Endovascular Trapping for a Giant Aneurysm of the Cervical Internal Carotid Artery: A Case Report

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Summary

We describe a case of giant cervical internal carotid aneurysm successfully treated by endovascular trapping. A 57-year-old woman with a history of maxillary contusion seven years before presented with pharyngeal discomfort during swallowing. MRI revealed a 4 cm mass in the right parapharyngeal space. A common carotid angiogram revealed a giant aneurysm with a wide neck originating from the cervical internal carotid artery; kinking of the internal carotid artery was noted at a point distal to the carotid bifurcation. Analysis of cerebral blood flow by SPECT during a balloon occlusion test showed no hypoperfusion areas, and the patient underwent endovascular trapping. There were no neurological or other complications after the procedure. A follow-up MRI revealed complete thrombosis of the aneurysm. Our results show that endovascular trapping for pseudoaneurysm of the cervical internal carotid artery can be a reliable and effective treatment in patients who tolerate a balloon occlusion test.

Introduction

Cervical internal carotid artery aneurysms due to blunt trauma are rarely observed. The outcome of direct surgery for these aneurysms is often unsatisfactory, but positive results have been reported recently with endovascular

treatment. We describe the successful use of endovascular trapping to treat a giant cervical internal carotid artery aneurysm that resulted in pharyngeal discomfort.

Case Report

A 57-year-old woman with a history of mandibular bruising due to a fall seven years earlier presented with pharyngeal discomfort during swallowing. She first noticed the discomfort in April 2005 and sought treatment at an otolaryngology clinic. A cervical tumor was initially suspected. However, further examination revealed a giant aneurysm (about 4 cm) in the right cervical internal carotid artery, at which point she was referred to our hospital for treatment. Upon presentation, she was conscious and complaining of pharyngeal discomfort during swallowing, but there was no evidence of dysphagia or lower cranial nerve disorders.

T2-weighted MRI revealed a giant mass (about 4 cm) with low signal intensity in the parapharyngeal space (figure 1). Angiography of the right common carotid artery showed marked bending at the origin of the internal carotid artery and an aneurysm immediately after this bend (figure 2). The distal internal carotid artery was poorly visualized.

The marked bending at the origin of the internal carotid artery made guidance of a stent or stent-graft difficult. Because of this, we be-

Figure 1 T2-weighted MRI shows a 4 cm mass in the right parapharyngeal space.

gan to evaluate the possibility of performing a permanent occlusion of the internal carotid artery. Collateral circulation via the anterior communicating artery or posterior communicating artery was confirmed by angiography during a temporary carotid balloon test occlusion. Brain single-photon emission CT (SPECT) during temporary carotid occlusion under mild hypotension was performed. Because no decrease in regional blood flow was observed on SPECT, we elected to perform permanent carotid occlusion using endovascular technique, in accordance with the wishes of the patient, who was employed in the customer service industry.

After femoral puncture, a bolus of 5000 U heparin was given intravenously, after which hourly injections of 1000 U were given to maintain an activated clotting time (ACT) between 200 and 300 seconds during the procedure. All procedures were performed while the patient was conscious. A guiding catheter with a balloon (Patlive[®]; 6 Fr, MP-1, Clinical Supply) was placed at the origin of the right internal carotid artery, and a conventional guiding catheter (Free Style[®]; 6 Fr, JB2, Medikit) was positioned in the right common carotid artery. A microcatheter (Excelsior SL-10[®], Boston Scientific) was guided to the carotid canal beyond the orifice of the internal carotid artery aneurysm,

and another microcatheter (Excelsior SL-10[®]) was placed in the aneurysm.

The balloon of the guiding catheter was inflated, and a conventional balloon occlusion test was performed for 20 minutes. No neurological symptoms were observed and the electroencephalogram remained unchanged. For endovascular trapping under balloon occlusion, coils were placed in the internal carotid artery at the proximal segment of the carotid canal. However, because the orifice was larger than expected, the coil started to enter the aneurysm at a point 1cm before the carotid canal. The coils were placed in the aneurysm, mostly near the orifice. Finally, the coils were properly positioned at the origin of the internal carotid artery for trapping (figures 3 and 4). The patient took aspirin 100 mg daily after permanent occlusion of the internal carotid artery.

Postoperative course was uneventful and pharyngeal discomfort during swallowing disappeared. A follow-up MRI ten months after the procedure showed complete thrombosis of the aneurysm and a reduction in mass (figure 5).

Discussion

Cervical internal carotid artery aneurysms are often pseudoaneurysms that develop in response to trauma such as cervical bruises or carotid artery injury during placement of a central venous catheter^{1,2,3}. The patient had suffered trauma seven years earlier, which raises the possibility of a pseudoaneurysm, but pathological examination was not performed. An increase in the size of a giant aneurysm is not due to intraluminal factors, but rather to the apposition of a new layer of thrombus at the periphery. Schubiger et Al claimed that formation of an intracranial giant artery aneurysm is due to a chronic dissection process associated with recurrent subadventitial hemorrhage from the vasa vasorum^{4,5}. Zhao et Al reported that adventitial inflammation leads to a weakening of the media via release of proinflammatory factors that invade the media and lead to dilation, which results in aneurysm formation⁶. The inflammatory process in the adventitia might lead to a vicious circle in which proliferation of the vasa vasorum in turn augments the supply of inflammatory cells to the vessel wall, thereby causing further adventitial inflammatory reactions. The vasa vasorum appear to play an important role in giant aneurysm formation^{6,7}.

Figure 2 Right carotid angiogram shows a giant aneurysm with wide neck originating at the cervical internal carotid artery; kinking of the internal carotid artery at a point distal to the carotid bifurcation is also evident.

Figure 3 Endovascular trapping of the right internal carotid artery was performed using coils.

Patients with cervical internal carotid artery aneurysms often show evidence of ischemic cerebrovascular disease such as cerebral embolism, in addition to dysphagia, pharyngeal discomfort, and dysgeusia due to space-occupy-

ing lesions that compress the lower cranial nerves^{3,8,9}. The benefit of early treatment for these aneurysms was confirmed in a long-term observational study that found a low incidence of spontaneous remission¹⁰.

Figure 4 A right carotid angiogram after the procedure shows complete occlusion of the internal carotid artery.

Figure 5 A follow-up T2-weighted MRI ten months after the procedure shows complete thrombosis in the aneurysm.

Figure 6 Illustration of the aneurysm and orifice.

Unfortunately, the outcome of direct surgery for cervical internal carotid aneurysms is often unsatisfactory. Interest in endovascular treatment using stents has therefore been increasing in recent years^{11,12,13,14,15}. However, a patient with postoperative recurrence even after combined stenting and aneurysmal embolization with Guglielmi detachable coils has been reported¹⁶, and more recent patients have been treated with covered stents or stent-grafts^{3,17,18}. Endovascular stent-graft repair for carotid pseudoaneurysm appears to be a promising technique. However, in an experimental study, Dacron-covered stent-grafts had a poor short-term patency rate due to limited biocompatibility¹⁹. In addition, Hans et Al. found that the more established technique of vessel sacrifice might be safer than stent-grafts in patients with tolerance to parent artery occlusion²⁰. Further research and development are needed to im-

prove stent-graft technology. In addition, evaluation of stent-grafts requires a longer follow-up period, to exclude the possibility of delayed stenosis of parent vessels.

In the present patient, there was marked bending at the origin of the internal carotid artery, and stent guidance was deemed overly difficult. In addition, since the aneurysm was very large, preservation of the parent artery could not be guaranteed. Therefore, after confirming tolerance by an internal carotid artery occlusion test, we selected trapping of the internal carotid artery.

Regarding pseudoaneurysms of the cervical internal carotid artery, Nishimura et Al.²¹ described a patient with incomplete occlusion after combined treatment with a stent and coils. The patient subsequently underwent aneurysmal proximal occlusion of the internal carotid artery using a balloon and coils, but developed an ophthalmic artery embolism and an increase in aneurysmal size after the procedure. Ultimately, the aneurysm was resected. Pathological examination revealed many new vessels from the media to intima of the arterial wall, vasa vasorum in the adventitia, opening of new vessels toward the internal lumen, and fibrin attachment to these openings. In the present patient, new vessels from the media to intima of the arterial wall, and vasa vasorum might also have been present. If so, blood flow to the aneurysm might remain after proximal occlusion of the internal carotid artery alone because blood flow would continue via well-developed vascular components in granulation tissue that had formed in the aneurysm. This residual blood flow might result in distal emboli. Therefore, trapping appeared to be a better option than proximal occlusion alone for internal carotid artery occlusion.

On the other hand, in patients with large aneurysms - as in the present case - preoperative angiography cannot clearly visualize the internal carotid artery on the distal side of the aneurysm, and identification of the site and size of the orifice is often difficult. In this patient, the orifice was longer than expected, extending to the distal side of the internal carotid artery (figure 6).

To ensure the safety and accuracy of endovascular trapping for large cervical internal carotid artery aneurysms, careful guidance of a microcatheter to the distal portion of the aneurysm before trapping is required.

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