Percutaneous Transluminal Angioplasty of Stenotic Primitive Hypoglossal Artery

—Case Report—

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Abstract

A 76-year-old female presented with vertebrobasilar insufficiency due to a severe stenosis of the right primitive hypoglossal artery (an unusual carotid-basilar anastomosis) manifesting as recurrent transient ischemic attacks (TIA) associated with quadriparesis and cerebellar ataxia with vertigo, nausea, and vomiting. She had been treated with 100 mg of aspirin per day, but TIA associated with the same symptoms persisted. Cerebral blood flow (CBF) studies disclosed a region of moderately low flow in the posterior fossa. Cerebral angiography demonstrated that the posterior fossa was supplied via the right primitive hypoglossal artery, which was severely stenotic at its origin. Percutaneous transluminal angioplasty using a Stealth catheter, 3.0-mm diameter and 10-mm long, successfully dilated the stenosis. No TIA occurred postoperatively, and a marked increase in CBF was demonstrated in the posterior fossa.

Key words: vertebrobasilar insufficiency, primitive hypoglossal artery, arterial stenosis, cerebral blood flow, percutaneous transluminal angioplasty

Introduction

Percutaneous transluminal angioplasty (PTA), first introduced to dilate atherosclerotic coronary arteries using a balloon catheter, has been used to treat hemodynamically significant stenotic lesions involving the extracranial and/or intracranial cerebral vessels. Improvements in microballoon and catheter technologies now allow PTA in both the anterior and posterior cerebral circulatory systems. Clinical application of PTA to treat atherosclerotic disease of the vertebral and basilar arteries has achieved significant benefit in alleviating symptoms and improving cerebral blood flow (CBF) to the posterior cerebral circulatory system.

Here we describe a patient with vertebrobasilar insufficiency due to a severe stenosis at the origin of the right primitive hypoglossal artery, an unusual carotid-basilar anastomosis, treated by PTA.

Case Report

A 76-year-old female was admitted to our institute on March 4, 1993, with a history of recurrent transient ischemic attacks (TIA) associated with quadriparesis, ataxic gait, vertigo, nausea, and vomiting beginning in January, 1988. She had been treated with 100 mg of aspirin per day, but the same type of TIA had persisted. Computed tomography on admission disclosed no notable abnormalities. Magnetic resonance (MR) imaging also disclosed no abnormalities in the posterior fossa (Fig. 1). Single photon emission computed tomography with technetium-99m-hexamethylpropyleneamine-oxime (99mTc-HMPAO SPECT) showed moderately decreased CBF in the posterior fossa compared with that in the frontal lobes, and the ratio of radioisotope uptake in the former to that in the latter was 0.69 (Fig. 2 left). Cerebral angiography disclosed severe stenosis at the proximal portion of the right primitive hypoglossal artery, which originated from the cervical portion of the ipsilateral internal carotid artery and supplied the...
posterior fossa (Fig. 3 left). The left vertebral artery was hypoplastic with only an ipsilateral posterior inferior cerebellar artery branching off.

Two days after admission, she underwent PTA with a Stealth dilatation balloon catheter (Target Therapeutics, Fremont, Cal., U.S.A.; 3.0-mm diameter and 10-mm long) positioned through a 7-Fr guiding catheter in the right internal carotid artery. Prior to this treatment, 3000 IU of heparin was administered intravenously. The dilatation catheter was introduced into the severely stenotic portion of the right primitive hypoglossal artery (Fig. 4). The balloon was occluded with the valve wire, then inflated using a gauged inflator to 7-atm pressure. The

Fig. 1 T1- (left) and T2-weighted (right) MR images on admission, showing no abnormalities in the brain stem or cerebellum.

Fig. 2 Pre- (left) and postoperative (right) CBF studies with 99mTc-HMPAO SPECT, showing moderately decreased preoperative CBF in the posterior fossa, which was markedly increased following PTA.

Fig. 3 Serial right internal carotid angiograms, showing a primitive hypoglossal artery originating from the cervical portion of the internal carotid artery and feeding the posterior fossa with a severely stenotic region in the proximal portion (left), which was markedly dilated just after PTA (center), and demonstrated no restenosis 3 months after the procedure (right).

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duration of inflation was 10 seconds, and the procedure was repeated four times. During the procedure, she manifested no neurological abnormalities.

Postoperative angiography demonstrated marked dilatation of the stenotic portion of the artery (Fig. 3 center), and 99mTc-HMPAO SPECT showed the radioisotope uptake in the posterior fossa increased markedly (Fig. 2 right). She manifested no neurological deterioration or TIA, and was discharged on March 14, 1993. Follow-up angiograms 3 months after the procedure demonstrated no restenosis (Fig. 3 right).

Fig. 4 Intraoperative right internal carotid angiogram, showing the Stealth dilatation balloon catheter introduced into the severely stenotic portion of the right primitive hypoglossal artery (arrow).

Discussion

Hemodynamic insufficiency, intraarterial embolization, and atherosclerotic occlusion of perforating branches are all possible causes of vertebrobasilar ischemia due to intracranial vertebrobasilar artery occlusive disease. The incidence of embolic stroke in the posterior circulation system is significantly less than that in the carotid artery system.6,9,10,13) Castaigne et al.3) found that 94% of the basilar artery occlusions and 68% of vertebral artery occlusions were due to thrombosis developing in a region of preexisting atherosclerotic stenosis.

Extracranial vertebral artery disease is seldom associated with ischemia unless the blood flow through bilateral vertebral arteries has been compromised.12) Naritomi et al.10) reported that decreases in regional CBF in the posterior circulatory system induced by postural hypotension are significantly greater in patients with vertebrobasilar insufficiency than in normal controls, and associated with dysautoregulation. Hemodynamic factors and dysautoregulation are apparently factors in the pathogenesis of vertebrobasilar insufficiency.15)

In a previous study, we found that hemodynamic compromise of the posterior circulation was the primary cause of vertebrobasilar ischemia in all but one of the patients examined.15) In the present patient considered, an unusual carotid–basilar anastomosis (primitive hypoglossal artery) joining the cervical part of the internal carotid artery to the basilar artery4,16) supplied blood to the posterior circulation, resulting in a moderate decrease in CBF in the posterior fossa. The principal cause of the recurrent TIA was thought to be hemodynamic insufficiency.

The PTA achieved mild angiographic dilatation, but the posterior fossa CBF was markedly increased and the TIA no longer occurred. This indicates that complete dilatation of the stenotic region may not be necessary because mild stenosis does not decrease cerebral perfusion.

Successful PTA may be followed by the development of sufficient collateral vasculature. Subsequent severe restenosis or occlusion may then be asymptomatic.

References

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*Neurol Med Chir (Tokyo) 34, June, 1994*