Treatment Strategy for Isolated Posterior Inferior Cerebellar Artery Dissection

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■ OBJECTIVE: **Isolated dissections that develop on the posterior inferior cerebellar artery (PICA) require intensive treatment because of their potential fatality. However, because of the rarity of these dissections, the optimal treatment has not yet been established.**

■ METHODS: **We retrospectively reviewed the clinical records of all patients who underwent any PICA dissection treatment in our institute over the last 4 years. Ten patients were enrolled, including 7 patients with subarachnoid hemorrhage (SAH) and 3 with PICA territory infarction. Dissection was seen at the proximal portion in 8 patients, whereas the remaining 2 patients showed distal PICA dissecting aneurysms.**

■ RESULTS: **Among the 7 patients with hemorrhage, 5 were actively treated (trapping and bypass, 2 patients; surgical clipping, 1 patient; coil embolization, 2 patients). Conservative management was performed in the other 2 patients. Among the 3 patients with infarction, 2 received conservative treatment. Endovascular treatment was performed in 1 patient, who showed rapid progression, aneurysm formation, and conversion to massive SAH within 10 days after the initial attack. Although 7 patients showed relatively good outcomes (modified Rankin Scale score, ≤2) after 30 days of follow-up, 1 patient had a final modified Rankin Scale score of 3. In addition, the other 2 patients (1 in each group) died as a result of major SAH.**

■ CONCLUSIONS: **Given the dynamic clinical course and potential fatality of PICA dissection, meticulous evaluation, intensive treatment with a diverse range of modalities, and proper follow-up are required for patients with PICA dissection to achieve favorable outcomes.**

INTRODUCTION

Intracranial vertebral artery (VA) dissections have been reported to represent up to 28% of all VA aneurysms. However, dissections limited to the branches of the intracranial VA, including the posterior inferior cerebellar artery (PICA), are generally rare and account for approximately 8% of all VA aneurysms.[1-5] Spontaneous dissection of the isolated PICA itself is even more rare, with an incidence ranging between 0.5% and 0.7% of all intracranial aneurysms and only a few cases having been reported in the literature.[3-8] Despite this low incidence, recent technological advances in diagnostic tools such as high-resolution magnetic resonance imaging (MRI) and three-dimensional digital subtraction angiography (DSA) have facilitated the detection of these lesions.[3,6,9] Clinically, PICA dissection can cause ischemic stroke or subarachnoid hemorrhage (SAH). Furthermore, PICA dissection might be underestimated as a cause of isolated PICA territory infarction.[9] Although several methods using endovascular or microsurgical treatment modalities have been introduced, the optimal treatment strategies for PICA dissection have not yet been well established. Moreover, few data are available regarding the long-term results of patients with PICA dissection.[5,6,10] Here, we describe our experience with patients with isolated PICA dissection, including their clinical manifestations and results from surgical, endovascular, and conservative

Key words
- Coil embolization
- Isolated PICA dissection
- OA-PICA bypass surgery
- PICA dissecting aneurysm
- Trapping

Abbreviations and Acronyms
CT: Computed tomography
CTA: Computed tomography angiography
DSA: Digital subtraction angiography
GCS: Glasgow Coma Scale
IVH: Intraventricular hemorrhage
MRA: Magnetic resonance angiography
MRI: Magnetic resonance imaging
mRS: Modified Rankin Scale
OA: Occipital artery
PICA: Posterior inferior cerebellar artery
SAH: Subarachnoid hemorrhage
VA: Vertebral artery

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treatments. We also reviewed the literature reporting various treatment modalities. Our aim was to identify the most appropriate treatment strategies based on cases at our institution.

METHODS

The institutional review board of Kyung Hee University Hospital approved this study. Retrospective analysis was conducted in patients with only isolated PICA dissections treated from March 2012 to December 2015 at our institution. During this period, we treated 573 ruptured or unruptured aneurysms by surgical or endovascular treatment. Among them, 55 cases of dissecting aneurysm (9.6%) were found and 15 cases of PICA aneurysm (2.6%) were treated at our institution. Aneurysms arising from the VA–PICA junction or VA dissecting aneurysms extending to the PICA origin site were excluded from this study. Similarly, saccular aneurysms without evidence of PICA dissection were also excluded. Ten consecutive patients (1.7%) were included in this study.

The baseline characteristics, medical histories, and radiologic findings of the patients with isolated PICA dissection are summarized in Table 1. The mean age of the patients was 60.8 years (range, 40–79 years); 4 patients were male and 6 were female. Of the 10 patients, 5 had a past medical history of diabetes mellitus and/or hypertension. Only 1 patient (case 4) reported severe posterior neck pain after cervical minor trauma with severe neck motion. Seven patients presented with SAH on computed tomography (CT) and the other 3 presented with PICA territory infarction. DSA was performed in all cases when dissection was suspected after magnetic resonance angiography (MRA) or CT angiography (CTA). The clinical diagnosis of PICA dissection was made by the treating neurosurgeon and an interventional neuroradiologist and was based on angiographic findings (string and pearl sign, double lumens, and irregular or fusiform dilatation). The location of the involved PICA segment was recorded according to the classification scheme described by Lister et al.[11] (I, anterior medullary; II, lateral medullary; III, tonsilomedullary; IV, telovelotonsillar; V, cortical segment). The angiographic findings and involved PICA segments in this study are described in Table 1. Based on their initial presentation, we divided patients into 2 groups: hemorrhagic and ischemic cases.

In addition, we analyzed and reviewed 90 isolated PICA dissection cases, which were treated with various modalities from the 12 previously reported studies (Table 2). We divided the various treatment modalities into 3 categories: parent artery occlusion, selective coiling or clipping of PICA dissection, and endovascular stent insertion with or without coil embolization. We also analyzed treatment-related ischemic or hemorrhagic complications. Outcomes were summarized with uniformity and presented as number of cases with percentage of excellent or good outcome as defined by a modified Rankin Scale (mRS) score.

RESULTS

Treatment Modalities and Follow-Up of PICA Dissection

The procedures and outcomes in this study are summarized in Table 3. Seven cases of SAH and 3 cases of infarction occurred. The treatment plan was decided according to the presentation of clinical manifestations (hemorrhage or infarction) and the location of the dissection (proximal or distal). Of the 10 patients, 3 underwent microsurgery (surgical trapping and occipital artery [OA]-PICA bypass, surgical trapping and intersegmental in situ bypass, and direct surgical clipping), 4 patients underwent endovascular treatment (coil embolization in 2 patients, 1 with a triple stent insertion at the VA and 1 with a failed endovascular approach), and the other 3 patients were observed for PICA dissection. In the first group, the distal segment lesions of the hemorrhagic cases (case 1 and 2) were treated by endovascular coil embolization. Alternatively, surgery was performed in 3 of the proximal segment lesions of the hemorrhagic cases (cases 3, 7, and 9) for the preservation of the PICA. Among the 7 patients with SAH, 5 were actively treated with surgery or endovascular treatment, whereas conservative management was performed in the other 2 patients. One patient (case 7) showed minimal change of the PICA and active treatment was not performed for the other one (case 10) because of an unstable general condition. In the second group, the proximal PICA segment was involved in all 3 patients with infarction. Of these 3 patients, triple stent therapy was performed at the VA in 1 patient (case 4), who showed rapid

Table 1. Patients and Dissection Characteristics

	n	%
Total	10	100.0
Age (years), median and range*	60.8	40–79
Female sex	6	60
Medical history		
Hypertension	2	20
Diabetes	4	40
Trauma history	1	10
Initial presentation		
SAH	7	70
SAH <1 mm + IVH	1	10
SAH >1 mm + IVH	6	60
PICA territory Infarction	3	30
Angiographic findings		
String and pearl	3	30
String	1	10
Double lumens	2	20
Irregular or fusiform dilatation	4	40
Involved segment of PICA		
I	2	20
II	4	40
I–II	2	20
IV	2	20

SAH, subarachnoid hemorrhage; IVH, intraventricular hemorrhage; PICA, posterior inferior cerebellar artery.
*Other value.