

Single Case – General Neurology

Rapid Change in Shape of Unruptured Intracranial Aneurysm with Acute Perforating Infarction

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Keywords

Perforator infarction · Thrombosed aneurysm · Unruptured intracranial aneurysm · Ischemic stroke · Thrombosis

Abstract

Acute ischemic stroke is a rare complication resulting from an unruptured intracranial aneurysm (UIA). Ischemic stroke adjacent to the aneurysms is considered the risk of rupture of aneurysms. However, there is presently no consensus on the optimal strategy for the management of UIAs with ischemic stroke. A 27-year-old woman presented with sudden onset left hemiparesis. Acute infarction of the right basal ganglia and an aneurysm of the right middle cerebral artery were discovered on brain imaging. Antiplatelet therapy was used to treat her. The diagnosis revealed ischemic stroke caused by a thrombosed aneurysm due to the change in the shape of the aneurysm on day 4. The UIA clipping procedure was performed on day 21 due to the risk of subarachnoid hemorrhage (SAH). The findings of the surgery and indocyanine green imaging revealed a partially thrombosed aneurysm and occlusion of a perforating artery. As is well known, enlargement of aneurysm size indicates increasing rupture risk. In the present case, after ischemic events developed, magnetic resonance angiography revealed enlargement of the aneurysm. The findings of the surgery revealed possible pathogenic mechanisms were perforating artery occlusion due to local extension of the luminal thrombus. Clinicians should be aware of the risk of ischemic stroke due to luminal thrombosis of the UIA and SAH and should consider urgent treatment of the UIA even immediately after ischemic stroke.

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Introduction

As previously studied, the prevalence of ischemic stroke or transient ischemic attack is 3–6.3% among patients with unruptured intracranial aneurysms (UIAs) [1, 2]. Luminal thrombosis, distal embolization, and increased mass effect of aneurysms occur in the process of inflammation of aneurysms. Numerous studies have identified the close relationship between hemodynamic-induced inflammation and the rupture of aneurysm [3, 4].

Based on these findings, ischemic stroke in the perforator area adjacent to aneurysms suggests a possibility of a warning sign of the aneurysm rupture [5, 6]. We report a patient who presented with acute ischemic stroke in the area supplied by a perforating artery caused by a thrombosed aneurysm due to the rapid change in the shape of the aneurysm.

Case Description

A 27-year-old woman was transferred to our hospital by ambulance for evaluation and treatment of complete left-sided hemiparesis and mild dysarthria. Her National Institutes of Health Stroke Scale at admission was 13 points. On presentation, cranial magnetic resonance imaging /magnetic resonance angiography showed acute infarction in the right basal ganglia on the magnetic resonance imaging diffusion-weighted image sequences and an aneurysm in the right middle cerebral artery (7 mm in diameter) (Fig. 1a, b). Dual antiplatelet therapy and edaravone were initiated. On the fourth day of hospitalization, cranial magnetic resonance angiography showed a rapid change in the shape of the aneurysm (Fig. 1c). Although ischemic stroke was in an acute state, we considered that the rapid enlargement of the aneurysm was due to an imminent rupture. Thus, the patient was assigned to undergo surgery on the antiplatelet therapy. Surgical clipping was performed 21 days after admission. The middle cerebral artery aneurysm was exposed through the pterional approach. The findings of the surgery and indocyanine green imaging revealed a partially thrombosed aneurysm and occlusion of a perforating artery (Fig. 2a, b). Angioplasty clipping using multiple clips was successfully completed without obstruction of the parent artery and another perforating artery. Having completed 2 months of rehabilitation, the patient was discharged. The modified Rankin Scale score was 1 after 90 days. Recurrence of aneurysms and ischemic stroke could not be verified clinically for 5 years after surgery.

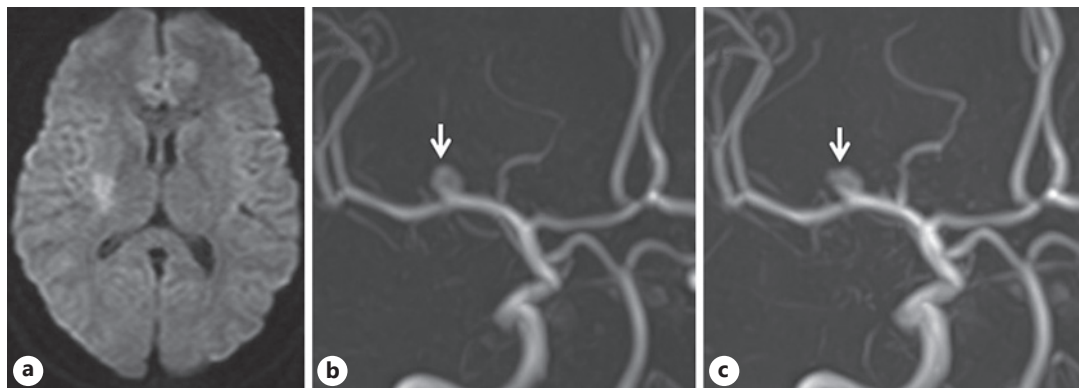


Fig. 1. Initial magnetic resonance imaging (a) and magnetic resonance angiography (MRA) revealed acute infarction of the right basal ganglia and an aneurysm of the right middle cerebral artery (b arrow). MRA on day 4 revealed the change in the shape of the aneurysm (c).

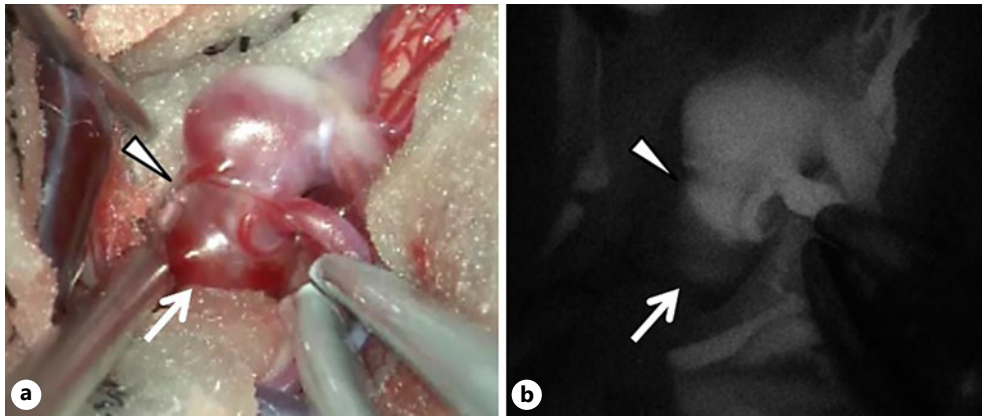


Fig. 2. Findings of the surgery (**a**) and indocyanine green imaging (**b**) revealed a partially thrombosed aneurysm (**a, b** arrow) and occlusion of a penetrating branch (**a, b** arrowhead).

Discussion

We present a case of the rapid change in the shape of the aneurysm following ischemic stroke due to unruptured aneurysm. As previously studied, the prevalence of ischemic stroke or transient ischemic attack is 3–6.3% among patients with UIAs [1, 2]. The cause of ischemic stroke caused by UIAs due to local extension of the luminal thrombus, distal embolization, and increased mass effect has been implicated as a possible mechanism [2]. The cause of ischemic stroke for our case is considered the thrombus formation inside the aneurysm on the perforating artery. Luminal thrombosis, distal embolization, and increased mass effect of aneurysms occur in the process of inflammation of aneurysms. Based on these findings, ischemic stroke in the perforator area adjacent to aneurysms suggests a possibility of a warning sign of the aneurysm rupture because the cause of the aneurysm rupture and ischemic stroke seems similar in terms of inflammatory process [3, 4]. However, there is presently no consensus on the optimal strategy for the management of UIAs with ischemic stroke. It is necessary to investigate which cases are at high risk of developing subarachnoid hemorrhage and which cases can be treated with antithrombotic drugs for cerebral infarction around the aneurysm. Physicians should be alerted to the need for close follow-up and early surgical procedure for ischemic stroke adjacent to aneurysms.

Conclusion

Ischemic stroke associated with UIA is a rare complication. Ischemic stroke due to luminal thrombosis to a nearby parent or perforating artery can lead to a rapid change in the shape of the UIA. Clinicians should be aware of the risk of ischemic stroke due to luminal thrombosis of the UIA and subarachnoid hemorrhage and should consider urgent treatment of the UIA even immediately after ischemic stroke.

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Statement of Ethics

This study was conducted in line with the principles of the Declaration of Helsinki. Written informed consent was obtained from the patient for the publication of this case report and any accompanying images. Ethical approval is not required for this study in accordance with local guidelines.

Conflict of Interest Statement

The authors declare that there is no conflict of interest.

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Author Contributions

Tatsuya Tanaka: care of patient and writing, designing, and editing of the manuscript. Hirofumi Goto, Nobuaki Momozaki, and Eiichiro Honda: care of patient and writing and editing of the manuscript.

Data Availability Statement

All data generated or analyzed during this study are included in this article. Further inquiries can be directed to the corresponding author.

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