physiologic vessel patency with regular blood flow through the ICA, it was decided to deploy a covered stent-graft.

The following procedural steps required an introducer exchange with a 45 cm long 9 Fr introducer sheath (Radifocus, Terumo, Tokyo, Japan). After removal of the former guidewire, a 300 cm long 0.014 in guidewire (Choice, Boston Scientific, Natick, US) was advanced into the ICA till the intrapetrous segment of the ICA over the 4 Fr Vertebral catheter. Subsequently the Vertebral catheter was withdrawn and a 6×20 mm “Fluency” (Bard Inc., Murray Hill, New Jersey, US) stent-graft was advanced over the guidewire. However the guidewire proved unfit to provide sufficient support for advancing the Fluency stent into the distal third of the extracranial internal carotid artery. The 300 cm long 0.014 in guidewire was thus exchanged for a 260 cm long 0.035 in angled stiff guidewire (Terumo, Tokyo, Japan) which successfully provided enough support. The 6×20 mm “Fluency” stent, however, determined a high attritus with the vessel wall and to avoid an extension of the vessel laceration, it was decided to opt for a different stent with a lower profile and higher flexibility. A 6×15 mm “Direct-stent” (InSitu technologies, Minneapolis, Minnesota, USA) was chosen and a 8 Fr 90 cm long 40 DEG “Glider Softip XF” guide catheter, with a 6.6F (.086”) internal diameter and a 7 cm distal segment length (Boston Scientific, Natick, MA, USA) was positioned as a guide catheter. This stent, commonly used in coronary emergency situations such as ruptures, dissections and fistulae aneurysms, is characterized by higher flexibility, lower profile and reduced vessel

traumatism, with a wall thickness of 0.21 mm and a semi-compliant balloon material. After fluoroscopy-guided placement of the Direct-stent over the lacerated portion of the ICA, the device was deployed inflating the balloon with a manometric syringe (Encore, Boston Scientific, Natick, US) at 6 atm pressure (Figure 2A). An angiographic check demonstrated the recovery of the physiologic vessel patency and blood flow, and the exclusion of the lacerated segment of the ICA (Figure 2B) with hemorrhage control, though a slight early venous filling and contrast material outlining the internal carotid artery along the skull base, due to iatrogenic dissection, persisted (Figure 2B,C). Subsequent cerebral angiography showed an improvement in the perfusion of the MCA and its distal branches, with an unmodified angiographic pattern regarding the ACA and its distal branches (Figure 2C). As a clinical result, interruption of the rhinopharyngeal bleeding and normalization of heart frequency and blood pressure was obtained, with resuscitation and stabilization of the patient’s condition.

A two week duplex ultrasound follow-up showed persistent patency of the ICA.

Discussion

Carotid blowout syndrome (CBS) is one type of arterial injury which can occur following head and neck tumors, radiation treatment, chemotherapy and surgery. Radiation therapy, in particular, is characterized by a higher risk of CBS. Patients with CBS have a 60% risk of neurological morbidity and 40% of mortality, which are considerably more frequent in patients, like the one presented in this case report, presenting massive bleeding and carotid thrombosis²⁻⁶.

Treatment of CBS includes open surgery with resection and reconstruction of carotid artery ligation, and endovascular procedures including embolization with steel and/or platinum coils, gelatin sponge particles, polyvinyl alcohol-based foams, detachable balloons and, more recently, stent-graft placement⁷. Surgical procedures are characterized by an unsatisfactory average 60% rate of major complications such as death and stroke^{8,9}, and have increasingly been replaced by endovascular embolization techniques. Endovascular procedures have shown many advantages over surgical techniques, such as more distal access to the bleed-

ing points, reduced operative time, no need for general anesthesia and a more precise demonstration and localization of bleeding points.

The rationale of ICA embolization lies in the progressive and slow narrowing of the arterial lumen induced by the pharyngeal tumor and the radio/chemotherapy, which stimulates hemodynamic compensation by hypertrophy of the contralateral carotid and vertebrobasilar system, thus limiting any brain damage caused by complete ICA occlusion. However, even though it is characterized by a lower morbidity and mortality rate than surgical procedures, embolization of the ICA still presents an unsatisfactory 15-20% rate of developing immediate or delayed cerebral ischemia.

Several recent studies report endovascular treatment with a stent-graft for CBS as a quick and effective method, determining lower morbidity compared to surgical procedures or permanent arterial occlusion by endovascular techniques. Moreover, it is a less time-consuming procedure, which should be preferred in life-threatening situations such as profuse and active bleeding responsible for unstable vital signs¹⁰⁻¹⁹.

Though several case reports describe a relatively high rate of recurrent active bleeding¹⁹⁻²¹, the immediate clinical results in patients who underwent placement of a covered stent for CBS have been considered favorable in many reports¹⁰⁻¹⁹.

Covered stents already in clinical use for the endovascular treatment of CBS are covered carotid stents like Wallgraft (Boston Scientific, Natick, US) and unconventionally used oesophageal covered stents like NITI-S (Tae-woong Medical Co.). At first we chose to deploy the Fluency plus vascular stent-graft (Bard, New Jersey, US) because of its high radial expansion force and its 2 mm flared bare ends to minimize the risk of dislocation and subsequent endoleak. We subsequently decided not to deploy the Fluency plus stent because of its reduced vessel compliance and its important vessel attritus, determined by the high profile

of the stent, which made stent placement difficult and the thromboembolic risk too high.

In need of a lower profile stent-graft, also because of the non-existence of stent-grafts designed for the endovascular treatment of CBS, we opted for an unconventional use of the coronaric "Direct Stent" stent-graft (In-situ technologies, Minnesota, US). Direct-Stent is one of the thinnest stent-grafts currently available, designed for the treatment of ruptures, dissections and aneurysms of the coronaric arteries, and characterized by a good flexibility and accessibility to tortuous anatomies. These characteristics allowed us to successfully cross the lesion, with reduced vessel trauma, to avoid further secondary thromboembolic occlusions, and to correctly deploy the stent. As a result, a satisfactory hemostasis was obtained, and vessel patency was nearly completely restored.

In addition, a very important message on the rescue endovascular treatment for carotid blow-out can be obtained from our case, observing that the authors made a mistake to embolize first some ECA branches, wrongly perceiving a blush of edematous nasal mucosa and underestimating the ICA vasospasm, which was not a consequence of local compression by the nasopharyngeal neoplasm, but a sign the vessel had bled. It is fundamental to analyze very carefully all the vessels in the examined region, even in emergency life-threatening conditions.

Conclusion

In summary, the unconventional use of the coronaric balloon expandable "Direct Stent" may represent a safe and useful tool for the endovascular treatment of CBS. Although long-term follow-up is needed to assess any bleeding recurrence, the immediate clinical results have been satisfactory. This case report highlights the usefulness and versatility of low profile, highly flexible, endovascular stent-graft placement as a rescue treatment in challenging cases of life-threatening carotid blowout syndrome.

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