A Case of a Ruptured Microaneurysm at the Tip of the Basilar Artery With Right Abducens Nerve Palsy at the Time of the Initial Rupture and Rerupture During an Outpatient Follow-Up

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Abstract

The presentation of abducens nerve palsy after each occurrence of subarachnoid hemorrhage (SAH) is rare. Herein, we report the case of a patient with a ruptured microaneurysm at the tip of the basilar artery who presented with right abducens nerve palsy at the time of the initial rupture and rerupture during an outpatient follow-up. A 52-year-old woman developed SAH with right abducens nerve palsy, which was treated with coil embolization. One year after the initial SAH, there was a relapse of the SAH and paresis of the right abducens nerve palsy. This may have been caused by the location of the abducens nerve in relation to the surrounding structures, which were susceptible to the effects of hematoma or intracranial pressure fluctuations. Stent-assisted coil embolization is an effective treatment for regrowth that appears after endovascular therapy of microaneurysms.

Introduction

Subarachnoid hemorrhage (SAH) with abducens nerve palsy has been reported in several studies [1–4]; however, its frequency, mechanism of occurrence, and clinical course remain unclear. No cases of ruptured cerebral aneurysms with abducens nerve palsy on the same side have yet been reported at the time of the initial rupture and rerupture during an outpatient follow-up. Herein, we report the case of a patient with a ruptured microaneurysm at the tip of the basilar artery who was presented with a right abducens nerve palsy at the time of the initial rupture and rerupture during an outpatient follow-up.

Case Presentation

On October 24, 2019, a 52-year-old woman was rushed to the emergency room because of the sudden onset of a severe headache. Her medical history revealed no significant findings. After admission to the emergency room, her Glasgow Coma Scale (GCS) score was 13 (E4, V5, and M4). She had no obvious pupillary irregularity but she was presented with tetraplegia and frequent vomiting. Her blood pressure level and pulse rate were 215/100 mmHg and 43 beats/min, respectively. Head computed tomography (CT) revealed SAH (Fisher group 3) with a World Federation of Neurosurgical Societies (WFNS) grade of II and a Hunt & Kosnik grade of II (Figure 1a-1c). Digital subtraction angiography (DSA) showed a microaneurysm with a longitudinal diameter of 2.1 mm at the tip of the basilar artery (Figure 1d); therefore, emergency coil embolization was performed. A 6-Fr Roadmaster guiding catheter (Goodman Co., Ltd., Aichi, Japan) was inserted into the left vertebral artery (VA), and a 3.4-Fr Tactics (Technocrat, Aichi, Japan) distal access catheter was used. An SL10 microcatheter (Stryker, Kalamazoo, MI, USA) was inserted into the aneurysm using a Traxcess 14 guidewire (Terumo Corporation, Tokyo, Japan) (Figure 1e). The aneurysm was contrast-enhanced, and a 2 mm × 3 cm Target Nano (Stryker, Kalamazoo, MI, USA) was implanted. The treatment was considered complete when the aneurysm was no longer contrasted (Figure 1f).
When the patient was extubated the day after her surgery, she presented with diplopia and right abducens nerve palsy. However, her head magnetic resonance imaging (MRI) revealed no obvious acute cerebral infarction, and head magnetic resonance angiography (MRA) indicated no cerebral aneurysm or main trunk artery occlusion. Her right abducens nerve palsy gradually improved; moreover, she fully recovered on day 14, November 7, 2019, and was discharged on day 21, November 14, 2019, with a modified Rankin Scale (mRS) score of 0. In the postoperative course, fasudil hydrochloride hydrate, 90 mg/day, was administered, and no cerebral vasospasm was observed. At six months after the disease onset, an outpatient MRA of the head revealed no change (Figure 2a).

However, one year and four months after the disease onset, on March 3, 2021, an outpatient MRA revealed findings suggestive of the regrowth of a cerebral aneurysm (Figure 2b). For the patient’s convenience, we planned to perform the examination on April 2, 2021; however, two days before the scheduled examination, on March 31, 2021, she was found crouching in the bathroom by her family at home and was rushed to the hospital for emergency treatment. After admission to the emergency room, her GCS score was 9 (E2, V2, and M5), without pupillary irregularity, and she did not have any gross neurological deficits. Her blood pressure level was 152/67 mmHg, and her pulse rate was 54 beats/min. Head CT revealed SAH (Fisher group 3), with a Hunt & Kosnik grade of III and a WFNS grade of III (Figure 3a–3c). DSA was immediately performed, which revealed regrowth with a length of 2.2 mm in the neck region of the initially treated cerebral aneurysm (Figure 3d).

After sedation, coil embolization was performed by the supervising neuroendovascular therapist on day 2, April 2, 2021. A 6-Fr Roadmaster catheter was guided to the left VA (Figure 3e), and Tactics and SL10 were guided to the area of regrowth of the cerebral aneurysm using Traxcess 14. A 1.5 mm × 2 cm Hyper Soft 3D (MicroVention/Terumo, CA, USA) was implanted, and embolization was performed (Figure 3f). When the patient was extubated on day 3, April 3, 2021, she had diplopia and right abducens nerve palsy. She did not have any gross neurological deficits. A diffusion-weighted image of the head MRI revealed no high signal intensity area, and the head MRA showed no cerebral aneurysm or obvious main artery occlusion. The right abducens nerve palsy was still present on day 12, April 12, 2021, although it was improving (Figure 4). Thereafter, although subjective symptoms of diplopia persisted, the right abducens nerve palsy gradually improved, and the patient was discharged from the hospital on day 30, April 30, 2021, with an mRS score of 0. In the postoperative course, fasudil hydrochloride hydrate, 90 mg/day, was administered, and no cerebral vasospasm was observed.
FIGURE 2: Head MRA six months and one year after surgery.

(a) At six months after the disease onset, an outpatient MRA of the head revealed no change. (b) However, one year after the disease onset, findings suggestive of a recurrence of the cerebral aneurysm were noted (white arrow). MRA: magnetic resonance angiography.

FIGURE 3: Coil embolization for the recurrence of cerebral aneurysm.

(a)-(c): Head CT revealed subarachnoid hemorrhage (Fisher group 3), with a Hunt & Kosnik grade of III and a WFNS grade of III. (d) DSA revealed a recurrence with a length of 2.2 mm in the neck region of the initially treated cerebral aneurysm. (e) Left vertebral angiography. (f) A 1.5 mm × 2 cm Hyper Soft 3D was implanted, and embolization was performed. WFNS: World Federation of Neurosurgical Societies; CT: computed tomography; DSA: digital subtraction angiography.
During an outpatient examination, two months after the rerupture, during an outpatient follow-up on March 29, 2021, the right abducens nerve palsy had completely improved; however, an outpatient MRA of the head on the same day revealed findings suggestive of cerebral aneurysm re-enlargement. Therefore, a DSA was performed on June 4, 2021, which confirmed the second regrowth of the cerebral aneurysm (Figure 5a). She was then administered 75 mg of clopidogrel and 100 mg of aspirin (dual antiplatelet therapy (DAPT)), and stent-assisted coil embolization was performed on June 14, 2021. A 6-Fr Roadmaster catheter was guided to the left VA, and Headway 17 (MicroVention, Terumo, Tustin, CA, USA) and SL10 were guided to the basilar artery (Figure 5b). Subsequently, Headway 17 and SL10 were guided to the left posterior cerebral artery and the second regrowth of the cerebral aneurysm, respectively (Figure 5c). A 3.5 mm × 23 mm LVIS Jr. (MicroVention, Terumo, Tustin, CA, USA) was deployed (Figure 5d). A 1.5 mm × 3 cm HyperSoft 3D was implanted through the jail lumen of the stent; then, the coil diameter was lowered and the coils were implanted. As a contrast-enhanced area was also observed between the initially treated and re-enlarged areas, another coil was placed in the same area to achieve embolization with six coils (Figure 5e).

The next day after surgery, a head MRI or MRA showed no obvious acute cerebral infarction or vascular occlusion, respectively. She was discharged from the hospital on day 6, June 19, 2021, with an mRS score of 0 without neurological deterioration. Cerebral angiography performed six months later showed no apparent recurrence, and MRA source images performed one year later showed no apparent recurrence.

**Discussion**
endothelialization, alleviate hemodynamic conditions, and enhance recurrence prevention. Stent-assisted wires crossing the neck region of the aneurysm have also been reported to provide a structural substrate for region. The coil density can be increased, and the stent porosity in the neck region can be reduced. Stent increasing the risk of complications outcome. Stent-assisted coil embolization of microaneurysms reportedly prevents recurrence without initiated one week before treatment, and stent-assisted coil embolization was performed with a good rupture caused by endovascular treatment was considered high. During the second regrowth, DAPT was endovascular surgeon who can perform coil embolization promptly. The size of the cerebral aneurysm was diameter of <2 mm using Target Nano and revealed good results, regardless of whether the aneurysm had clipping, but the disadvantage is that it is highly invasive. Nguyen et al. [9] reported that the intraoperative rupture rate of small cerebral aneurysms with a diameter of >3 mm (2.3%) is higher than that of aneurysms with a diameter of <3 mm (11.7%). Jindal et al. [10] performed coil embolization of microaneurysms with a diameter of <2 mm using Target Nano and revealed good results, regardless of whether the aneurysm had ruptured. In the present case, coil embolization was the treatment of choice because the hospital has an endovascular surgeon who can perform coil embolization promptly. The size of the cerebral aneurysm was approximately 2 mm at the time of initial treatment as well as regrowth, and the risk of intraoperative rupture caused by endovascular treatment was considered high. During the second regrowth, DAPT was initiated one week before treatment, and stent-assisted coil embolization was performed with a good outcome. Stent-assisted coil embolization of microaneurysms reportedly prevents recurrence without increasing the risk of complications [11]. The use of a stent allows the coil to be placed within the aneurysm and in the neck region of the aneurysm, increasing coil density and decreasing stent porosity in the neck region. The coil density can be increased, and the stent porosity in the neck region can be reduced. Stent wires crossing the neck region of the aneurysm have also been reported to provide a structural substrate for endothelialization, alleviate hemodynamic conditions, and enhance recurrence prevention. Stent-assisted
coil embolization should be considered a treatment option for recurrent enlargement of cerebral aneurysms.

Conclusions
We reported the case of a patient with a ruptured microaneurysm at the tip of the basilar artery who was presented with right abducens nerve palsy at the time of the initial rupture and rerupture during an outpatient follow-up. In the present case, the prognosis of SAH-associated abducens nerve palsy was good, and the time to improvement may depend on disease severity. Stent-assisted coil embolization is an effective treatment option for repeated regrowths after treatment of microaneurysms.

Additional Information

Disclosures
Human subjects: Consent was obtained or waived by all participants in this study. Conflicts of interest: In compliance with the ICMJE uniform disclosure form, all authors declare the following: Payment/services info: All authors have declared that no financial support was received from any organization for the submitted work. Financial relationships: All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. Other relationships: All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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