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Case Report

Successful thrombectomy of top-of-the-basilar artery occlusion - difficult to detect in clinical practice: A case report ☆

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ABSTRACT

Top-of-the-basilar artery occlusion frequently causes infarction of the midbrain, thalamus, and portions of the temporal and occipital lobes as the vascular supply of these regions comes from the posterior communicating and posterior cerebral arterial tributaries of the basilar artery. Clinical signs include an array of visual, oculomotor, and behavioral abnormalities, usually without prominent motor dysfunction, which makes diagnosis challenging for those inexperienced with these sign. We describe a 59-year-old male presenting with acute ischemic stroke due to top-of-the-basilar artery occlusion. Despite attempting several paraclinical examinations relating the sudden coma with Glasgow Coma Scale of 6 points, the neuroimaging detected the large vessel occlusion that was difficult to recognize. After confirming top-of-the-basilar artery occlusion, the recanalization was realized immediately. The patient was discharged with good clinical recovery.

Introduction

The efficacy of endovascular treatment for acute ischemic stroke has been substantiated by several recent randomized clinical trials, with the strongest recommendation (ie, Class 1, Level of Evidence A) by the AHA/ASA [1]. The diagnosis and management of posterior circulation stroke (PCS) has previously been discussed in general. Approximately 20%-25% of ischemic strokes occur in the territory of the posterior circulation [2]. Mortality in PCS is 3.6%-18.6% [3]. Ischemic stroke due to acute basilar artery occlusion is one of the most feared

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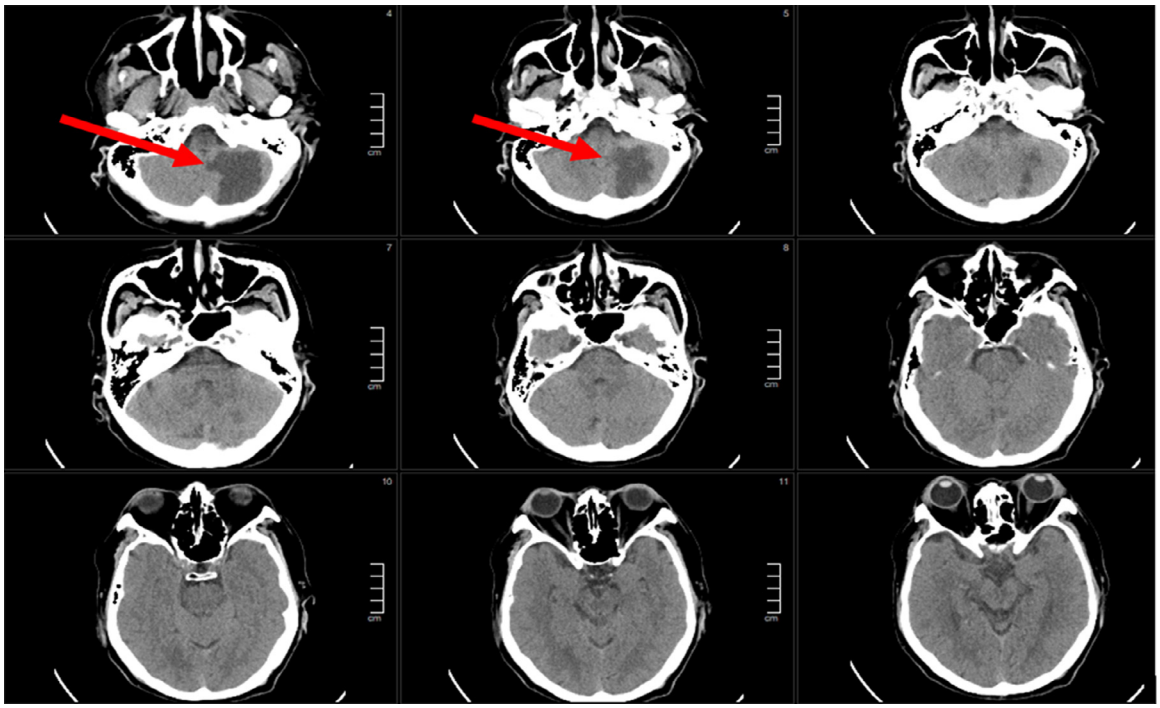

Fig. 1 – Left cerebellar infarction in the PICA-controlled territory (red arrow).

diagnoses in vascular neurology and is usually associated with poor outcomes [4]. Early studies based on autopsy material or on highly selected case series of patients noted fatality rates of up to 90%. However, recent prospective case series of patients with conservatively treated acute basilar artery occlusion have reported fatality rates under 50% [5–7]. Early recanalization of PCS is now well appreciated; however, there is no definitive guideline or consensus on the optimal reperfusion strategy or on the therapeutic time window [8]. Moreover, there are no published studies on definitive treatment interventions that are specific to top-of-the-basilar artery occlusion.

We present our experience with successful thrombectomy of top-of-the-basilar artery occlusion, which is difficult to detect in clinical practice, using the A Direct Aspiration First Pass Technique (ADAPT). ADAPT is a thrombectomy procedure wherein the tip of an intermediate aspiration catheter is placed directly near the thrombus upon confirmation with digital subtraction angiography (DSA). Manual aspiration is subsequently performed until the thrombus is removed, which is confirmed when an aspirated clot is noted within the syringe used for aspiration and repeat DSA shows revascularization of the previously occluded vessel.

Case presentation

Patient information

We report the case of a 59-year-old male with history of uncontrolled hypertension and without any prior neurological history. Fifteen hours before hospital admission, the patient had acute onset of dizziness and right-sided numbness and was initially treated at another hospital. Three hours before hospital admission, the patient suddenly succumbed to coma and was subsequently transferred to our hospital.

Clinical findings

The patient had a Glasgow Coma Scale (GCS) score of 6. He had stable vital signs, with blood pressure of 150/80 mm Hg and a regular heart rate. His left pupil was dilated but reactive to light, with unspecified motor function. The National Institutes of Health Stroke Scale (NIHSS) was 28. Other physical examination findings were unremarkable.

Diagnostic assessment

Computed tomography (CT) of the brain showed left cerebellar infarction involving the posterior inferior cerebellar artery (PICA)-controlled territory (Fig. 1). CT angiography (CTA) with volume-rendering technique (VRT) revealed occlusion of the left vertebral artery from its origin, and there was a suspicious defect at the top of the basilar artery, suggesting possible thrombosis in this region. If not carefully observed, this could easily be missed (Fig. 2). Magnetic resonance imaging (MRI) was requested to confirm the suspected lesion in the top-of-the-basilar-artery region. Diffusion-weighted imaging (DWI) revealed cerebellar, occipital lobe, and thalamus infarction (Fig. 3). Susceptibility-weighted imaging (SWI) revealed a small, focal hypointense signal representing a small intravascular thrombus in the top-of-the-basilar artery (Fig. 4).

Electrocardiogram showed regular sinus rhythm of 95 beats per minute. The patient was taken to the catheterization laboratory for angiography and endovascular intervention.

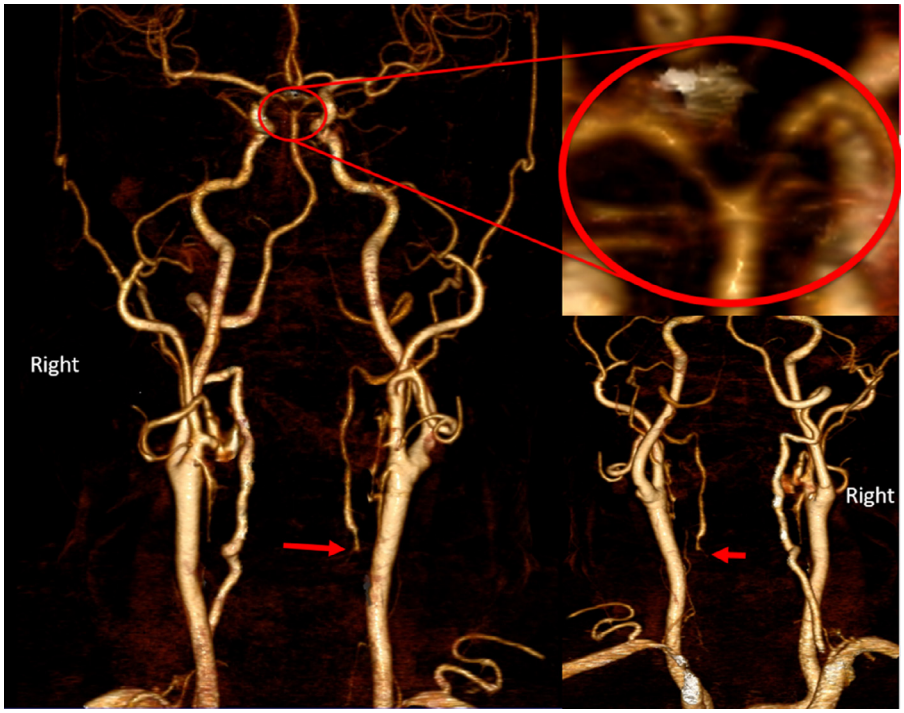

Fig. 2 – Occlusion of the left vertebral artery from the origin (red arrow) and suspicious lesion at the top-of-the-basilar artery (red circle).

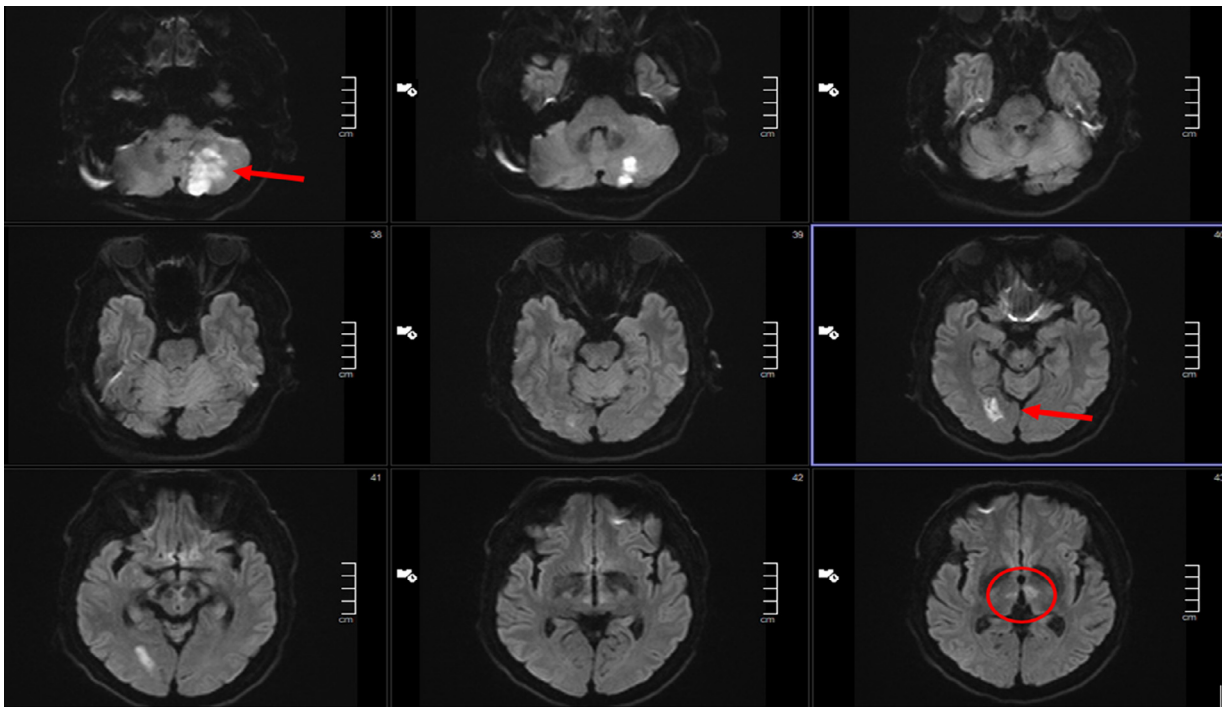

Fig. 3 – Cerebellar, occipital lobe (red arrow) and thalamus infarction (red circle) on DWI.

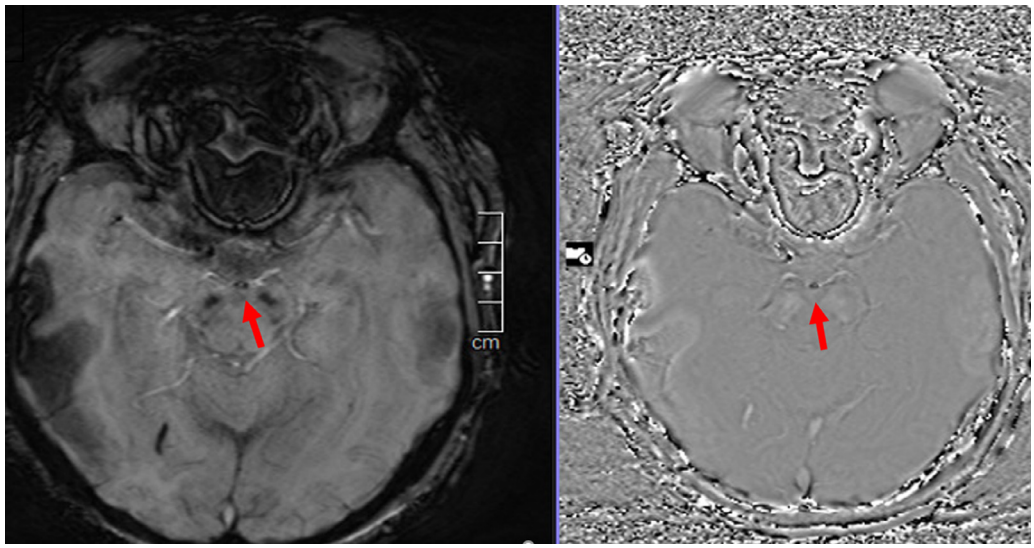

Fig. 4 – Small hypointense signal representing suspected thrombus in the top-of-the-basilar artery (B) in SWI.

Angiography showed tandem lesions, noting long-segment chronic occlusion in the left vertebral artery and a small migratory thrombus (seen as a filling defect) in the top-of-the-basilar artery. The right vertebral artery was normal, with a patent lumen, making it possible for the neurointerventionalist to insert the thrombectomy system via vertebrobasilar approach and aspirate the top-of-the-basilar artery thrombus (Fig. 5).

Therapeutic interventions

A Neuron Max 088 guide catheter (0.088-inch diameter, 90-cm working length, Penumbra) was placed in the right vertebral artery intraforaminal (V2) segment. Through the guide catheter, a Sofia Plus intermediate aspiration catheter (0.070-inch diameter, 125-cm working length, Microvention) was inserted into the vertebrobasilar artery with its tip placed near the thrombus. The Sofia Plus intermediate aspiration catheter was connected to the suction system (50 mL syringe), and manual negative pressure aspiration was performed once (Fig. 6). Subsequent angiogram revealed complete recanalization of the vertebrobasilar artery (Fig. 7).

Follow-up and outcome of interventions

Repeat cranial MRI 24 hours after intervention showed complete recanalization of the right vertebrobasilar artery complex, with no evidence of hemorrhagic complication or new vascular territory occlusion (Fig. 8).

The patient recovered almost completely 24 hours after endovascular treatment (Fig. 9). Ten days after the stroke event and prior to hospital discharge, the patient had good recovery with a GCS of 15, no body weakness, and a Modified Rankin Scale score of 1.

Timeline

Actual time of treatment (Military time)	Time intervals
❖ Symptom onset – 08:00	❖ Door to hospital – 60 min
❖ Symptom progression – 20:00	❖ Door to stroke center – 720 min
❖ Arrive to ED – 22:06	❖ Door to CT first slice – 846 min
❖ Head CT & CTA – 22:08	❖ Door to MRI first slice – 848 min
❖ Head MRI – 22:44	❖ Door to groin puncture – 884 min
❖ Arrive to INR – 23:45	❖ Door to recanalization – 950 min
❖ Groin puncture – 23:30	❖ Symptom onset to recanalization – 950 min
❖ Recanalization – 23:50	

Note: ED: Emergency Department; MRI: Magnetic Resonance Imaging; CT: Computed Tomography; CTA: Computed Tomography Angiography;
INR: Interventional Neuroradiologist.

Discussion

A well-defined area of left cerebellar infarction was seen on the initial CT study of this patient, and CTA revealed occlusion of the left vertebral artery. We initially considered the possibility of posterior circulation tandem occlusion at the origin of the left vertebral artery, with a small thrombus formed from the left vertebral artery root that migrated and lodged in the left PICA. Fifteen hours before admission, the patient had only mild symptoms related to the left cerebellar territory infarct. The small thrombus might have further migrated to the top-of-the-basilar artery, obstructing the paramedian thalamic artery perforators with partial occlusion of the posterior cerebral arteries, leading to worsening of symptoms and eventual coma. Lesions of the thalamus were not clearly

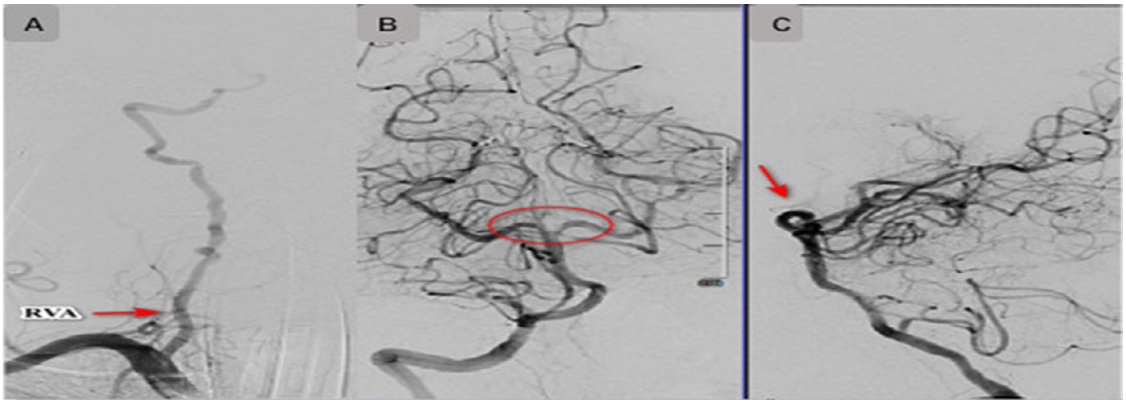

Fig. 5 – Angiography showing patent right vertebral artery (A) Contrast filling defect at the top-of-the-basilar artery representing thrombus and absent paramedian thalamic artery perforators (B, C).

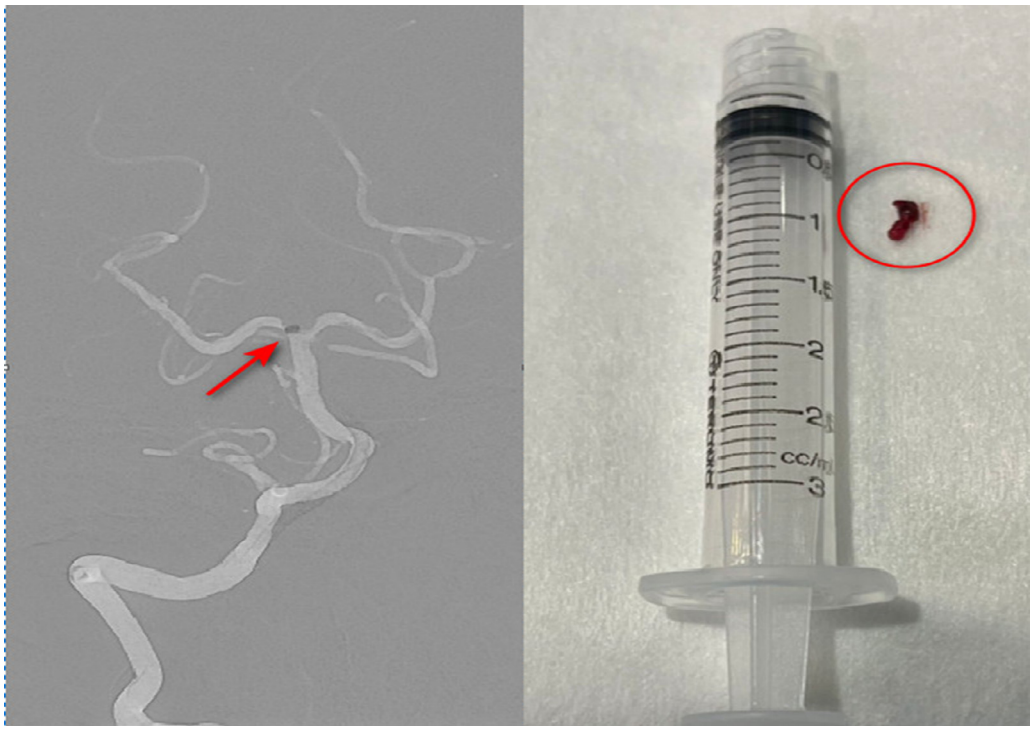

Fig. 6 – (A) Sofia Plus intermediate aspiration catheter tip placed at the top-of- the-basilar artery thrombus (red arrow). (B) Thrombus collected by manual aspiration (red circle).

detected on CT, and the abnormality is difficult to recognize via CTA. If not carefully assessed, the subtle obstructing lesion will not be detected in the time window when appropriate medical treatment can prevent worsening of symptoms. Further review of CTA revealed a suspicious contrast-filling defect in the top-of-the-basilar artery. Subsequent MRI studies with DWI and SWI sequences confirmed a small obstructing thrombus in the top-of-the-basilar artery, noting bilateral thalamic infarction (Fig. 4). Emergency endovascular treatment was performed based on these findings. The patient had left vertebral artery occlusion that also involved the left PICA territory; however, endovascular access through the left vertebral artery and recanalization of the left PICA could lead to reperfusion injury. Moreover, the bilateral thalamic infarction was the main reason causing the sudden coma. This was the specific sign relating the top-of- the-basilar artery and artery of Percheron occlusion, which was identified by sequences of MRI later. Thrombectomy was the most effective therapy in this case immediately.

On angiography, we observed a thrombus at the apex of the basilar artery causing partial occlusion of bilateral posterior cerebral artery proximal segments and occlusion of the

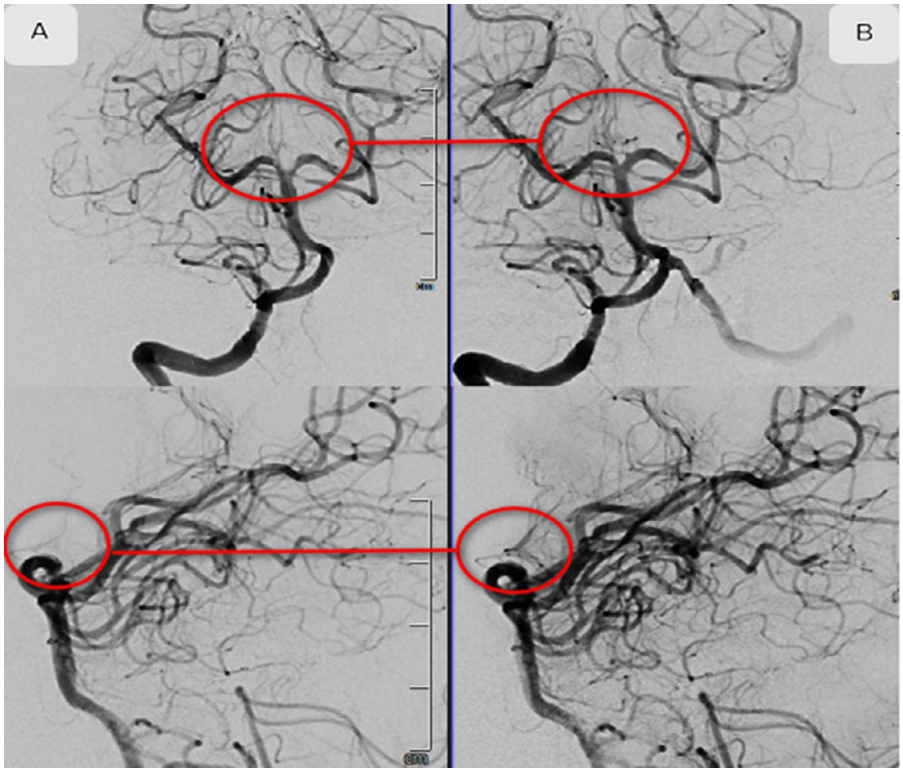

Fig. 7 – The angiogram revealed complete recanalization of the vertebrobasilar artery. (A) Before thrombectomy. (B) After thrombectomy (revascularization of paramedian thalamic artery perforators).

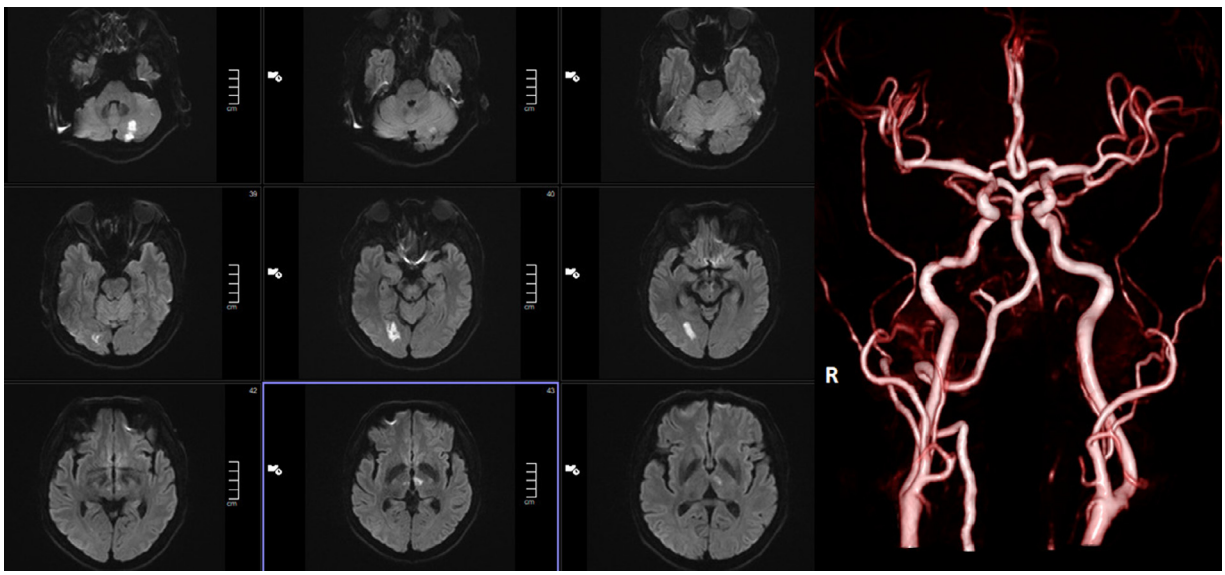

Fig. 8 – MRI showed successful recanalization of the right vertebrobasilar artery.

paramedian thalamic artery. Thrombectomy was performed using the "push-to-the-top" technique, and aspiration was performed only once. As a result, a small thrombus was aspirated, the apex of the basilar artery was recanalized, and the paramedian thalamic artery perforators were clearly seen on postinterventional imaging (Fig. 7). Repeat MRI 24 hours after intervention revealed an absence of lesions in the top-of-the-basilar artery, and 3D time-of-flight angiography demonstrated intact bilateral posterior cerebral artery proximal (P1) segments (Fig. 8). The patient was fully awake

Fig. 9 – Near-full recovery of the patient 24 hours after neuro-intervention.

24 hours after the intervention, without limb weakness on physical examination.

Conclusion

Cerebral infarction caused by top-of-the-basilar artery occlusion is rare and difficult to recognize in clinical practice. There is a need to meticulously review the available imaging studies (CT, MRI, and angiography) and to correlate the findings with the immediate patient symptomatology. In this case, thrombectomy was an effective treatment option that led to successful posterior circulation recanalization of the involved region. Early endovascular intervention can lead to good patient outcomes. Because there are only a few published cases of top-of-the-basilar artery occlusion with successful treatment intervention, there is a need to conduct prospective studies to evaluate the safety and efficacy of thrombectomy techniques for this type of lesion.

Authors' contribution

Mai Van Muong and Tran Chi Cuong contributed equally to this article as co-first authors. Mai Van Muong and Le Minh Thang contributed to write original draft. Nguyen Luu Giang, Mai Van Muong, Lemuel Marquez Narcise, and Le Minh Thang contributed to undergo interventional procedure, collect, and interpret the imaging. Mai Van Muong, Le Minh Thang, and Nguyen Minh Duc made substantial contributions to collect patient data and clinical data analysis. All authors have read, revised, and approved the final published version of the manuscript. All authors were responsible for submission of our study for publication.

Statement of ethics

Ethical approval was not necessary for the preparation of this article.

Patient consent

Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

Data availability statement

All data generated or analyzed during this study are included in this article and/or its online supplementary material files. Further enquiries can be directed to the corresponding author.

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