

Case Report

Dissecting Aneurysm of Vertebral Artery Manifesting as Contralateral Abducens Nerve Palsy

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Isolated abducens nerve paresis related to ruptured vertebral artery (VA) aneurysm is rare. It usually occurs bilaterally or ipsilaterally to the pathologic lesions. We report the case of a contralateral sixth nerve palsy following ruptured dissecting VA aneurysm. A 38-year-old man was admitted for the evaluation of a 6-day history of headache. Abnormalities were not seen on initial computed tomography (CT). On admission, the patient was alert and no signs reflecting neurologic deficits were noted. Time of flight magnetic resonance angiography revealed a fusiform dilatation of the right VA involving origin of the posterior inferior cerebellar artery. The patient suddenly suffered from severe headache with diplopia the day before the scheduled cerebral angiography. Neurologic examination disclosed nuchal rigidity and isolated left abducens nerve palsy. Emergent CT scan showed high density in the basal and prepontine cistern compatible with ruptured aneurysmal hemorrhage. Right vertebral angiography illustrated a right VA dissecting aneurysm with prominent displaced vertebrobasilar artery to inferiorly on left side. Double-stent placement was conducted for the treatment of ruptured dissecting VA aneurysm. No diffusion restriction signals were observed in follow-up magnetic resonance imaging of the brain stem. Eleven weeks later, full recovery of left sixth nerve palsy was documented photographically. In conclusion, isolated contralateral abducens nerve palsy associated with ruptured VA aneurysm may develop due to direct nerve compression by displaced vertebrobasilar artery triggered by primary thick clot in the prepontine cistern.

Key Words : Vertebral artery · Subarachnoid hemorrhage · Abducens nerve paralysis.

INTRODUCTION

Isolated abducens nerve palsies caused by vertebral artery (VA) aneurysm have been rarely reported^{1-3,7}. Nerve compression due to aneurysm, cisternal hematoma, vascular insufficiency, increased intracranial pressure (ICP) have been suggested as potential mechanisms for isolated abducens nerve paralysis following ruptured VA aneurysm. The patients usually presented with bilateral or ipsilateral gaze palsy to the pathologic lesions.

To the best of our knowledge, we describe the first case of dissecting VA aneurysm presenting with contralateral abducens nerve palsy and discuss its possible mechanisms.

CASE REPORT

A 38-year-old man was admitted for management and evalua-

tion of a headache that had persisted 6 days. The headache had initially developed after completing a marathon. The patient had visited the emergency department in our institution 3 days later. Neurologic and laboratory examinations at that time revealed no abnormalities. Computed tomography (CT) scan revealed no evidence of hemorrhage. The patient was discharged receiving analgesic and further radiologic tests were recommended. On the present admission, the patient was alert and displayed no signs suggesting neurologic deficits. Time of flight magnetic resonance angiography (Fig. 1A) and axial magnetic resonance angiography source image (Fig. 1B) disclosed a fusiform dilatation of the right vertebral artery involving the proximal portion of the posterior inferior cerebellar artery (PICA). The patient suddenly suffered from severe headache with diplopia a day before the scheduled cerebral angiography. Neurologic tests revealed nuchal rigidity and impairment of conjugate left lateral

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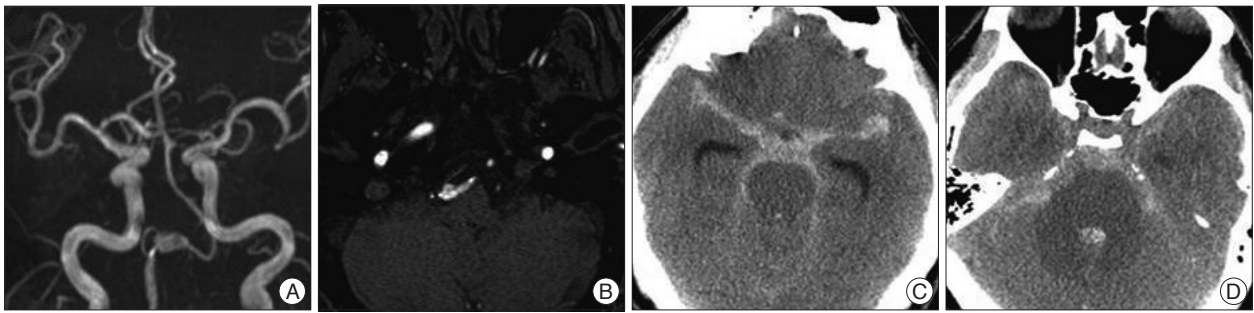


Fig. 1. A and B : TOF-MRA and axial MRA source images revealing a fusiform dilatation of the right vertebral artery. C and D : Emergent CT scan demonstrates thick cisternal hemorrhage, in particular prepontine cistern without ventriculomegaly. TOF : time of flight.

gaze. Emergent intracranial CT demonstrated a high density area in the basal cistern and prepontine cistern without ventriculomegaly (Fig. 1C, D).

Right vertebral angiography (Fig. 2A, B) revealed a dissecting aneurysm of right distal vertebral artery compromising proximal PICA with blood supplying to the left proximal portion of PICA through glomus-like vascular channel from right VA. In particular, the vertebrobasilar artery was remarkably flexed to the inferior on the left side. A double-stent method was performed for ruptured dissecting vertebral artery aneurysm. No diffusion restriction was found in follow-up magnetic resonance imaging (MRI) of the brain stem (Fig. 2C). Four weeks later, another angiography (Fig. 2D) illustrated the upward displacement of the vertebrobasilar artery compared with previous images and a CT scan (Fig. 2E) showed hemorrhage resolution in the prepontine cistern. Full recovery of left abducens nerve paresis was achieved in 11 weeks after onset (Fig. 3B).

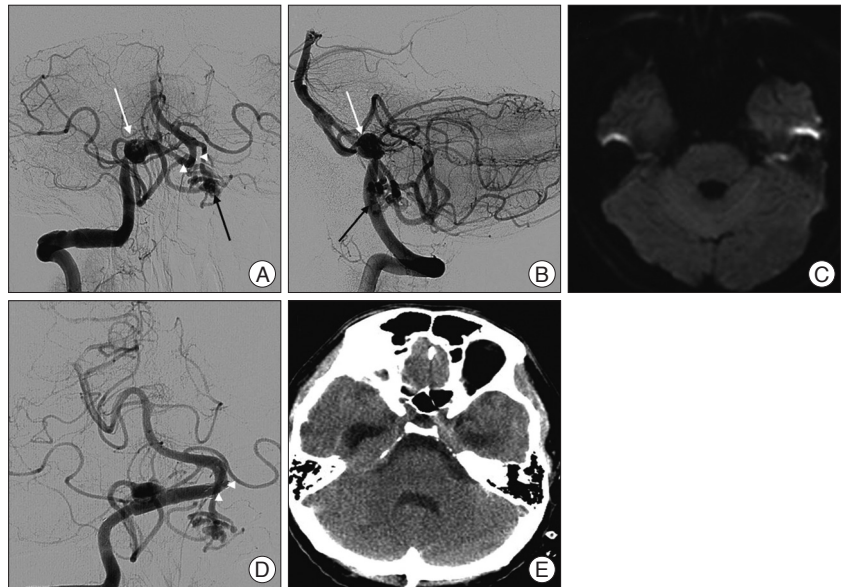


Fig. 2. A and B : Right vertebral angiography shows a dissecting aneurysm of the vertebral artery (white arrow) including origin of the PICA with prominent flexed and displaced vertebrobasilar artery (white arrowheads). Blood supply to left proximal PICA through glomus-like vascular channel (black arrow) from right VA is observed. C : No diffusion restriction of brainstem is found. D : Follow-up angiography illustrates the upward migration of vertebrobasilar artery (white arrowheads). E : Resolution of hemorrhage is noted in the prepontine cistern. PICA : posterior inferior cerebellar artery, VA : vertebral artery.

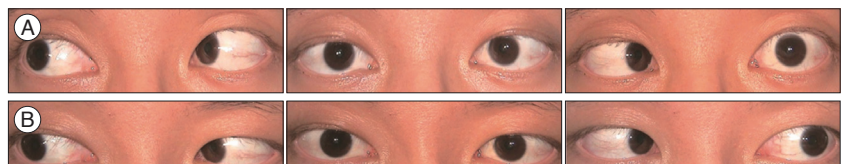


Fig. 3. A : Initial photograph discloses isolated unilateral sixth nerve palsy on left side. B : A photograph taken 11 weeks later revealed the recovery of left abducens nerve palsy.

DISCUSSION

The incidence of isolated abducens nerve palsy following VA aneurysm is rare. To our knowledge, only three cases of VA aneurysm (two ruptured and one unruptured) presenting with unilateral sixth nerve paralysis have been reported¹⁻³.

The possible mechanisms of the isolated nerve palsies related to aneurysm of VA can be divided into several groups : direct compression by aneurysm^{1,2}, brain stem or nerve compression due to thick cisternal hematoma, especially prepontine cistern⁷, stretch nerve injury on the petrous apex triggered by increased ICP⁶, and vascular insufficiency to the abducens nuclei by vasospasm⁹.

The chance of the direct nerve contact with aneurysm could be ruled out in our patient because the patient suffered left sixth nerve palsy after ruptured right dissecting VA aneurysm. Copeto and Chan¹) and Dumas and Shults²) showed ipsilateral sixth nerve palsy to the same direction of VA aneurysm.

Thick prepontine cisternal hemorrhage was found in an intracranial CT scan, but the possibility of nerve paresis was thought to be low, considering the prepontine segment of the abducens nerve, because direct compression by cisternal hematoma causes

only bilateral abducens nerve palsy. Morioka et al.⁷⁾ illustrated two cases of bilateral isolated sixth nerve palsy compressed by cisternal hematoma.

Regarding the increased ICP, no prominent brain swelling or acute hydrocephalus was seen on brain CT. Follow-up MR imaging demonstrated no diffusion restriction on brain stem. Thus, vasospasm could be excluded as a candidate etiology. In addition, the neurologic deficit signs associated with facial nuclei or medial longitudinal fasciculus were not noted⁹⁾.

Therefore, for this patient, a thick blood clot in the prepontine cistern (Fig. 1D) may attribute to marked displacement of vertebrobasilar artery (Fig. 2A) and may lead to compression of the abducens nerve on the opposite side.

A similar mechanism has been suggested as a cause of isolated sixth nerve palsy on the contralateral side. Elongation of vertebral artery⁸⁾ and prominent flexion of basilar artery related to aneurysm of superior cerebellar artery⁵⁾ can lead to isolated sixth nerve palsy on the contralateral side by compression of the vertebral artery of the opposite side.

Every VA aneurysm presenting with isolated sixth nerve palsy was treated by clip placement. Opening of Liliequist's membrane and cisternal irrigation of hematoma may seem to be effective for clinical improvement⁴⁾. Complete recovery of nerve palsy was observed in three cases (two bilateral and one unilateral)^{3,7)}.

In this case, endovascular flow diversion by double-stent method was performed. Full recovery resulted by 11 weeks after onset. Although, MRI with spoiled gradient recalled echo images was not obtained for the confirmation of direct abducens nerve contact with vertebral artery due to the limited time, the follow-up MRI may support the mechanism of nerve compression by shifted vertebrobasilar artery.

CONCLUSION

Isolated contralateral abducens nerve palsy following ruptured VA aneurysm may develop as a result of nerve compression secondary by displaced verterobasilar artery due to primary thick clot in the prepontine cistern.

References

1. Coppeto JR, Chan YS : Abducens nerve paresis caused by unruptured vertebral artery aneurysm. *Surg Neurol* 18 : 385-387, 1982
2. Dumas S, Shults WT : Abducens paresis. A rare presenting sign of posterior-inferior cerebellar artery aneurysm. *J Clin Neuroophthalmol* 2 : 55-60, 1982
3. Duvoisin RC, Yahr MD : Posterior Fossa Aneurysms. *Neurology* 15 : 231-241, 1965
4. Göksu E, Akyüz M, Gürkanlar D, Tuncer R : Bilateral abducens nerve palsy following ruptured anterior communicating artery aneurysm : report of 2 cases. *Neurocirugia (Astur)* 18 : 420-422, 2007
5. Hirose Y, Nakamura T, Takamiya Y, Kinoshita N, Hirai H : Fusiform superior cerebellar artery aneurysm presenting with contralateral abducens nerve paresis--case report. *Neurol Med Chir (Tokyo)* 30 : 119-122, 1990
6. Hoeoek O, Norlen G, Guzman J : Saccular Aneurysms of the Vertebral-Basilar Arterial System. A Report of 28 Cases. *Acta Neurol Scand* 39 : 271-304, 1963.
7. Morioka T, Matsushima T, Yokoyama N, Muratani H, Fujii K, Fukui M : Isolated bilateral abducens nerve palsies caused by the rupture of a vertebral artery aneurysm. *J Clin Neuroophthalmol* 12 : 263-267, 1992
8. Narai H, Manabe Y, Deguchi K, Iwatsuki K, Sakai K, Abe K : Isolated abducens nerve palsy caused by vascular compression. *Neurology* 55 : 453-454, 2000
9. Nathal E, Yasui N, Suzuki A, Hadeishi H : Ruptured anterior communicating artery aneurysm causing bilateral abducens nerve paralyses--case report. *Neurol Med Chir (Tokyo)* 32 : 17-20, 1992