

# Spontaneous Disappearance of Unruptured Intracranial Aneurysm: A Case Report

Sang Hoon Jeong<sup>1</sup>, Jung Hwan Lee<sup>1</sup>, Tae Hong Lee<sup>2</sup>, Chang Hwa Choi<sup>1</sup>

<sup>1</sup>Department of Neurosurgery, Pusan National University Hospital, Pusan National University School of Medicine, Busan, Republic of Korea

<sup>2</sup>Department of Diagnostic Radiology, Pusan National University Hospital, Pusan National University School of Medicine, Busan, Republic of Korea

Spontaneous resolution or thrombosis of giant or ruptured intracranial aneurysms is occasionally reported. However, spontaneous resolution of unruptured aneurysms without any intervention is extremely rare. Recently, we encountered a case of spontaneous resolution of a small unruptured aneurysm of the anterior communicating artery. We describe this rare case and discuss the mechanism of resolution with a review of the related literature.

**Key Words:** Anterior communicating artery aneurysm, Intracranial aneurysm, Thrombosis

Spontaneous resolution of giant or ruptured intracranial aneurysms is infrequent.<sup>1,2</sup> In such cases, aneurysms are not visible on angiography even if no intervention was performed. However, this unusual phenomenon has rarely been reported in small and unruptured aneurysms. Recently, we encountered an extremely rare case of spontaneous resolution of a small unruptured anterior communicating artery (ACoA) aneurysm on angiography. In this report, we describe the case and discuss the mechanism of resolution with a review of the related literature.

## CASE

A 65-year-old woman visited our neurosurgical department for further evaluation of an intracranial aneurysm confirmed by health screening. She had undergone surgery for thyroid cancer, was on thyroid hormone medication, and had no history of hypertension, diabetes mellitus, or vascular disease. The general findings were unremarkable, and the results of a neurological examination were normal. All laboratory findings were normal. A 6-mm bilobulated unruptured saccular intracranial aneurysm with a 4-mm neck at the left ACoA and a 4-mm unruptured fusiform

**Corresponding Author:** Chang Hwa Choi, Department of Neurosurgery, Pusan National University Hospital, 179, Gudeok-Ro, Seo-Gu, Busan 49241, Republic of Korea  
Tel: +82-51-240-7254 Fax: +82-51-240-7254 E-mail: chwachoi@pusan.ac.kr

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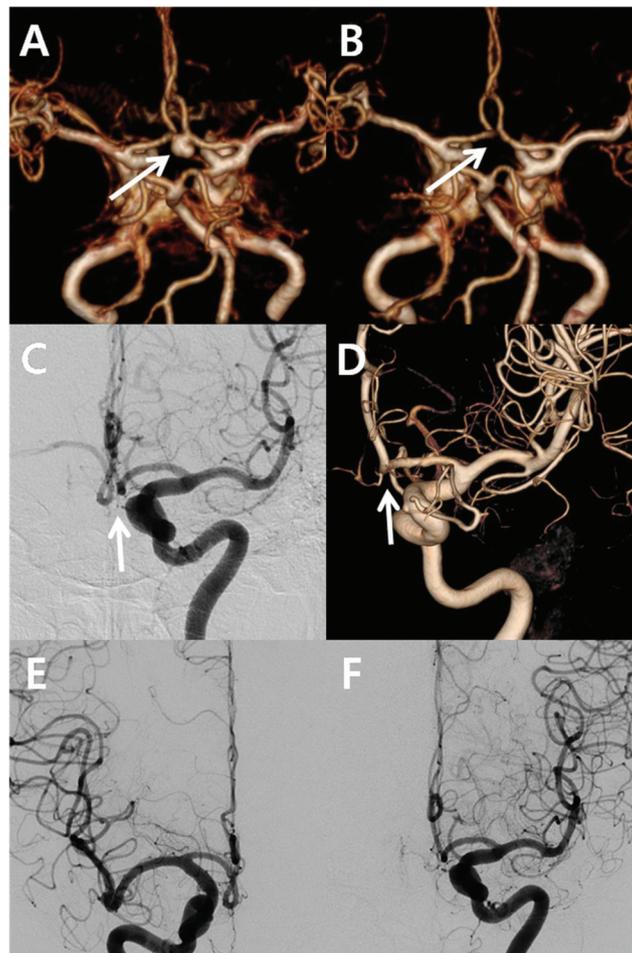
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aneurysm at the right middle cerebral artery (MCA) were incidentally detected on computed tomography (CT) angiography (CTA). The angle of the aneurysm, defined as the angle of inclination between the aneurysm and its neck plane, was  $90^\circ$  (Fig. 1A). We recommended treatment of the aneurysm by endovascular or surgical procedure, but the patient refused the treatment and preferred regular clinicoradiological follow-up. Without any medication for the

aneurysm, follow-up CTA (performed after 30 months) and angiography (performed after 40 months) revealed complete spontaneous resolution of the intracranial aneurysm of the ACoA (Fig. 1B, C, D).

## DISCUSSION

The incidence rate of spontaneous thrombosis



**Fig. 1.** Three-dimensional (3D) reconstruction computed tomography angiogram (CTA) shows a 6-mm sized bilobulated unruptured saccular aneurysm at the left ACoA (A). The ACoA aneurysm including neck is not seen on follow-up CTA after 30 months (B). After 40 months, digital subtraction angiography (DSA) of left internal carotid artery (ICA) with contralateral carotid artery compression and 3D reconstructed rotational angiography confirm the resolution of the ACoA aneurysm without the remnant neck and preservation of ACoA flow (C, D). DSAs of both ICA without contralateral carotid artery compression show even both A1 flow (E, F).

of a ruptured intracranial aneurysm is 1%–2% and this may increase up to 3% in cases treated with antifibrinolytic agents.<sup>1,3</sup> For ruptured aneurysms in particular, hypotension, vasospasm, use of antifibrinolytic agents, surrounding clot, and contrast media have been implicated as factors associated with the spontaneous resolution of aneurysms.<sup>1</sup> In giant cerebral aneurysms, spontaneous thrombosis of the aneurysmal sac is a common event, with an incidence rate of 50%.<sup>4</sup> The high volume-to-neck ratio of the aneurysm is the major contributing factor of spontaneous thrombosis of aneurysms, particularly of giant aneurysms.<sup>5</sup> Unlike giant or ruptured intracranial aneurysms, spontaneous resolution of small and unruptured cerebral aneurysms, as in the present case, has been rarely reported, and the pathological mechanisms are unclear.<sup>5-7</sup> The volume-to-neck ratio of the aneurysm, medical factors to increase coagulability or blood viscosity, age of the aneurysm, angle of the aneurysm, direct distortion of the parent artery by the aneurysmal sac, wall shear stress (leading to a change in endothelial signaling pathways favoring thrombosis), and the angiographic procedure have been considered to explain spontaneous thrombosis of aneurysm.<sup>5,6,8</sup> Most of these factors appear to be related to some aspects of Virchow's triad for vascular thrombosis (stasis, hypercoagulability, and endothelial lesions).<sup>1,9</sup> In the present case, we encountered a case of spontaneous resolution of a small, usual, 6-mm unruptured aneurysm of the ACoA on follow-up CTA and angiography without any calcification or high-density lesion on nonenhanced brain CT. No associated factors of spontaneous

thrombosis were noted. All laboratory findings, particularly activated partial thromboplastin time, prothrombin time, serum/urine osmolality, and platelet count, which are associated with blood viscosity, were within normal ranges. In previously reported cases of thrombosis of other aneurysms, the remnant neck often persisted.<sup>5,6</sup> However, in the present case, the remnant neck was not identified and the ACoA flow was well maintained on follow-up angiography (Fig. 1C). We could not elucidate the exact mechanism underlying the spontaneous resolution. However, we hypothesize that the main mechanism was flow stasis; the angle of aneurysm was 90° and both A1 flow were even (Fig. 1E, F), causing a flow collision at the ACoA, that induced intraluminal flow stasis and cascade of thrombosis of the aneurysm.

Although the patient's aneurysm has completely disappeared, this does not guarantee complete cure considering the progression of thrombosed aneurysms, such as stabilization, growth, recanalization, and rupture.<sup>10,11</sup> Therefore, the terms “complete” or “spontaneous” cure must be used with caution until the natural history of thrombosed aneurysms is more clearly understood. Spontaneous healing of ruptured aneurysms has been suggested by Dávila et al. in 1984.<sup>12</sup> They defined spontaneous healing of aneurysms if three conditions are met: good neurological results; disappearance of the aneurysm with patency of the parent artery and without spasm, as demonstrated in a follow-up angiography performed at least 3 months after the subarachnoid hemorrhage; and absence of cerebral infarction

on CT. Although all three conditions were met except the condition of subarachnoid hemorrhage in the present case, intensive observation is necessary, as there are risk factors for aneurysm rupture, such as multilobulation and multiple aneurysms (associated right MCA aneurysm).<sup>13</sup> Several treatment options, such as conservative treatment, antiplatelet therapy, intervention, and surgery, can be considered in cases of usual unruptured aneurysms. However, there is no consensus regarding the management of intracranial aneurysms with spontaneous thrombosis, especially in partially thrombosed aneurysms. According to a recent literature review by Vandembulcke et al.,<sup>7</sup> antiplatelet therapy could be safely used for the treatment of small unruptured thrombosed aneurysms and has been shown to be associated with a decrease in the aneurysm growth rate and wall inflammation.<sup>14,15</sup> Decisions regarding the treatment of medium and large aneurysms should be made irrespective of the presence or absence of thrombosis. Spontaneous intra-aneurysmal thrombosis is associated with a higher risk of rupture in larger aneurysms; therefore, early intervention is indicated.<sup>7</sup>

In conclusion, we described an extremely rare case of spontaneous disappearance of an unruptured intracranial aneurysm. However, we could not elucidate the exact mechanism of spontaneous resolution. Therefore, we will closely follow the patient with radiological examination to determine whether any changes will occur in the future.

## CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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## REFERENCES

1. Hamilton MG, Dold ON. Spontaneous disappearance of an intracranial aneurysm after subarachnoid hemorrhage. *Can J Neurol Sci* 1992;19:389-91.
2. Su T-M, Hsu S-W, Chen W-F, Lee T-C, Cheng C-H. Acute thrombosis and recanalization of a ruptured anterior communicating artery aneurysm. *J Clin Neurosci* 2009;16:1077-9.
3. Fodstad H, Liliequist B. Spontaneous thrombosis of ruptured intracranial aneurysms during treatment with tranexamic acid (AMCA). *Acta Neurochir* 1979;49:129-44.
4. Whittle I, Dorsch NW, Besser M. Spontaneous thrombosis in giant intracranial aneurysms. *J Neurol Neurosurg Psychiatry* 1982;45:1040-7.
5. Choi C-Y, Han S-R, Yee G-T, Lee C-H. Spontaneous regression of an unruptured and non-giant intracranial aneurysm. *J Korean Neurosurg Soc* 2012;52:243-245

6. Pop R, Chibarro S, Manisor M, Proust F, Beaujeux R. Spontaneous thrombosis of a basilar tip aneurysm after ventriculoperitoneal shunting. *BMJ Case Rep* 2015;2015:bcr2015011841.
7. Alberto V, Mahmoud M, Daniele S, Francesco P, Thomas DR, Giulia C. Complete spontaneous thrombosis in unruptured non-giant intracranial aneurysms: a case report and systematic review. *Clin Neurol Neurosurg* 2021;200:1-7.
8. Ohta H, Sakai N, Nagata I, Sakai H, Shindo A, Kikuchi H. Spontaneous total thrombosis of distal superior cerebellar artery aneurysm. *Acta Neurochir* 2001;143:837-43.
9. Tokpa A, Derou L, Yao KS, N'dri DO. Spontaneous Disappearance of a Ruptured Intracranial Aneurysm. *Open J Mod Neurosurg* 2019;9:164-71.
10. Cohen JE, Rajz G, Umansky F, Spektor S. Thrombosis and recanalization of symptomatic nongiant saccular aneurysm. *Neurol Res* 2003;25:857-9.
11. Lee KC, Joo JY, Lee KS, Shin YS. Recanalization of completely thrombosed giant aneurysm: case report. *Surg Neurol* 1999;51:94-8.
12. Dávila S, Oliver B, Molet J, Bartumeus F. Spontaneous thrombosis of an intracranial aneurysm. *Surg Neurol* 1984;22:29-32.
13. Investigators UJ. The natural course of unruptured cerebral aneurysms in a Japanese cohort. *N Eng J Med* 2012;366:2474-82.
14. Zanaty M, Roa JA, Nakagawa D, Chalouhi N, Allan L, Al Kasab S, et al. Aspirin associated with decreased rate of intracranial aneurysm growth. *J Neurosurg* 2019;133:1478-85.
15. Roa JA, Zanaty M, Ishii D, Lu Y, Kung DK, Starke RM, et al. Decreased contrast enhancement on high-resolution vessel wall imaging of unruptured intracranial aneurysms in patients taking aspirin. *J Neurosurg* 2020;1:1-7.