

## Case Report

## Endovascular coil embolization for ruptured kissing aneurysms associated with A1 fenestration

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**Abstract****Background:** Fenestration of intracranial arteries is a rare anomaly, and is frequently associated with cerebral aneurysms. In this paper, we report rare kissing aneurysms associated with A1 fenestration.**Case Description:** A 71-year-old woman presented with subarachnoid hemorrhage. Diagnostic digital subtraction angiography revealed two saccular aneurysms at the proximal junction of a fenestration and posterior aspect of the fenestration that appeared to be 'kissing' each other. Emergent endovascular coil embolization was performed.**Conclusion:** Kissing aneurysms associated with fenestration of the horizontal segment in the anterior cerebral artery are rare, and have not been reported. During treatment of such specific types of aneurysms by endovascular treatment, three-dimensional rotational digital subtraction angiography was very useful for deciding the appropriate working angles.**Key Words:** Coil embolization, fenestration, kissing aneurysms, ruptured aneurysm, three-dimensional rotational digital subtraction angiogram**Access this article online****Website:**[www.surgicalneurologyint.com](http://www.surgicalneurologyint.com)**DOI:**

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**Quick Response Code:****INTRODUCTION**

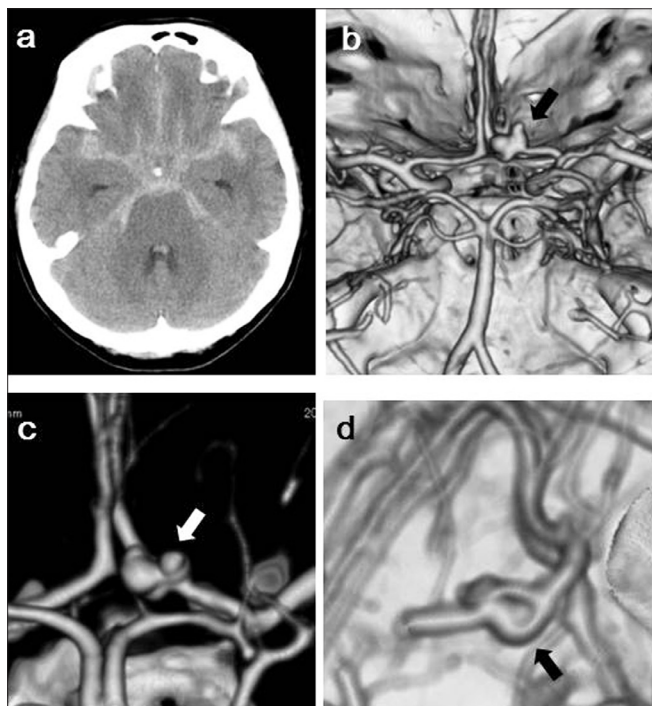
Ever since the advent of cerebral angiography, fenestrations of the intracranial arteries associated with saccular aneurysms are a well-recognized anomaly, and an increasing number of such cases have been reported over the years.<sup>[17]</sup> Kissing aneurysms are a rare and specific type of multiple aneurysms that require caution in diagnosis and management.<sup>[11]</sup> Kissing aneurysms associated with horizontal-segment (A1) fenestration of the anterior cerebral artery are rare, and have not been reported. Obtaining adequate surgical exposure or the most useful projection for endovascular treatment may

be especially difficult due to the complicated geometry of kissing aneurysms associated with fenestration.<sup>[7,14]</sup>

**CASE REPORT**

A 71-year-old woman presented with severe headache of acute onset. Head computed tomography (CT) showed Grade I subarachnoid hemorrhage (SAH, Fisher Grade 3) of the Hunt and Hess grading system. CT angiography revealed an aneurysm with a bleb in the right A1 segment. Three-dimensional (3D) CT image reconstruction revealed a segmental duplication of the distal one-third of the right A1 segment, associated with an irregular aneurysm and blebs [Figure 1].

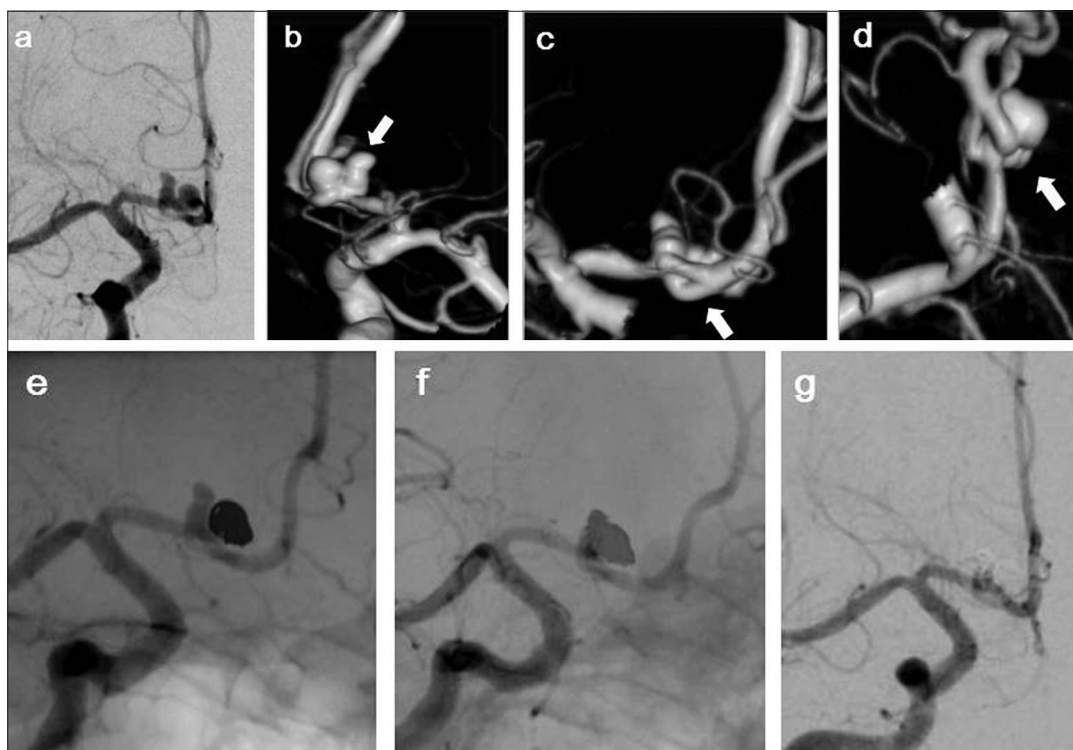
Emergent endovascular coil embolization was performed for each of the aneurysms. A 7F guiding catheter



**Figure 1:** CT on admission showing diffuse subarachnoid hemorrhage in the basal cistern (a). 3D CT angiogram, superior posterior view (b), superior view (c), and inferior view (d) showing a segmental duplication of the distal one-third of the right A1 with blebs

(Guider Softip XF; Boston Scientific, Fremont, CA, USA) was introduced into the right proximal internal carotid artery under general anesthesia and systemic heparinization. Before the coil embolization, diagnostic digital subtraction angiography revealed two saccular aneurysms at the proximal junction of the fenestration and posterior aspect of the fenestration that appeared to be ‘kissing’ each other. 3D image reconstruction revealed small bleb formation in each of the aneurysms. Because we could not determine which of the aneurysms was ruptured, we decided to treat each by coil embolization. During the endovascular procedure, we used 3D angiographic reconstruction to determine the appropriate working angle for separating the aneurysmal sac from the fenestration [Figure 2].

We used a support catheter (Cerulean G40; Medikit Co., Tokyo, Japan) to lead the microcatheter into the distal A1. A microcatheter (Excelsior SL-10; Boston Scientific) was placed within the posterior distal aneurysm. The aneurysmal sac and neck were successfully packed with several detachable coils. Then, we treated the proximal aneurysm at the proximal bifurcation of the fenestration using the same technique. Another microcatheter (Excelsior SL-10 Pre-shaped S; Boston Scientific) was selected for obtaining safe aneurysmal catheterization and adequate stability during the coil placement. Because the aneurysm had a wide neck above the bifurcation, we packed only the aneurysmal sac with a detachable



**Figure 2:** Preoperative right carotid angiogram showing two aneurysms appearing to be “kissing” each other, associated with A1 fenestration (a, b, c, and d). Coil embolization of distal aneurysm: e, coil embolization of both aneurysms: f, and final view: g

bioactive coil (DELTAPAQ CERECYTE, Micrus Endovascular San Jose, CA, USA) to preserve both channels of the fenestrated A1. The postoperative course was uneventful, and the patient was discharged without any neurologic deficits.

## DISCUSSION

Fenestrations are observed in 0.3–0.9% of cerebral angiograms and are frequently located in the vertebral artery and the basilar artery.<sup>[4,14]</sup> Fenestration of the cerebral arteries is a congenital anomaly and is frequently associated with other vascular anomalies, such as saccular aneurysms. Fenestration of the anterior cerebral artery (ACA) was observed in 0.1–7.2% of dissected autopsy specimens.<sup>[9]</sup> Embryologically, fenestration of the ACA probably results from a persistence of the plexiform anastomosis between the primitive olfactory artery and the ACA.<sup>[15]</sup> Since most fenestrations are only visible from one specific viewing angle, visualization by conventional angiography is difficult because of the limited number of projections available. The detection rate of fenestrations has improved with the availability of 3D imaging, which provides visualization from a wider range of angles.<sup>[17]</sup> Furthermore, 3D imaging is useful for accurate pretreatment evaluation of intracranial aneurysms, such as in our case.

Table 1 summarizes the clinical manifestations in the 13 cases of aneurysms associated with A1 fenestration reported in the literature, including the case presented here.<sup>[5,8-10,12-14,16,18-20]</sup> The patients included six female and seven male patients, with a mean age of 53.3 years (range, 41–71 years). There was a tendency for saccular aneurysms to occur in younger patients, and our case presented here was the oldest of all. In most of the cases, the aneurysms were treated by neck clipping, and there

were no previous reports of endovascular treatment.

The term “kissing aneurysms” refers to two anatomically adjacent aneurysms with different origins and partially adherent walls. In the intracranial circulation, these aneurysms are quite rare and there have been no previous reports in the literature of kissing aneurysms associated with A1 fenestration.<sup>[2]</sup> Kissing aneurysms have been reported to occur at an incidence of only 0.2%.<sup>[11]</sup> Although conventional angiography can be used to diagnose kissing aneurysms, they are often misinterpreted as the blebs on an aneurysmal dome or a single multiloculated aneurysm.<sup>[1]</sup> Harada *et al.*, reviewed 23 cases in the literature and found that in 13 of these cases (57%), the kissing aneurysms had not been recognized preoperatively.<sup>[6]</sup> At the first diagnostic 3D CT angiography in the present case, the aneurysms were not diagnosed as two aneurysms, but as a single aneurysm with multiple blebs. 3D CT angiography was useful for the diagnosis of A1 fenestration, but it was still difficult to identify the kissing aneurysms.

In previous reports, neck clipping was the standard treatment for aneurysms associated with fenestrations [Table 1] and there has been no report of A1 aneurysms associated with fenestrations treated by coil embolization. On the other hand, some cases of kissing aneurysms treated by coil embolization have been reported. Dissection and clipping of kissing aneurysms is very challenging, because the aneurysmal walls are adherent at the so-called “kissing point”, and because of the narrow working space around each aneurysmal neck.<sup>[11,19]</sup> Especially in the case of kissing aneurysms associated with A1 fenestration, as in the present case, application of temporary clips for dissecting aneurysms that reduces the intraluminal pressure and facilitates dissection is

**Table 1: Summary of thirteen cases of aneurysms associated A1 fenestration**

Case No.	Author	Year	Age	Sex	Side	Aneurysm size	Ruptured or unruptured	Treatment	Outcome
1	Yamada	1982	43	M	Rt	NA	ruptured (SAH)	clipping	Death
1	Inagawa	1983	70	F	Lt	NA	ruptured (SAH)	conservative	MD
2	Korosue	1983	41	M	Rt	NA	ruptured (SAH)	clipping	Death
3	Hanada	1984	50	F	Rt	NA	ruptured (SAH)	clipping	GR
4	Minakawa	1985	56	M	Lt	NA	ruptured (SAH)	clipping	
5	Wakabayashi	1985	38	M	Rt	6.5mm	ruptured (SAH)	clipping	GR
6	Wakabayashi	1985	41	M	Rt	5.0mm	ruptured (SAH)	clipping	Death
7	Ogasawara	1988	65	F	Lt	NA	ruptured (SAH)	clipping	VS
8	San-Galli	1992	47	M	Lt	NA	unruptured	clipping	GR
9	Kachhara	1998	50	F	Rt	NA	ruptured (SAH)	clipping	GR
10	Wanibuchi	2001	52	F	Lt	4.3mm	unruptured	clipping	GR
11	Terui	2010	70	M	Rt	3.0mm	unruptured	clipping	GR
12	Present case	2010	71	F	Rt	Kissing aneurysms 4.5mm, 5.2mm	ruptured (SAH)	coiling	GR

F: Female, M: Male, Lt: Left, Rt: Right, NA: Not available, SAH: Subarachnoid hemorrhage, MD: Moderate disability, GR: Good recovery

difficult because of the complicated hemodynamics.<sup>[3]</sup> As compared to neck clipping, endovascular treatment for such complicated aneurysms would be associated with a reduced risk of premature rupture, since dissection of the aneurysm neck is unnecessary in this treatment procedure.

There are, however, some difficulties in the endovascular treatment for kissing aneurysms.<sup>[1,7,11]</sup> First, the channels of the fenestrated arterial segments should be preserved whenever an angiographically visible branch originates from the channels. Angiographically non-visible branches might be present; therefore, sacrificing the channels of the fenestrated artery should be reserved only for limited cases.<sup>[7]</sup> Second, neither aneurysm could be clearly discriminated from the two limbs of the fenestration or from the other aneurysm. Therefore, appropriate working projections are very important to avoid an overlap of the coils while packing the other aneurysm.<sup>[7]</sup>

In the present case, we performed successful coil embolization for kissing aneurysms associated with A1 fenestration and preserved both channels of the fenestrated A1 branches. The biplane 3D rotational digital subtraction technique enabled us to determine the most useful working angle for treating these complicated aneurysms.

## CONCLUSION

We have reported kissing aneurysms associated with fenestration of the horizontal segment of the anterior cerebral artery. To treat such specific types of aneurysms by endovascular techniques, we successfully used rotational angiography and 3D image reconstruction. For the management of kissing aneurysms, endovascular coil surgery is considered as an attractive treatment strategy and 3D rotational digital subtraction angiography is an important tool for achieving safe coil embolization.

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## Commentary

First of all, I compliment you on your technical achievement.

Second, I personally believe that this is a dangerous approach to use, as the anatomy can be seen more directly and controlled from an intracranial perspective than by the indirect interventional approach. You did

not know which aneurysm bled. The anatomy is complex and needs to be seen directly with temporary clipping to understand the anatomy so that proper clip application can be made. I suspect that if you had 100 of these cases that the complication rate would be significant by the endovascular approach. That is my opinion. I hope that in the future, others will report their cases, and

that a true value in the interventional approach can be determined with more cases in the literature at that time. At this time, I would advise others to treat such aneurysms directly by surgery.

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