Radiology Case Reports 15 (2020) 387–390

Available online at www.sciencedirect.com

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Case report

Basilar trunk artery aneurysm presenting with brainstem stroke

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ARTICLE INFO

Article history:
Received 28 November 2019
Revised 31 December 2019
Accepted 7 January 2020

Keywords:
Aneurysm
Fusiform
Dolichoectatic
İschemic stroke

ABSTRACT

Basilar trunk artery aneurysms are extremely rare lesions that account for only 2.1% of all intracranial aneurysms. They are mostly recognized in patients around the age of 60, show a slight male predominance, and are associated with high morbidity and mortality. Chronic mural bleeding ectasia is the most common subtype of basilar trunk artery aneurysms. Its median maximum diameter ranges between 11 and 21 mm and is incidentally detected in more than half of the cases. Herein, we present a 58-year-old male patient who presented with brain stem stroke due to a chronic mural bleeding ectasia with a maximum diameter of 27 mm and died in the first week after admission.

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Introduction

The "basilar trunk artery" is the name given to the arterial segment located between the origin of the basilar artery and the origin of the superior cerebellar artery. Basilar trunk artery aneurysms (BTA) are extremely rare lesions that account for only 2.1% of all intracranial aneurysms [1]. To date, various names have been given to BTAs such as fusiform aneurysm, dolichoectatic artery, and serpentine aneurysm [2]. They are mostly recognized in patients around the age of 60, show a slight male predominance, and are associated with high morbidity and mortality. Multiple BTAs are detected in approximately one-quarter of cases [1,2].

There are 4 different subtypes of BTA that differ in frequency, natural history, clinical presentation, and treatment strategies: chronic mural bleeding ectasia (CMBE), saccular aneurysm, segmental fusiform ectasia, and acute dissecting aneurysm [1]. Herein, we present a 58-year-old male patient who presented with a giant CMBE-induced stroke and died in the first week after admission.

Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.
Declarations of Competing Interest: The authors declare that they have no conflict of interest.

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https://doi.org/10.1016/j.radcr.2020.01.009

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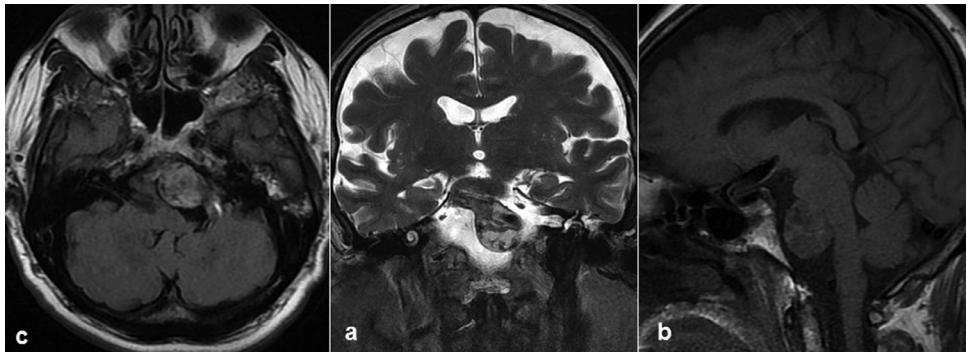

Fig. 1 – Axial fluid attenuated inversion recovery (a), coronal T2-weighted (b) and sagittal fluid attenuated inversion recovery (c) magnetic resonance images demonstrate a well-defined lobulated mass measuring 24 x 21 x 27 mm (TR x AP x CC) in the prepontine cistern at the location of the basilar artery trace. It is a heterogeneous mass with chronic mural bleeding and widespread thrombus.

Case report

A 58-year-old man with a 14-year history of hypertension and hypercholesterolemia presented to our emergency department 2 hours after the onset of symptoms of headache, vertigo, severe imbalance, weakness of the limbs, difficulty in speaking, and decreased level of consciousness. He had a history of several transient ischemic attacks (TIA) with an increasing frequency in the last few years. No evidence of intracranial hemorrhage, hematoma, or space-occupying lesion was detected on the head computed tomography obtained on admission. However, the basilar artery was enlarged and the lumen appeared hyperdense, suggesting thromboembolic changes.

On brain magnetic resonance imaging (MRI), a well-defined lobulated mass measuring 24 × 21 × 27 mm (TR × AP × CC) was detected in the prepontine cistern at the location of the basilar artery trace. It was a heterogeneous mass with chronic mural bleeding and widespread thrombus (Fig. 1). The mass showed low T1- and high T2-signal and depicted intense heterogeneous enhancement following gadolinium administration (Fig. 2). It was severely compressing the brain stem and there was a focal area with high T2-signal in the right half of the mesencephalon. This area showed prominent restriction of diffusion in diffusion weighted images and apparent diffusion coefficient (ADC) mapping, suggestive of an acute infarct (Fig. 3). Axial magnetic resonance angiography (MRA) depicted a basilar artery aneurysm with a maximum diameter of 24 mm. An associated long segment occlusive thrombus within the basilar artery, extending for approximately 27 mm, was evident (Fig. 4). On 3D MRA images, almost complete occlusion and weak intraluminal signal were observed in the basilar artery, as the result of diffuse thrombosis. Besides, the intraluminal signal could not be distinguished in both posterior cerebral arteries (Fig. 5). Both vertebral arteries were in normal calibration.

Based on the rather specific imaging findings, the lesion was diagnosed as a giant CMBE. Antiplatelet and anticoagulant therapy was immediately started. However, the symptoms of the patient rapidly deteriorated and he died in the first week after admission.

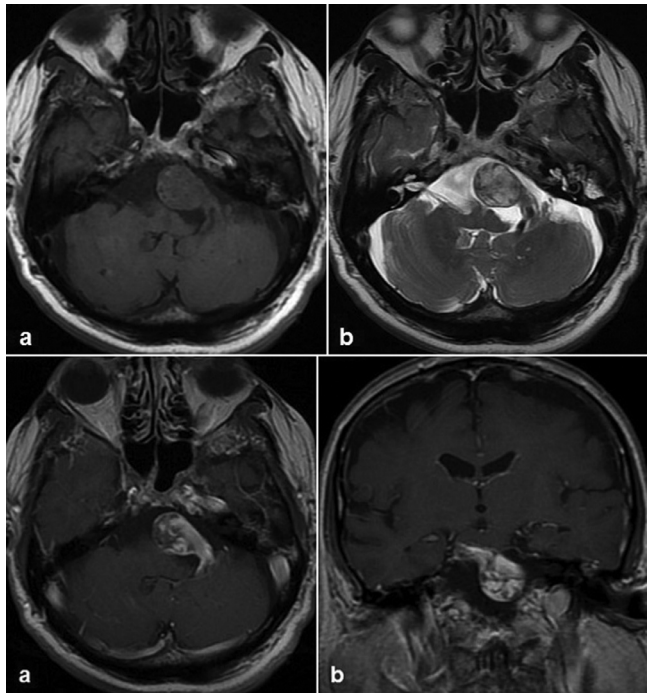

Fig. 2 – Axial T1-weighted (a), axial T2-weighted (b), and contrast-enhanced axial (c) and coronal T1-weighted magnetic resonance images. The mass shows low T1-signal (a), high T2-signal (b) and intense heterogeneous enhancement following gadolinium administration (c and d).

Discussion

Initial clinical presentation of a BTA may be 1 of 3 different forms, including incidental, subarachnoid hemorrhage, and

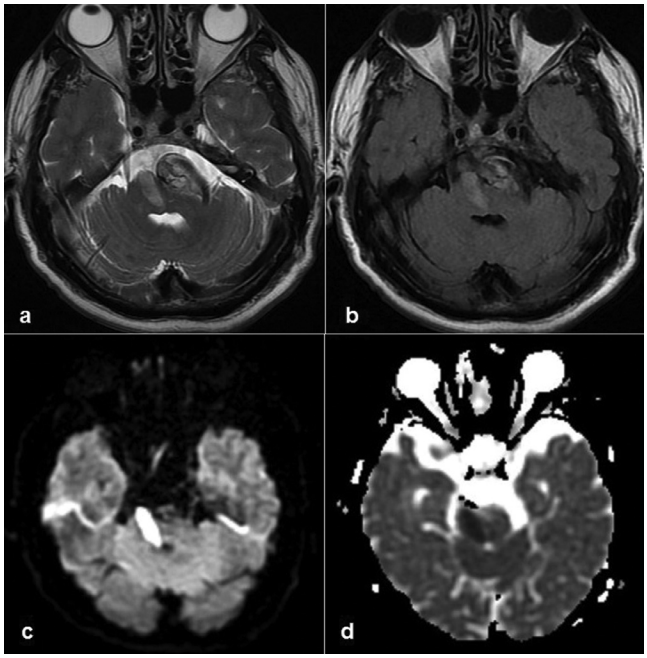

Fig. 3 – Axial T2-weighted (a) and fluid attenuated inversion recovery (b) images demonstrating severe brain stem compression and a focal area with high T2-signal in the right half of the mesencephalon. Diffusion weighted image (c) and ADC mapping (d) show prominent restriction of diffusion suggestive of an acute infarct in this area.

neurologic deficit. According to the single-center experience of 52 cases reported by Saliou et al, the frequency order of the subtypes of BTA is as CMBE, saccular aneurysm, segmental fusiform ectasia, and acute dissecting aneurysm, from high to low. Saliou et al showed that more than half of the BTA cases of the first 3 subtypes are incidentally recognized, however, cases with acute dissecting aneurysm always present with subarachnoid hemorrhage and/or neurologic deficit [1].

As a result of the mass effect of the ectatic vessel, 27% of all CMBE patients present with ischemic stroke and 9% with isolated compression symptoms. The median maximum diameter of the CMBE ranges between 11 and 21 mm, and the infarction in cases presenting with stroke shows a preference for pons and lateral medulla [1,2]. We presented a case of CMBE with a maximum diameter of 27 mm, which was well above the previously reported range, causing extensive ischemic infarction in the brain stem. The history of multiple TIAs implies that the clinical course of our patient progressed slowly to a sudden exacerbation as a preterminal manifestation. And intramural hemorrhage sites evident on the patient's brain MRI sections may be corresponding to the previous episodes.

Detection and typing of BTAs have a critical role in determining the treatment approach and prognostication. Data from numerous recent studies show that both computed tomography angiography (CTA) and MRA have a diagnostic accuracy of around 90% for the detection of intracranial aneurysms larger than 3mm in diameter [3–5]. Owing to its lack of ionizing radiation, MRA has the advantage over CTA in that it provides the opportunity to screen patients for intracranial aneurysm. Furthermore, novel MRI techniques such as ultrahigh-resolution MRA, hybrid-opposite-contrast MRA, and contrast-enhanced black blood MRI promise a further evaluation of the aneurysm by estimating the wall thickness, characterizing atherosclerotic plaques, and estimating rupture risk, respectively. Developments in this area in recent years are not limited to the techniques mentioned. Molecular imaging methods such as ferumoxytol-enhanced MRI and myeloperoxidase-specific MRI have set out to analyze the level of aneurysmal wall inflammation and predict the rupture risk based on this analysis [5–7]. It seems that these new techniques will be decisive in the treatment planning of intracranial aneurysms in the near future. However, despite these significant improvements in MRA techniques, digital subtraction angiography (DSA) is still the gold standard in the diagnosis and treatment planning of these lesions [5].

Because of their steep anatomic localization and morphologic configuration complicated by the incorporation of the perforating arteries, clinical management of BTAs poses immense difficulties. Endovascular techniques using stents and coils enable reconstructive treatment of BTAs with lower morbidity rate compared to surgery. However, in fusiform CTAs, the absence of a suitable aneurysmal neck usually makes simple clip reconstruction or coil embolization impossible and necessitates further techniques such as stent-assisted coiling and flow diversion [8,9]. Despite significant advances in the field of endovascular therapy, the most appropriate option for

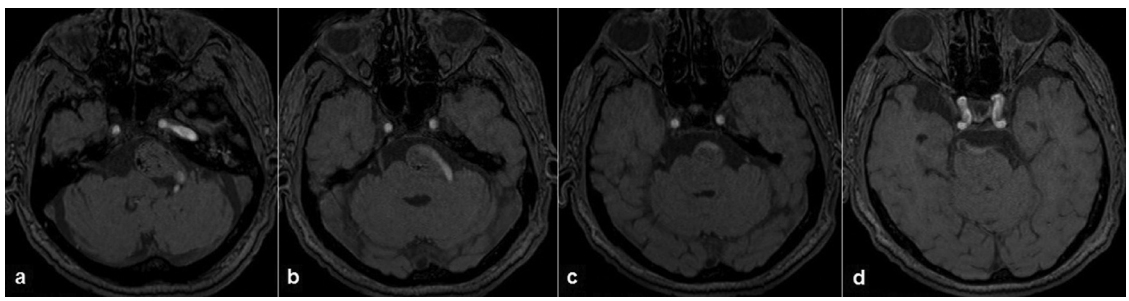

Fig. 4 – Consecutive axial magnetic resonance angiography sections depict a basilar artery aneurysm with a maximum diameter of 24 mm. There is a long segment occlusive thrombus within the basilar artery, extending for approximately 27 mm.

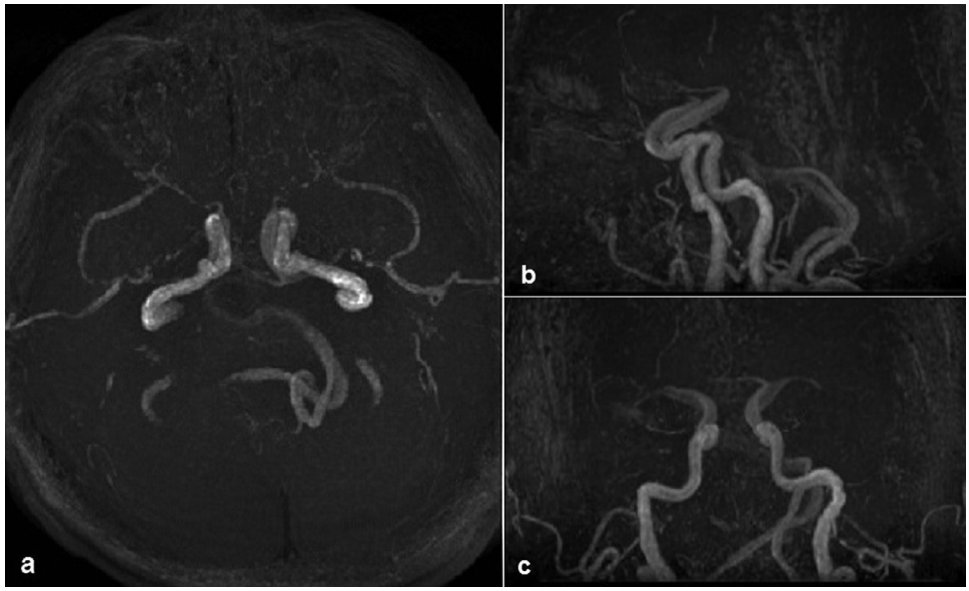

Fig. 5 – Axial (a), sagittal (b) and coronal 3D magnetic resonance angiography images demonstrate almost complete occlusion and weak intraluminal signal in the basilar artery as the result of diffuse thrombosis. Note that the intraluminal signal cannot be distinguished in both posterior cerebral arteries.

the treatment of giant BTAs remains open surgical treatment. And nowadays, "flow reversal" is the most commonly preferred surgical method in the treatment of these lesions [10]. However, for patients presenting with stroke, antiplatelet, and anticoagulant therapy is the inevitable treatment approach [9]. In our case, despite the rapid and effective medical treatment, the clinical picture rapidly deteriorated and the patient died. It seems that the presence of the risk factors for aneurysm formation, such as hypertension and hypercholesterolemia, has accelerated the process and the lesion has reached an unusually large size. And the fact that surgical intervention was not performed at the right time despite the history of multiple TIAs seems to be the cause of this recent clinical picture.

Informed consent

Informed consent for publication was obtained from the patient.

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