

## Coil Embolization for Distal Middle Cerebral Artery Aneurysm

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Middle cerebral artery (MCA) aneurysms are a common source of subarachnoid hemorrhage (SAH). But, ruptured distal MCA aneurysm is very rare, and their clinical and radiological features are poorly understood. Microsurgical repair remains the most common method used to treat distal MCA aneurysm, even though endovascular coiling has been favored recently. We report our experience of successful coiling for ruptured distal MCA aneurysm. In selected patients, coiling may be a good treatment option for ruptured distal MCA aneurysm.

**KEY WORDS :** Coil embolization · Ruptured distal middle cerebral artery aneurysm.

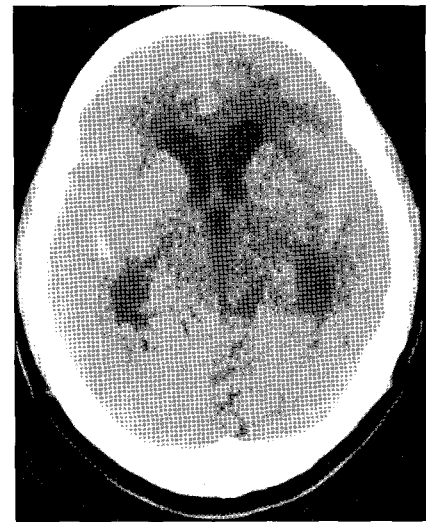
### Introduction

Approximately 20% of clinically significant intracranial aneurysms arise from the middle cerebral artery (MCA)<sup>4,6,14</sup>. However, ruptured distal middle cerebral artery is very rare. Some reported that the incidence of distal MCA aneurysms ranges from 1.1 to 5% of total lesions of this type<sup>15,17</sup>. Therefore the management outcome in this specific group of patients remains uncertain. Although the coiling has been a favorable method to treat intracranial aneurysms, microsurgical approach is still performed as the most common method used to treat distal ruptured distal MCA aneurysms<sup>11,17</sup>. We present our experience of the endovascular treatment of the patient with a ruptured distal MCA aneurysm.

### Case Report

A 50-year-old female presented with a sudden onset of severe headache and drowsy consciousness. A computed tomography (CT) scan of the brain revealed a subarachnoid hemorrhage (SAH) in both sylvian fissures (Fig. 1). At admission, the patient was not found to have any other neurological deficits. On the first day in the hospital, diagnostic cerebral angiography revealed a distal MCA aneurysm, measuring approximately 3 × 4 mm in size (Fig. 2). The aneurysm was cath-

eterized with a microcatheter and a microguidewire, and it was occluded with GDCs under an intravenous anesthesia. The aneurysm was completely obliterated within one stage (Fig. 3). Complications were not detected during the procedural time. She was discharged from the hospital 18 days after admission without any neurological deficits.



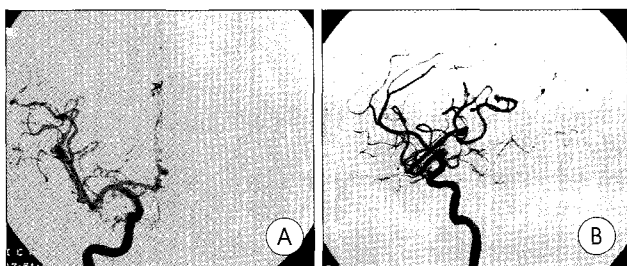
**Fig. 1.** Initial noncontrast brain computed tomography scan. There are hyperdense subarachnoid hemorrhage in bilateral sylvian fissure.

### Discussion

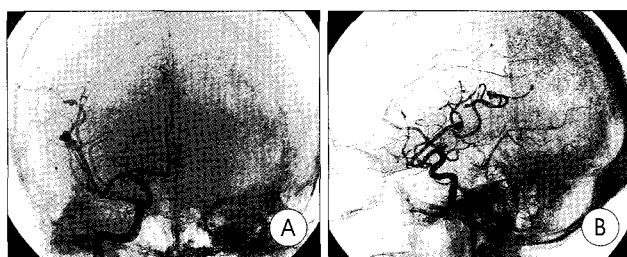
Some reports deal with such a common aneurysm site as the MCA, but distal MCA aneurysms are very rare<sup>11,17,19,20</sup>. Since the first reported case of the distal MCA aneurysm in

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**Fig. 2.** A : Anterior–posterior view of right internal carotid artery (ICA) angiography shows a aneurysm in the distal middle cerebral artery. B : Lateral view of right ICA angiography shows an aneurysm in the distal middle cerebral artery.



**Fig. 3.** A : Anterior–posterior view of right internal carotid artery (ICA) angiography shows complete occlusion of the distal middle cerebral artery aneurysm. B : Lateral view of right ICA shows complete occlusion of the distal middle cerebral artery aneurysm.

1951<sup>16</sup>, there have been some case reports featuring the lesion. According to the large series of Rinne et al.<sup>17</sup>, 4% of all MCA aneurysms were distal. Heros et al<sup>10</sup> reported that aneurysms beyond the major bifurcation of the MCA represented 5% of all MCA aneurysms.

MCA aneurysms are often small and widely necked, and they often incorporate the origin of arterial branches into the base. Although an endovascular coiling has been favored recently, direct microsurgical repair remains as the most commonly used method to treat distal MCA aneurysms.

Usually the aneurysms arise between two exiting branches as a consequence of a hemodynamic stress and an increased flow at a bifurcation site in the vessel<sup>3</sup>. These lesions receive the full force of the pulsatile flow from the parent artery directly into their fundus, thus the patients often present with SAH<sup>14</sup>. But, the most common etiology of distal intracranial aneurysms is an infection with mycotic emboli which may result as a secondary aneurysmal formation<sup>3,12</sup>. They may also be related to trauma, vasculitis, tumor emboli or directly to an intracranial neoplasm<sup>1,3,5,11</sup>. In this case, neither a mycotic emboli nor a trauma was a cause of the aneurysm. It is unclear that what kind of factors facilitates the distal MCA aneurysmal formation.

Although some reported that the microsurgery may be an effective method for distal MCA aneurysm<sup>11</sup>, there are some problems regarding this method. Firstly, a sufficient dissection of the distal sylvian fissure is required in order to expose the distal MCA aneurysm; the distal sylvian fissure dissection is usually more complicated than the proximal dissection. Se-

condly, it is sometimes difficult to know the location of the aneurysm during surgery due to an anatomical variation. Aneurysms arising from major arteries near the circle of Willis are easy to localize and may be treated surgically, whereas distal aneurysms of peripheral branches are often challenging to localize at the time of the operation<sup>13</sup>. These reasons made it difficult to perform a direct surgical method in distal MCA aneurysms. Drake et al.<sup>8</sup> reported that some of the distal large aneurysms could not be directly clipped and were treated with proximal occlusion instead.

Recently, coiling is gaining favor as an attractive alternative to the direct microsurgery, even though there are also some considerations required when using the coiling method. Especially, angioanatomical features such as an aneurysmal neck size of more than 4mm, an intolerable dome/neck ratio, an inadequate endovascular access, an unstable intraluminal thrombus, or an arterial branch origin incorporation state may not lead to a good result by the coiling procedure<sup>7</sup>.

Distally located aneurysms occurs more commonly in catheter instability, and in vascular anatomy with multiple bends and acute turn, and makes for challenging aneurysm catheterization, risk of dome perforation by microcatheter that load and jumping phenomenon, and difficulty placing multiple coils<sup>9,12</sup>. However, the improvements in the catheter technology have made distal aneurysms more accessible for coiling.

The authors believe that when the anatomical angiographic features allow, the coiling method may be the treatment of choice even for the distal MCA. Due to the low incidence, there are only a few reported cases on the coil treatments, compared to the surgical treatments<sup>2</sup>.

## Conclusion

The authors experienced a rare case of ruptured distal middle cerebral artery aneurysm. Although this is just one case, we believe that the coiling for the aneurysm is a safe and effective treatment option for the lesion.

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