

# **Percutaneous Transluminal Angioplasty for Stenosis of the Posterior Cerebral Artery in Progressive Stroke**

## **—Case Report—**

Kazuhito NAKAMURA, Keiji MURATA\*, Taichiro KAWAKAMI\*\*,  
Yuzo TERAOKA\*\*, Hidetoshi IKEDA, and Masakazu SAKAGUCHI\*

Department of Neurosurgery, Osaka City General Hospital, Osaka;

\*Department of Neurosurgery, Shimada Municipal Hospital, Shimada, Shizuoka;

\*\*Department of Neurosurgery, Osaka City University Graduate School of Medicine, Osaka

### **Abstract**

**A 59-year-old male presented with repeated transient hemianopsia and hemiparesis on the left. Emergency magnetic resonance angiography showed stenosis of the right posterior cerebral artery (PCA). Endovascular recanalization with percutaneous transluminal angioplasty was performed immediately after the diagnosis. Patency of the PCA was successfully restored. The patient was discharged without neurological deficits. Progressive stroke in the PCA territory is rare. However, emergency endovascular recanalization is possible after prompt clinical diagnosis based on repeated diffusion-weighted magnetic resonance imaging and angiography after a 24-hour interval.**

Key words: angioplasty, posterior cerebral artery, balloon catheter, acute stroke

### **Introduction**

Percutaneous transluminal angioplasty (PTA) for stenosis of the basilar artery using a coronary balloon catheter was first described in 1980.<sup>8)</sup> Since then, many endovascular recanalization procedures for steno-occlusive lesions of the posterior circulation have been reported.<sup>2,6,8,9)</sup> However, PTA of the posterior cerebral artery (PCA) is rare. PTA of the PCA was performed for abnormal perfusion to the ipsilateral middle cerebral artery territory via leptomeningeal anastomosis,<sup>10)</sup> and for cases of chronic cerebral ischemia, but not in the acute stage of an ischemic cerebrovascular accident. The reason is that diagnosis of PCA infarction in the chronic stage is easy, but more difficult in the acute stage, with transient hemianopsia as the only symptom.

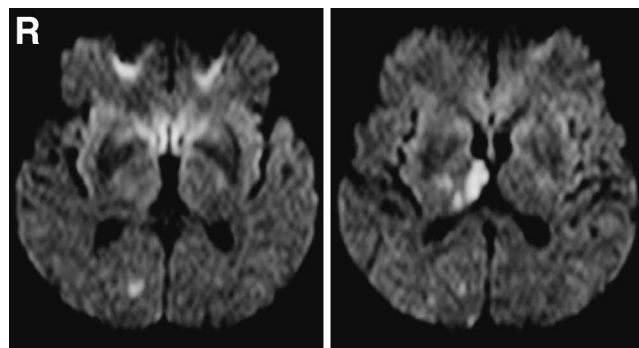
Here we describe a case of endovascular recanalization of stenosis of the PCA in the acute stage of progressive stroke.

### **Case Report**

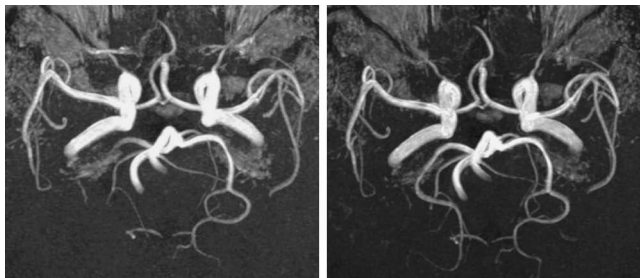
A 59-year-old male came to the emergency room and complained of left hemibody hypalgesia, which had

repeatedly become worse and then improved for one month. In addition, transient left hemianopsia had also occurred repeatedly for 24 hours before admission. The left hemibody hypalgesia and left hemiparesis appeared again and gradually become worse before admission.

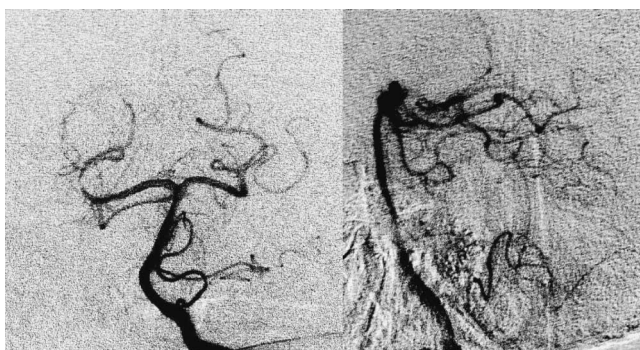
On admission, neurological examination found hemibody hypalgesia and mild hemiparesis on the left. No hemianopsia was present. Brain computed



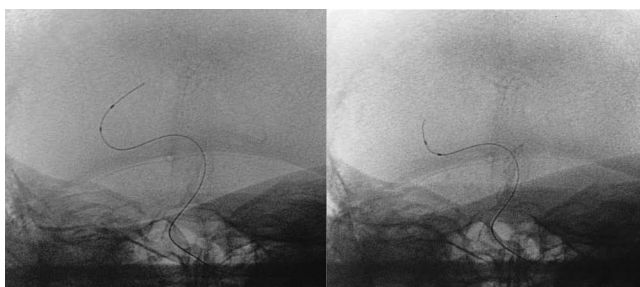
**Fig. 1** T<sub>2</sub>-weighted (left) and diffusion-weighted (right) magnetic resonance images demonstrating hyperintense spots in the thalamus and occipital lobe.



**Fig. 2** Preoperative (*left*) and postoperative (*right*) magnetic resonance angiograms demonstrating recovery of flow of the right posterior cerebral artery.



**Fig. 3** Left vertebral angiograms demonstrating severe stenosis of the second segment of the right posterior cerebral artery.

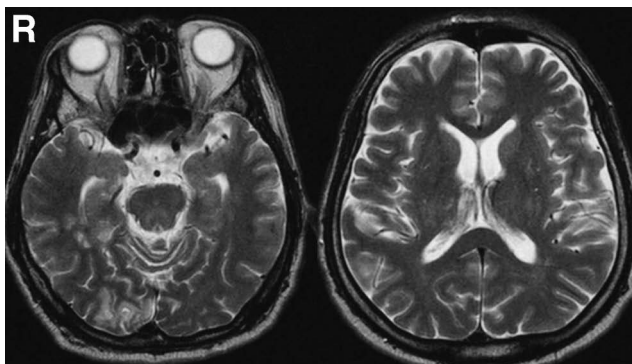


**Fig. 4** Intraoperative left vertebral angiograms demonstrating the microballoon catheter introduced into the stenosis of the right posterior cerebral artery.

tomography (CT) showed multiple low density spots in the right occipital lobe. Diffusion-weighted magnetic resonance (MR) imaging revealed hyperintense spots in the same area (Fig. 1). MR angiography showed severe stenosis of the P<sub>2</sub> segment of the right PCA (Fig. 2 *left*). Cerebral angiography performed on the day of admission confirmed steno-



**Fig. 5** Postoperative left vertebral angiogram demonstrating dilation of the stenosis and improved blood flow.



**Fig. 6** T<sub>2</sub>-weighted magnetic resonance images showing no extensive infarction one month after percutaneous transluminal angioplasty.

sis of the right P<sub>2</sub> segment. Left vertebral angiography showed delay in circulation time (Fig. 3). The medial posterior choroidal artery was not opacified. Right carotid angiography verified poor collateral circulation. The calibers of the proximal PCA and distal PCA were 2.2 and 2.0 mm, respectively, and the stenosis ratio was 80%. The diagnosis was progressive hemodynamic and/or embolic stroke.

Heparin (5000 IU) was administered and edalabon (30 mg) was infused intravenously. Emergency PTA was attempted through the transfemoral approach using an ENVOY<sup>®</sup>, 5 Fr, HH1 (Cordis Corporation, Johnson & Johnson Company, Miami Lakes, Fla., U.S.A.) as the guiding catheter. PTA was performed with a microballoon catheter (Gateway<sup>™</sup> OTW, 2.0 × 9.0 mm; Boston Scientific Corporation, Fremont, Calif., U.S.A.), with preparations for back-up stent-

ing and bypass surgery (Fig. 4). The balloon catheter was inflated to 2.0 atm for 30 seconds. This procedure was successful in maintaining the patency of the PCA (Fig. 5). Angiography failed to confirm patency of the medial posterior choroidal artery.

Edalabon (60 mg/day) was given intravenously for 14 days and antiplatelet agents (aspirin 100 mg/day and cilostazol 100 mg/day orally) were administered after the PTA. MR angiography confirmed recovery of PCA flow one month later (Fig. 2 right). Postoperative MR imaging also showed no new extensive ischemic lesion (Fig. 6). The patient was discharged without neurological deficits.

## Discussion

The present case of stenosis of the PCA in the acute stage of progressive stroke was treated before approval for the use of intravenous recombinant tissue plasminogen activator (rt-PA) in Japan. The low density areas on CT suggested this progressive stroke was caused by an atherothrombotic lesion and the onset time was unclear, which led to hesitation about the use of rt-PA.

The medial posterior choroidal artery occasionally feeds the cerebral peduncle and the internal capsule.<sup>1,3)</sup> A short circumflex artery also feeds the cerebral peduncle.<sup>3)</sup> Hemiplegia may occur with PCA occlusion.<sup>4)</sup> Hemiparesis associated with PCA ischemia usually results from infarction of the cerebral peduncle and less frequently from involvement of the anterior segment of the posterior limb of the internal capsule.<sup>4)</sup> In our case, infarction of the thalamus and the occipital lobe were present. We suspect that hemodynamic insufficiency to the cerebral peduncle or posterior limb of the internal capsule occurred. However, no cerebral blood flow study was available in this case.

Several surgical reperfusions of the PCA have been reported.<sup>5,7)</sup> External carotid artery-PCA anastomosis with an interposition saphenous vein graft was used to treat vertebrobasilar progressive stroke.<sup>7)</sup> Superficial temporal artery (STA) to PCA bypass used the posterior temporal artery as the recipient, which was less complicated than direct anastomosis of the STA to the main branch of the PCA.<sup>5)</sup> However, direct surgical procedures are more complicated and invasive than endovascular treatment. The risk of vessel rupture with PTA for PCA stenosis is similar to that in other intracranial vessels, and may be decreased by choosing a balloon smaller in diameter than the normal caliber of the PCA and using lower nominal pressure.

Careful examination of clinical symptoms and repeated diffusion-weighted MR imaging and an-

giography after a 24-hour interval are important for the diagnosis of progressive ischemia of the PCA. However, endovascular recanalization for the stenosis of the PCA can be performed after prompt diagnosis. Newer devices for endovascular recanalization are desirable for safer and more distal PTA.

## References

- 1) Fujii K, Lenkey C, Rhoton AL Jr: Microsurgical anatomy of the choroidal arteries: Lateral and third ventricles. *J Neurosurg* 52: 165-188, 1980
- 2) Higashida RT, Tsai FY, Halbach VV, Dowd CF, Smith T, Fraser K, Hieshima GB: Transluminal angioplasty for atherosclerotic disease of the vertebral and basilar arteries. *J Neurosurg* 78: 192-198, 1993
- 3) Kawashima M, Rhoton AL Jr, Tanriover N, Ulm AJ, Yasuda A, Fujii K: Microsurgical anatomy of cerebral revascularization. Part II: posterior circulation. *J Neurosurg* 102: 132-147, 2005
- 4) Montavont A, Nighoghossian N, Hermier M, Derex L, Berthezène Y, Philippeau E, Honnorat J, Froment JC, Caplan LR, Trouillas P: Hemiplegia in posterior cerebral artery occlusion: acute MRI assessment. *Cerebrovasc Dis* 16: 452-453, 2003
- 5) Nagasawa S, Sakaguchi I, Ohta T: The posterior temporal artery as the recipient in superficial temporal artery to posterior cerebral artery bypass. Technical note. *Surg Neurol* 52: 73-77, 1999
- 6) Nomura M, Hashimoto N, Nishi S, Akiyama Y: Percutaneous transluminal angioplasty for intracranial vertebral and/or basilar artery stenosis. *Clin Radiol* 54: 521-527, 1999
- 7) Sato S, Kadoya S, Suzuki T: [ECA-PCA anastomosis with the use of an interposition saphenous vein graft for vertebrobasilar progressing stroke]. *No Shinkei Geka* 13: 681-686, 1985 [Jpn, with Eng abstract]
- 8) Sundt TM Jr, Smith HC, Cambell JK, Vlietstra RE, Cucchiara RF, Stanson AW: Transluminal angioplasty for basilar stenosis. *Mayo Clin Proc* 55: 673-680, 1980
- 9) Terada T, Yokote H, Tsuura M, Kinoshita Y, Hayashi Y, Itakura T, Komai N: Tissue plasminogen activator thrombolysis and transluminal angioplasty in the treatment of basilar artery thrombosis: Case report. *Surg Neurol* 41: 358-361, 1994
- 10) Touho H, Takaoka M, Ohnishi H, Furuoka N, Karasawa J: Percutaneous transluminal angioplasty for severe stenosis of the posterior cerebral artery: case report. *Surg Neurol* 42: 42-47, 1995

---

Address reprint requests to: Kazuhito Nakamura, M.D., Department of Neurosurgery, Osaka City General Hospital, 2-13-22 Miyakojimahondori, Miyakojimaku, Osaka 534-0021, Japan.  
e-mail: kazu12@ocgh.hospital.city.osaka.jp