Radiology Case Reports 19 (2024) 5248–5252

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journal homepage: www.elsevier.com/locate/radcr

Case Report

Endovascular treatment for secondary basilar occlusion caused by spontaneous thrombus migration from the vertebral artery: Two case reports ☆,☆☆

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ARTICLE INFO

Article history:
Received 4 April 2024
Revised 31 July 2024
Accepted 2 August 2024

Keywords:
Endovascular treatment
Vertebral
Basilar
Thrombus

ABSTRACT

Thrombus migration is a well-known clinical condition that occurs before mechanical thrombectomy and after intravenous thrombolysis in patients with anterior circulation strokes. Although thrombus migration from the vertebral artery (VA) can result in life-threatening basilar artery (BA) occlusion, its occurrence in the posterior circulation has rarely been discussed. Two patients with secondary BA occlusion caused by spontaneous thrombus migration from the VA are presented. A 60-year-old man with a left cerebellar infarction secondary to ipsilateral VA occlusion was admitted to our hospital 8 hours after onset, with a National Institute of Health Stroke Scale (NIHSS) score of 4. The patient became comatose 3.5 hours after arrival owing to subsequent BA occlusion. He was successfully treated with mechanical thrombectomy. A 74-year-old man with right cerebellar infarction secondary to ipsilateral VA occlusion was admitted to our hospital 26 hours after onset, with an NIHSS score of 3. He became comatose 1 hour after arrival owing to BA occlusion and was treated with thrombectomy, followed by internal and external decompression. Despite the mild symptoms of VA occlusion and consequently delayed admission to the hospital, stroke physicians should be aware that spontaneous thrombus migration from the VA to the BA can result in a life-threatening presentation.

☆ Competing Interests: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

☆☆ Acknowledgments: We would like to thank Editage (www.editage.jp) for English language editing.

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https://doi.org/10.1016/j.radcr.2024.08.006

Introduction

Patients with unilateral vertebral artery (VA) occlusion are often asymptomatic or present with mild symptoms [1]. Therefore, intravenous thrombolysis and/or mechanical thrombectomy is often not performed.

In anterior circulation strokes, thrombus migration often occurs before mechanical thrombectomy [2–5] and after intravenous thrombolysis [6–9]. However, cases of this clinical entity involving the posterior circulation have rarely been reported. Only 1 case series of thrombus fragmentation and migration from the VA to the basilar artery (BA) after intravenous thrombolysis with a life-threatening presentation has been published [10]. Furthermore, few studies have shed light on spontaneous BA occlusion secondary to VA occlusion, although awareness of this clinical entity is required, especially in local stroke centers treating patients with mild stroke and in thrombectomy centers.

The cases of 2 patients treated with endovascular thrombectomy for secondary BA occlusion caused by spontaneous thrombus migration from the VA are presented herein.

Case reports

Case 1

A 60-year-old man with a medical history of hypertension and current smoking developed left-sided facial coldness, diplopia, and vertigo. His symptoms did not improve, and he was admitted to our hospital 8 hours after onset. Upon arrival at our hospital, his National Institute of Health Stroke Scale (NIHSS) score was 4 and his Glasgow Coma Score (GCS) was 15. Electrocardiography revealed no evidence of atrial fibrillation. Computed tomography (CT) revealed a low-density area in the left cerebellar hemisphere (Fig. 1A). CT angiography showed occlusion of the left VA from segments V3 to V4 (Fig. 1B). In view of the mild symptoms of the patient, intravenous thrombolysis and thrombectomy were not performed. However, the patient suddenly became comatose and developed quadriplegia 3.5 hours after admission (11.5 hours after onset), with an NIHSS score of 28 points. CT showed no intracranial hemorrhage. These findings raised the suspicion of BA occlusion, and emergency digital subtraction angiography was performed. A right vertebral angiogram showed partial recanalization of the left VA and a contrast defect in the bilateral proximal posterior cerebral arteries, suggesting thrombus migration from the occluded VA into the BA (Fig. 1C). The patient underwent mechanical thrombectomy with a contact aspiration technique using an RED 68 reperfusion catheter (Penumbra Inc.; Alameda, CA, USA), resulting in successful recanalization of the occluded BA despite residual occlusion of the P2 segment of the right posterior cerebral artery (PCA) and the P3 segment of the left PCA. The symptoms of the patient, including coma and quadriplegia, improved immediately after recanalization of the BA. Despite a single attempt at recanalization of the right PCA with a combined technique using an aspiration catheter and a stent retriever (Tron FX 2/15 mm; Terumo, Tokyo, Japan), the P2 segment of the right PCA remained occluded. Considering the risk of hemorrhagic complications, the procedure was terminated with thrombolysis in cerebral infarction (TICI) grade 2b (Fig. 1D). The NIHSS score of the patient improved to 8 immediately after the procedure. During hospitalization, paroxysmal atrial fibrillation was detected using Holter electrocardiography. Anticoagulant therapy was initiated as secondary prevention. The patient was transferred to a convalescent rehabilitation hospital on postoperative day 27 with a modified Rankin scale (mRS) score of 5, and his mRS score improved to 3 with moderate ataxia at 4 months after onset.

Case 2

A 74-year-old man with a medical history of hypertension and current smoking developed mild vertigo and nausea and stayed home for 26 hours. Upon arrival, his NIHSS score was 3. CT showed a low-density lesion in the right cerebellar hemisphere (Fig. 2A). Magnetic resonance angiography revealed occlusion of the right VA (Fig. 2B). The patient was initially treated medically in view of his mild symptoms and extended time window for thrombolysis and thrombectomy. However, the patient suddenly became restless and subsequently comatose 1 hour after arrival (27 hours after symptom onset). CT did not show hemorrhagic transformation or edematous changes in the ischemic lesion. Based on clinical suspicion of BA occlusion secondary to thrombus migration from the VA, emergency cerebral angiography was performed. Brachiocephalic angiography revealed occlusion of the proximal VA (Fig. 2C). The left vertebral angiogram (VAG) showed contrast defects in the left VA and at the top of the BA with occlusion of the left superior cerebellar artery (SCA) (Fig. 2D). An emergency mechanical thrombectomy was performed using an aspiration catheter (AXS Catalyst 6 aspiration catheter; Stryker, Minneapolis, MN, USA). The left VAG showed recanalization of the BA with persistent occlusion of the left SCA and modified TICI grade 2b (Fig. 2E). Although the patient recovered from coma immediately after thrombectomy, his consciousness level gradually deteriorated 2 days after thrombectomy. CT demonstrated massive swelling as a result of bilateral cerebellar infarction. The patient underwent external and internal decompression (Fig. 2F). However, his mRS score was 5 because of severe ataxia and psychiatric complications at 2 years and 5 months after onset.

Discussion

In the present study, 2 patients who first presented with mild stroke symptoms secondary to VA occlusion and subsequently developed life-threatening BA occlusion were described.

In cases of anterior circulation stroke, thrombus migration has been demonstrated in multiple studies before and after intravenous thrombolysis [2–4,6,7,11–14]. In particular, thrombus migration has been reported to occur spontaneously in approximately one-third to half of all middle cerebral artery (MCA) occlusion cases and in 54% of MCA occlusion cases

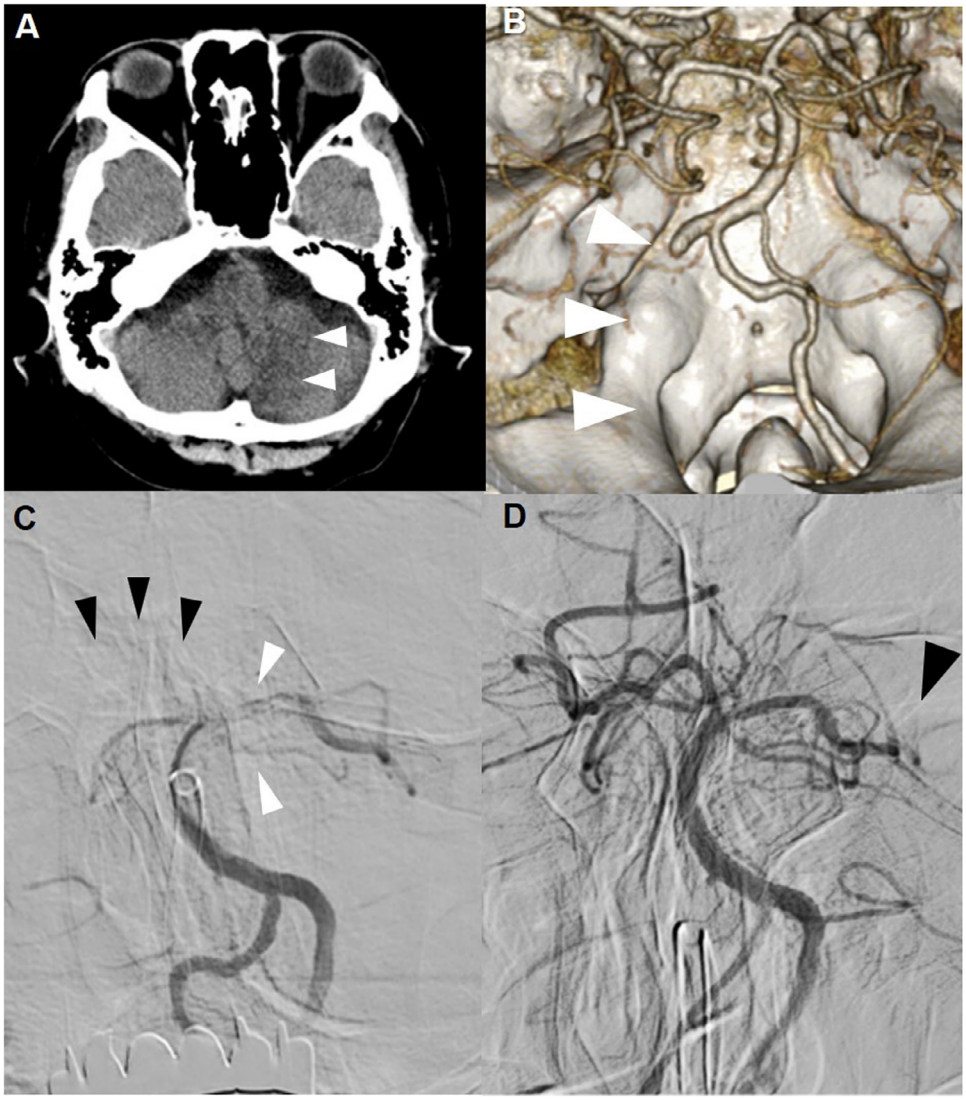

Fig. 1 – (A) Computed tomography (CT) scan obtained upon arrival showing a low-density lesion in the left cerebellar hemisphere (arrowheads). (B) CT angiography (CTA) showing occlusion of the left vertebral artery (VA) from the V4 segment (arrowheads). (C) Right vertebral injection demonstrating stagnant flow in the left posterior cerebral artery (PCA), the left superior cerebellar artery (SCA) (white arrowheads), and a contrast defect in the right PCA (black arrowheads). (D) Left vertebral injection performed immediately after thrombectomy showing recanalization of the top of the basilar artery (BA) with flow stagnation in the P3 segment of the left PCA (arrowhead).

following intravenous thrombolysis, with 7% presenting with clinical deterioration despite clinical improvement in most cases [7]. In fact, the occlusion of distal vessels by migrated clots may impair collateral flow via the circle of Willis or leptomeningeal anastomoses in cases of internal carotid artery (ICA) occlusion and proximal M1 MCA occlusion, thereby worsening cerebral perfusion and neurological status [2,3]. However, the occurrence of thrombus migration in posterior circulation stroke has not been well documented except in 1 series of patients treated with intravenous thrombolysis [10]. In a previous series of 615 patients who underwent intravenous thrombolysis, VA occlusion was found in 7 patients (1.1%). Of these 7 patients, 2 (approximately 28.6%) presented with neurological deterioration following thrombolysis and subsequently underwent mechanical thrombectomy [10]. Based on this study, patients with isolated VA occlusion rarely undergo intravenous thrombolysis, despite a relatively high rate of neurological deterioration. However, because VA occlusion may not cause any symptoms owing to robust collaterals from the contralateral VA, the incidence of asymptomatic or mildly symptomatic VA occlusion may be underestimated. In the present study, the patients did not call for an ambulance immediately after symptom onset because their symptoms were mild.

This case report highlights several important issues. First, as the symptoms of isolated VA occlusion are often mild, patients may be transferred to nonthrombectomy-capable hospitals rather than to facilities performing mechanical

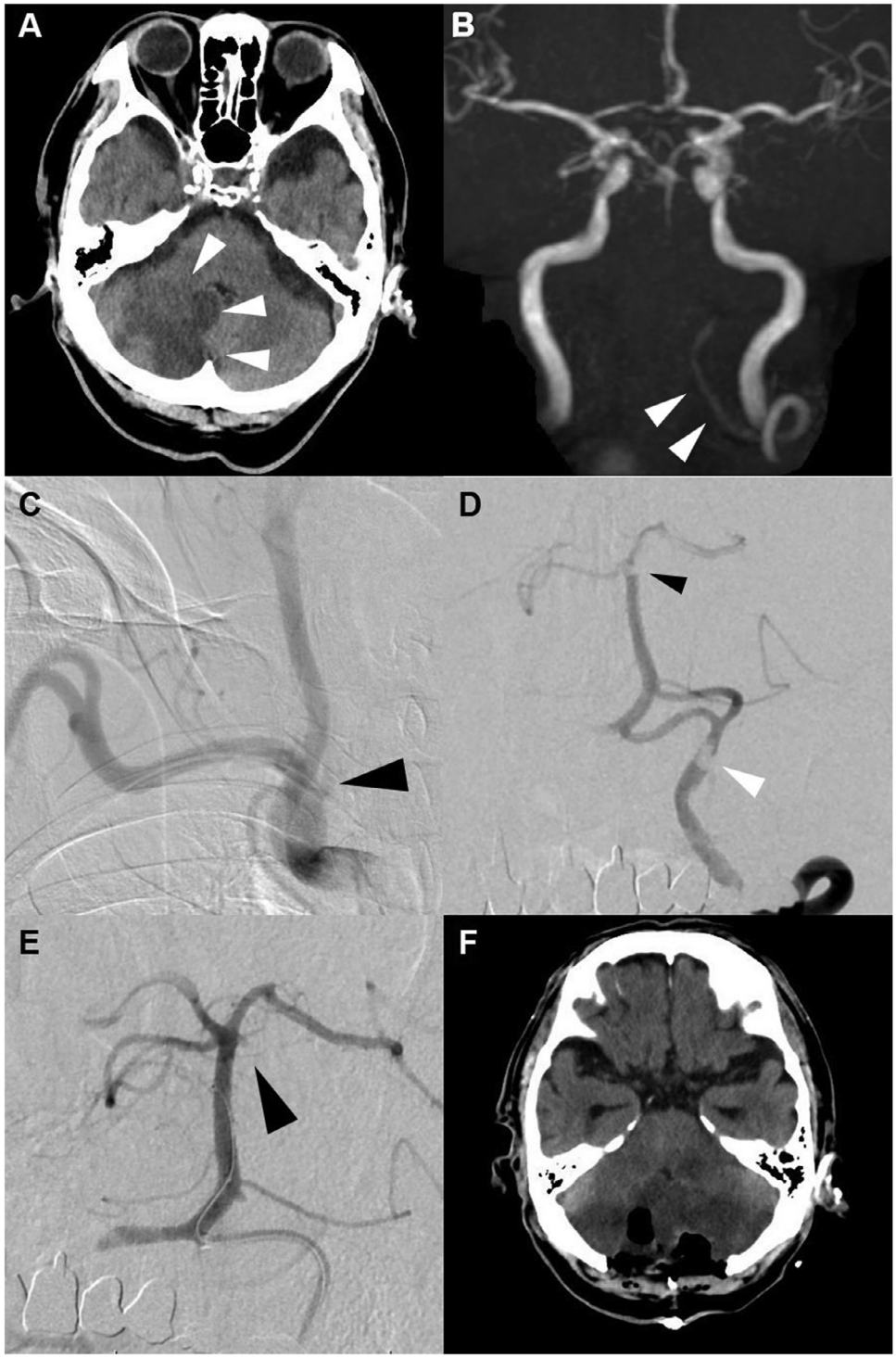

Fig. 2 – (A) Computed tomography (CT) scan showing a low-density lesion in the right cerebellar hemisphere (arrowheads). (B) Magnetic resonance angiography demonstrating occlusion of the right vertebral artery (VA) and the patent left VA (arrowheads). (C) Brachiocephalic angiography demonstrating the stump of the right VA (arrowhead). (D) Left vertebral injection showing contrast defects in the left VA (white arrowhead) and at the top of the basilar artery (BA) with occlusion of the left superior cerebellar artery (SCA) (black arrowhead). (E) Left vertebral injection immediately after thrombectomy showing recanalization of the top of the BA with persistent occlusion of the left SCA (arrowhead). (F) CT scan obtained after internal and external decompressive craniectomy demonstrating a large infarction core in the bilateral cerebellar hemispheres.

thrombectomy. Although the rarity of isolated VA occlusion should not encourage the transfer of the patient to facilities performing mechanical thrombectomy, physicians should be aware that a thrombus in an isolated VA may migrate into the BA, resulting in life-threatening BA occlusion. Second, uncertainty persists regarding whether patients with isolated VA occlusion should be treated with intravenous thrombolysis and/or mechanical thrombectomy to prevent a life-threatening event secondary to thrombus migration from the VA to the BA. Given that thrombus migration in the posterior circulation is rare, future randomized trials may not be feasible, and whether or not thrombolysis and/or thrombectomy should be performed must be determined on a case-by-case basis.

Conclusion

Mild symptoms of VA occlusion may be related to delayed hospital admission. However, stroke physicians should be aware that spontaneous thrombus migration from the VA to the BA can result in a life-threatening presentation.

Human rights statements

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1964 and later versions.

Patient consent

Informed consent was obtained from the patients for the publication of this case report.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.radcr.2024.08.006.

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