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Case Report

Stroke in the Deep Brain: A Case Report of Artery of Percheron Infarct

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Abstract

The Percheron artery is an uncommon anatomical variant that supplies arterial blood bilaterally to the paramedian thalami and the rostral midbrain. Its occlusion leads to bilateral thalamic and mesencephalic infarctions, but diagnosis can be challenging due to the complexity of the anatomy and resulting clinical variability. This review presents the case of a 60-year-old male with an artery of Percheron infarct and emphasizes the significance of early recognition of this condition, despite clinical variability for prompt stroke treatment.

Keywords: *Artery of Percheron; Thalamus Infarction; MRI; Stroke; Diagnosis Challenge*

Introduction

The Percheron artery is an uncommon anatomical variant that supplies arterial blood bilaterally to the paramedian thalami and the rostral midbrain.

Case Report

A 60-year-old man with a medical history of hypertension, poorly controlled diabetes, heart failure, and chronic kidney failure presented to the emergency department with altered consciousness one days ago. On examination, he had a Glasgow Coma Scale score of 5 and bilateral myosis. Capillary glucose levels were normal. A computed tomography (CT) scan performed on admission showed no acute hemorrhage or infarctions. However, an electrocardiogram revealed previously unknown atrial fibrillation.

The patient was admitted to the Neurology Clinic for further observation. Due to the persistence of ophthalmologic signs and consciousness disturbances, a head magnetic resonance imaging (MRI) was ordered on the second day of hospitalization. The MRI revealed symmetrical lesions in the paramedian thalamus and midbrain in the territory of the penetrating arteries. These lesions were hyperintense in FLAIR (Figure 1A and 1B) and T2 sequences (Figure 1D) and showed an abnormal restriction of water diffusion on diffusion-weighted imaging (DWI) with a low apparent diffusion coefficient (ADC) (Figure 1C). These findings supported the diagnosis of an acute infarction of the Percheron artery. The doppler of supra-aortic trunks, showed only minor carotid atheroma, and the cause was believed to be embolic due to atrial fibrillation. After the procedure, standard oral anticoagulants and additional treatments were recommended. Since thrombolytic therapy was not utilized due to the late diagnosis of AOP infarction, rehabilitation therapy was quickly initiated following the MRI.As the patient's consciousness gradually returned by the fifth day following the procedure.

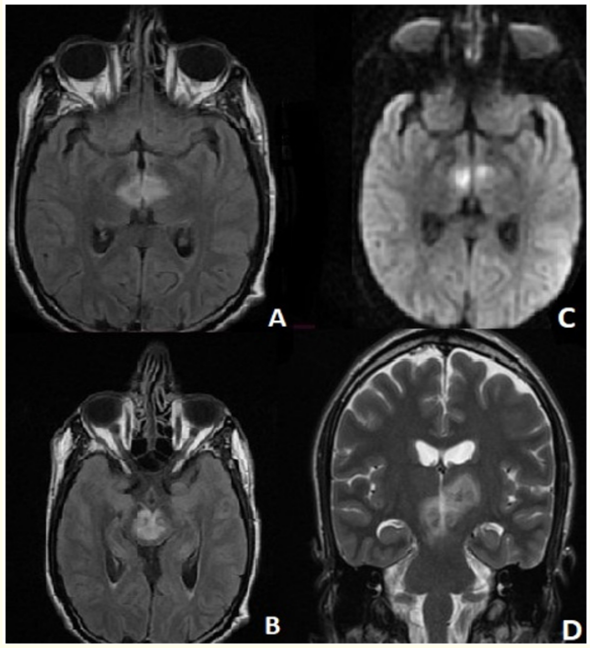

Figure 1: *Axial brain MRI T2 FLAIR (A, B) Diffusion b1000 (C), and Coronal T2 (D): FLAIR shows hyperintense signal in bilateral paramedian thalami and paramedial mesencephalon-in the territory of the penetrating arteries, axial T2-WI shows symmetrical hyperintense lesions presented in the paramedial thalamus. DWI findings confirm diagnosis of Percheron artery infarction.*

Discussion

The thalamus receives its blood supply from the vertebral system, with four vascular territories. The anterior territory is supplied by the anterior thalamoperforating arteries from the posterior communicating artery. The inferolateral and posterolateral regions receive blood supply from thalamogeniculate arteries originating from the P2 segment of the posterior cerebral artery (PCA) and choroidal arteries. Additionally, the anterior choroidal artery plays an indirect role in supplying the posterolateral area [1]. The paramedian territory, the largest thalamic area, is supplied by posterior thalamoperforating arteries from the P1 segment of the PCA. In the absence of the thalamic polar artery, paramedian arteries can supply both the paramedian and anterior territories [2,3].

Additionally, arteries serving the rostral midbrain, including the superior mesencephalic (or rubral) artery territory, may share a common origin with the paramedian arteries. This region includes neuronal structures such as the interpeduncular nucleus, interstitial nucleus of Cajal [4,5] decussation of the superior cerebellar peduncle, medial part of the red nucleus, nucleus of the oculomotor nerve, and the anterior portion of the periaqueductal gray matter [2].

Percheron identified several variations in the anatomy of the posterior thalamoperforating arteries. In type I, small perforating branches arise symmetrically from both P1 segments of the posterior cerebral arteries (PCAs). Type III involves perforating arteries originating from an unnamed branch that connects the left and right P1 segments. In type II, the vascular supply to the thalamus comes from a single PCA, which can take two forms: Type IIa, where separate branches supply the bilateral thalamic territories, and type IIb, where a common trunk supplies both sides. A unique feature of the type II variant is the presence of a unilateral perforator that supplies both ipsilateral and contralateral thalamic territories, known as the Artery of Percheron (AOP) [1].

When it comes to clinical stroke patterns, the artery of Percheron (AOP) is an essential consideration. It can cause different types of strokes, including paramedian and polar thalamic, paramedian thalamic and mesencephalic, and bilateral paramedian thalamic strokes. The symptoms of these strokes can include memory impairment, vertical gaze palsy, and altered mental status. Altered mental status can range from hypersomnolence or coma to drowsiness or disorientation, and these vigilance problems can last until death. However, complete recovery has been observed in certain cases [6].

Cardioembolism is considered the leading suspected cause of paramedian thalamic infarction, as numerous patients also present with ischemic lesions in other brain areas, such as the cerebellum, MCA territory, and occipital lobe, either simultaneously or at different times [1].

Neuroimaging studies have identified four distinct patterns of AOP infarction, each associated with bilateral paramedian thalamic involvement. Up to 43% of cases, including our case, had bilateral paramedian thalamic involvement with the midbrain, while 38% of cases had bilateral paramedian thalamic infarction without midbrain. The third pattern, documented in 14% of instances, was characterized by bilateral paramedian thalami and anterior thalamus infarction. Only 5% of cases of anterior thalamic infarction without associated midbrain infarction have been documented [7]. Therefore, it is essential to use neuroimaging studies like in our case, we used cerebral MRI to accurately diagnose AOP infarction.

Diffusion-weighted imaging (DWI) and fluid-attenuated inversion recovery (FLAIR) are the key imaging techniques for early detection of AOP infarction, with DWI identifying acute ischemia and FLAIR revealing subacute lesions [8]. Changes in signal intensity on MRI or CT, indicative of ischemia affecting the bilateral paramedian thalami with or without involvement of the rostral midbrain, combined with a relevant clinical history, strongly suggest the diagnosis [9]. Hypodense signals on T2 imaging, along with postcontrast enhancement indicative of hemorrhagic conversion, have also been observed [4].

The midbrain "V sign," a hypertensive signal seen on FLAIR and DWI, was characterized as a pathognomonic indication with a 67% sensitivity to detect AOP infarction [7].

Initial MR imaging can be falsely negative for AOP infarction, so it doesn't rule out the diagnosis. If clinical suspicion persists, reimaging within 48 hours is recommended [10].

Bilateral thalamic lesions can result from various conditions beyond artery of Percheron (AOP) infarction. Vascular causes include top of the basilar syndrome and deep cerebral venous thrombosis. Metabolic disorders like Wernicke's encephalopathy present with specific MRI findings. Other causes include neoplasms, infections, Wilson's disease, and osmotic myelinolysis. Accurate diagnosis requires careful clinical correlation and advanced imaging to differentiate these conditions [8].

The prognosis for thalamic infarcts is generally favorable, with low mortality and minimal permanent motor deficits. A study of 15 patients with AOP infarcts found 67% of those with bilateral paramedian thalamic infarcts had favorable outcomes (mRS ≤2), compared to only 25% of those with both thalamic and midbrain infarcts. This indicates that midbrain involvement worsens prognosis. Lack of neurological improvement may be linked to a small ischemic area in the pons [8].

In the acute phase, intravenous thrombolysis is generally regarded as the preferred treatment. Intra-arterial thrombolysis has also been successfully used. If an embolic source is present, systemic anticoagulation should be considered [1].

Conclusion

The Percheron artery is a rare anatomical variant that supplies blood bilaterally to the paramedian thalami and the rostral midbrain. Its occlusion can result in bilateral thalamic and mesencephalic infarctions, leading to challenging diagnosis and clinical variability. This review highlights the case of a 60-year-old male with an artery of Percheron infarct and emphasizes the importance of early recognition and prompt stroke treatment for this condition.

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