Retinal Embolization and Cerebellar Asymptomatic Embolization after Carotid Stenting Using Distal Balloon Protection A Case Report

S. ISLAM, H. MANABE, S. HASEGAWA, A. TAKEMURA,
M. NAGAHATA, C. ITO, M. EZURA

*Department of Neurosurgery, Radiology, Ophthalmology Kuroishi City Hospital, Kuroishi,
Department of Intravascular Neurosurgery, Konan Hospital; Sendai, Japan*

Key words: carotid stenting, retinal embolization, cerebellar embolization, distal protective device

Summary

We describe a rare case of having both symptomatic ipsilateral retinal embolization and asymptomatic cerebellar embolization occurring after carotid stenting with use of distal protective device. In this case, external carotid angiograms revealed accessory meningeal artery-ophthalmic artery and occipital artery-vertebral artery anastomoses. This case suggested that the protection for external carotid artery should be considered during carotid stenting to avoid retinal embolization and cerebellar or cerebral embolization in cases showing angiographical anastomoses between external carotid artery and ophthalmic artery or intracranial arteries.

Introduction

As the most common complication of carotid stenting is cerebral embolization due to debris migration, the embolic protection devices such as filter or distal occlusion balloon has been developed to prevent this complication. Although a risk of direct distal embolization of cerebrum due to migration of debris from stenotic portion is markedly reduced down with use of distal balloon protection¹, the migration of debris to the retina or to brain passing through an anastomosis from external carotid

artery (ECA) to internal carotid artery (ICA), vertebral artery or ophthalmic artery during carotid stenting has not been well described².

We hereby presented a rare case of having both ipsilateral retinal embolization and asymptomatic cerebellar embolization occurring just after carotid stenting with use of distal protective balloon device (GuardWire Plus system: Medtronic Japan). This case suggested the importance of protection of ECA during carotid stenting as well as protection of ICA.

Case Report

A 63 year-old-man was admitted to our department because of episode of weakness of his left arms and legs continuing for about ten minutes in past one month. Cerebral angiography revealed 70% stenosis on cervical portion of the right ICA (figure 1A). On admission, he had no neurological deficits.

Endovascular Treatment

Angiography and stenting was performed under local anesthesia. Under systemic heparinization (initial bolus injection 5000IU: hourly bolus injection 1000 IU), a 9 French guiding catheter was inserted to the right common carotid artery via the right femoral artery. A GuardWire Plus system (Medtronic Japan)

was passed coaxially through the guiding catheter, and navigated into distal ICA beyond the stenotic portion. With balloon on the GuardWire Plus system inflated at the distal ICA, 7 cm from common carotid bifurcation, in order to occlude the ICA, Savy angioplasty balloon (4 mm diameter and 4 cm length, Johnson & Johnson, USA) was navigated with the GuardWire Plus system, and inflated for one minute at the stenotic portion with nominal pressure.

After withdrawn this angioplasty balloon, Smart stent (9 mm diameter and 4 cm length, Johnson & Johnson, USA) was navigated to the ICA and placed to cover the stenosis. After stent placement, Powerflex angioplasty balloon (5 mm diameter and 4 cm length, Johnson & Johnson, USA) was inserted to the stented ICA, and was inflated for one minute with nominal pressure as postdilation. After withdrawal this angioplasty balloon catheter, the aspiration catheter was inserted just below the balloon on the GuardWire Plus system, and about 40cc blood was aspirated. After aspiration, the ICA was flushed by heparinized saline to wash the stagnating blood toward ECA, and the balloon on the GuardWire Plus system was deflated. Duration of occlusion of ICA was 15 minutes. The patient showed no neurological sign throughout this stenting procedure. Immediate poststenting angiography revealed that the stenting gained 100% patency of the ICA (figure 1B). The systemic heparinization was discontinued 24 hours after the stenting procedure. Thereafter, oral aspirin was given.

Postoperative Clinical Course

On the next day of the stenting, patient complained of the visual field defect of the right eye (figure 2A). Diffusion-weighted MR image showed a small hyperintense lesion on the right cerebellar hemisphere (figure 2B). Emergency right external carotid angiography revealed ophthalmic-accessory meningeal artery and occipital artery – vertebral artery anastomoses (figure 2C), and no occlusion of cerebellar arteries was seen on right vertebral angiograms.

Figure 1 A) Presenting right carotid angiogram (lateral view) revealed stenosis on internal carotid artery. B) Post-stenting angiogram (lateral view) showing dilation of the stenosis

Figure 2 A) Postoperative visual field examination of the right eye showed visual field defect on mainly lower nasal area. Visual defect was indicated by black dots. B) Poststenting diffusion-weighted MR image revealed a hyperintense spot on the right cerebellar hemisphere (arrow). C) Right retinal angiogram showing branch occlusion of the central retinal artery (arrow). D) Right external carotid angiogram (lateral view) showing the retinal supply from the accessory meningeal artery (small arrow) and anastomosis between the occipital artery and the vertebral artery (large arrow) on late arterial phase.

Fluorescein right retinal angiograms revealed the occlusion of branch of central retinal artery (figure 2D). After receiving daily intravenous 60000 IU urokinase injection for 5 days, the patient returned home one week after the stenting with no neurological deficit except for the visual field defect.

Discussion

One of the popular protective devices for prevention of cerebral embolization during

carotid stenting is distal protective balloon. After stenting procedure with use of this distal protective device, the blood stagnating in the ICA between distal protective balloon and CCA bifurcation, which possibly contains the debris, should be aspirated. After the aspiration, the ICA had better be flushed by heparinized saline in order to wash the stagnating blood toward ECA, because it is unclear if the all stagnating blood can be removed by suction only.

After this procedure, the protective balloon

is deflated to recover normal circulation of the ICA.

In this case, the debris in the stagnating blood would migrate to retinal artery passing through the accessory meningeal artery – ophthalmic artery anastomosis and to the posterior inferior cerebellar artery through the occipital artery – vertebral artery anastomosis, and causing asymptomatic cerebellar infarct and retinal branch occlusion. The ECAG after stenting showed the retinal supply from the accessory meningeal artery and anastomosis between the occipital artery and ipsilateral vertebral artery. According to the study by Wilentz et Al, retinal embolization during carotid stenting occurred in 4% of cases, and 1.7% was symptomatic¹. The pre-stenting ECAG is necessary to check the connection between ECA and ophthalmic artery or intracranial arteries.

Total amount of 40cc blood was aspirated from aspiration catheter, the tip of which was put just below the distal protective balloon. As the diameter of origin of the ICA was 6 mm and the distance between common carotid bifurcation and the protective balloon was 7 cm, the stagnating blood in the ICA was calculated to be less than 7cc. Aspiration of 40cc blood could not remove the all stagnating blood, so

that the debris migrated to ECA at washing of the ICA.

As it is uncertain if the stagnating blood could be completely removed by aspiration only, the rinsing of ICA should be performed before deflation of the protective balloon. And at the rinsing of ICA, balloon protection of possible anastomosis between ECA and intracranial artery or ophthalmic artery should be considered to avoid debris migration to brain or eye, especially in cases showing these anastomoses on pre-stenting ECAG.

References

- 1 Al-Mubarak N, Roubin GS et Al: Microembolization during carotid stenting with the distal –balloon antiemboli system. *Int Angiol* 21: 344-348, 2002.

Hiroshi Manabe, M.D.
Department of Neurosurgery
Kuroishi City Hospital
1- 70, Kitami-cho Kuroishi Aomori
036-0541, Japan
E-mail: hirobee@infoaomori.ne.jp

EDITORIAL COMMENT

This is an interesting paper reporting a complication occurring after carotid stenting that shows that, although technique has made tremendous progresses in that field of Interventional Neuroradiology, it has to be used as a complement to anatomic knowledge and appropriate therapeutic decisions. The question of the necessity of stenting in this case, performed rapidly after the onset of symptoms and without any trial of medical treatment remains a debate that we will not open here. However, what is reported as a technical complication can be, as often, considered as an avoidable complication. The anastomoses the authors describe were certainly present before their procedure and therefore careful analysis of the internal and external carotid tree should be included in the angiographic evaluation before any procedure that flushes material (emboli or plaque debris) into the external carotid artery, in order to protect the patient from sometimes devastating consequences.

This basic preoperative management will allow the interventionalist to take the appropriate decisions and use the appropriate tools. Technique should be at our service and one should not make our procedures more complex by accumulating technical tricks that might increase the therapeutic risk; we do agree with the authors when they claim that other arterial protections can be used but only in peculiar circumstances.

Dr Georges Rodesch
Neuro Radio Diagnostique et Thérapeutique
Hôpital Foch
40, rue Worth - B.P. 36 - 92151 Suresnes