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Hippocampus infarct following a posterior cerebral artery occlusion. A case report

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ABSTRACT

A 64-year-old gentleman, presented for subacute onset of a short-term memory problem, preceded by headache, right arm numbness, and visual disturbances. On neurological exam, he had anterograde amnesia, decreased pinprick sensation on his right arm, and right homonymous hemianopsia.

Brain Magnetic Resonance imaging (MRI) and Magnetic Resonance Angiography (MRA) showed subacute ischemic lesions in the left occipital lobe, hippocampus, and thalamus, caused by a distal occlusion of the left Posterior Cerebral Artery (PCA). A distal occlusion of the PCA led to multiple infarcts in different anatomical structures, causing a constellation of variant neurological signs.

Our case documents a unique presentation of PCA ischemic stroke.

Background

The Hippocampus is mainly supplied by the PCA and to a lesser degree from the anterior choroidal artery. [1] Visual analysis with Diffusion-Weighted MRI (DWI) has identified 4 patterns of lesions affecting the hippocampus: complete, lateral, dorsal, and circumscribed lesions in the lateral hippocampus. [2] The PCA strokes are associated with headaches, visual symptoms, sensory-motor symptoms, and neuropsychological symptoms.[4] Headaches is one of the initial symptoms, and are more frequently seen with infarcts in the posterior than the anterior circulation.[5] Other presenting symptoms include dizziness, confusion, nausea and vomiting.[4] when the involved area is limited to the hippocampal area, amnesia, and memory processing are mainly affected. [2] This amnesia is usually temporary, not lasting more than 24 hours, and it is called Transient Global Amnesia (TGA).[6] The prevalence of an isolated acute stroke of the hippocampus is 0.03% in a case series of 6800 patients.[7] Ischemic lesions are well identified on DWI due to the strong contrast between affected and unaffected tissues, which offers more details in stroke syndromes.[3] The isolated involvement of the hippocampal structures enlightens its important role in memory processing.[8] TGA, characterized by transient anterograde or retrograde amnesia without altered consciousness or other cognitive deficits, may rarely follow an ischemic stroke, typically associated with unilateral or bilateral hippocampal lesions [8,9]. The patient usually shows a stereotyped behavior like asking the same question over and over again.[9]

Case Presentation

A 64-year-old patient presented to the Emergency Department (ED) for altered general status and high blood pressure. The patient is a hypertensive, diabetic, dyslipidemic patient, and has coronary artery disease, status post stent insertion in 2011.

On the same day of the presentation, the patient's family noticed difficulty in arousing the patient from sleep and the patient was complaining of a tingling sensation in his right arm.

The patient had a severe headache but denied any chest pain, dyspnea, orthopnea, fever, or chills; he also denied any blurry vision or diplopia, loss of consciousness, vertigo, or dizziness. The family reported retrograde amnesia on the same day.

Upon admission to the ED, vital signs were within normal ranges, heart rate of 78 Beats per minute, blood pressure of 160/120 mmHg, temperature of 36.7oC, and saturation of 98%.

Physical examination revealed orientation to people and place but not to time., and he was not able to recall the events of the day prior to his admission. Systolic ejection murmur radiating to the right carotids was heard on heart auscultation.

Neurological examination showed intact Cranial Nerves (CN) III to XII, normal motor function in all limbs, positive pupillary light reflex, +2 deep tendon reflexes, and an equivocal Babinski on the right. There was a decreased pinprick sensation on his right arm. The patient also had a right homonymous hemianopsia. The rest of the bedside exam was normal.

Stroke protocol was initiated, and brain MRI and MRA showed multiple areas of cortical ischemic lesions in the left occipital lobe, left hippocampus, and left thalamus, consistent with subacute ischemic lesions in the territory of the left PCA (Figure 1).

The patient was admitted to the regular floor, and during his stay, the patient was started on antiplatelet and anticoagulation, while his blood pressure, diabetes, and dyslipidemia medications, were continued.

Discussion

A 64-year-old gentleman, with uncontrolled hypertension and diabetes mellitus, presented for subacute onset of short-term memory problem, preceded by right arm numbness and visual disturbances. On neurological exam, he had

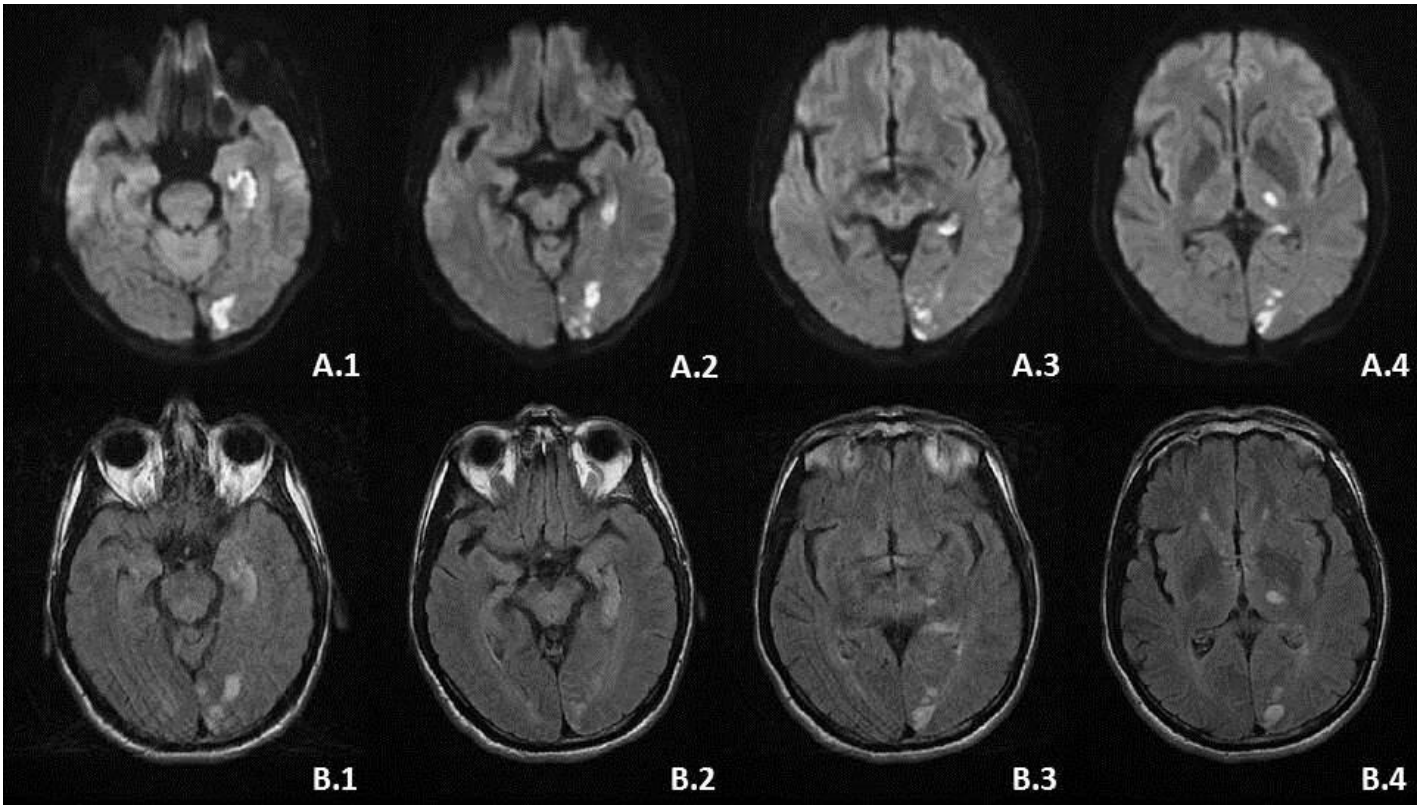

Figure 1: Diffusion (A.1 to A.4) and Flair (B.1 to B.4) axial brain MRI cuts, showing the subacute ischemic lesions in the left occipital lobe, hippocampus and thalamus.

anterograde amnesia, decreased pinprick sensation on his right arm, and right homonymous hemianopsia.

Brain MRI/MRA demonstrated subacute ischemic lesions in the left occipital lobe, hippocampus, and thalamus (Figure 1), attributed to distal occlusion of the left PCA (Figure 2). In this case, this occlusion led to multiple infarcts in different anatomical structures, causing a constellation of variant neurological signs. Moreover, the vascular supply of the posterior two thirds of the hippocampus is derived from the P2 segment of the PCA and the rostral third is generally irrigated by segments of the anterior choroidal arteries. [2]

The pathophysiology underlying this case was not studied in the emergency room but rather followed up with the neurology team, similar to the explications given by Sparaco in a study in 2019, the reason behind the stroke was thought to involve interruption of blood flow secondary to an embolism [11]. The oxygen-deprived brain tissue led to ischemic injury, which in our case led to a different clinical presentation than the usual visual, sensory, and motor impairments, as it affected the hippocampal vascular territory [11].

In fact, this case of PCA occlusion in a 64-year-old patient with multiple vascular risk factors is notable for its unique anterior infarct of the hippocampus. It has been found by Arboix et al that infarctions in the vascular territory of the posterior cerebral artery typically show limb weakness and visual defects such as hemianopsia, and sensory deficits [12]. Similarly, Robotham et al showed particularly that a posterior stroke can cause color perception deficits [13]; whereas this case exhibited memory disturbances as a result of this stroke which is rarely mentioned in the literature.

The diagnosis of a PCA stroke does not differ from other acute ischemic strokes in the brain, in our case, the procedure involved neurovascular imaging, which was enough to establish a diagnosis; to that we can add from the literature, cardiac monitoring with electrocardiogram and echogram to detect underlying heart conditions and blood tests for homeostasis [14,15].

As for the treatment and prognosis, the findings in the literature are consistent with our plan. The patient was put on therapeutic dose antiplatelet and

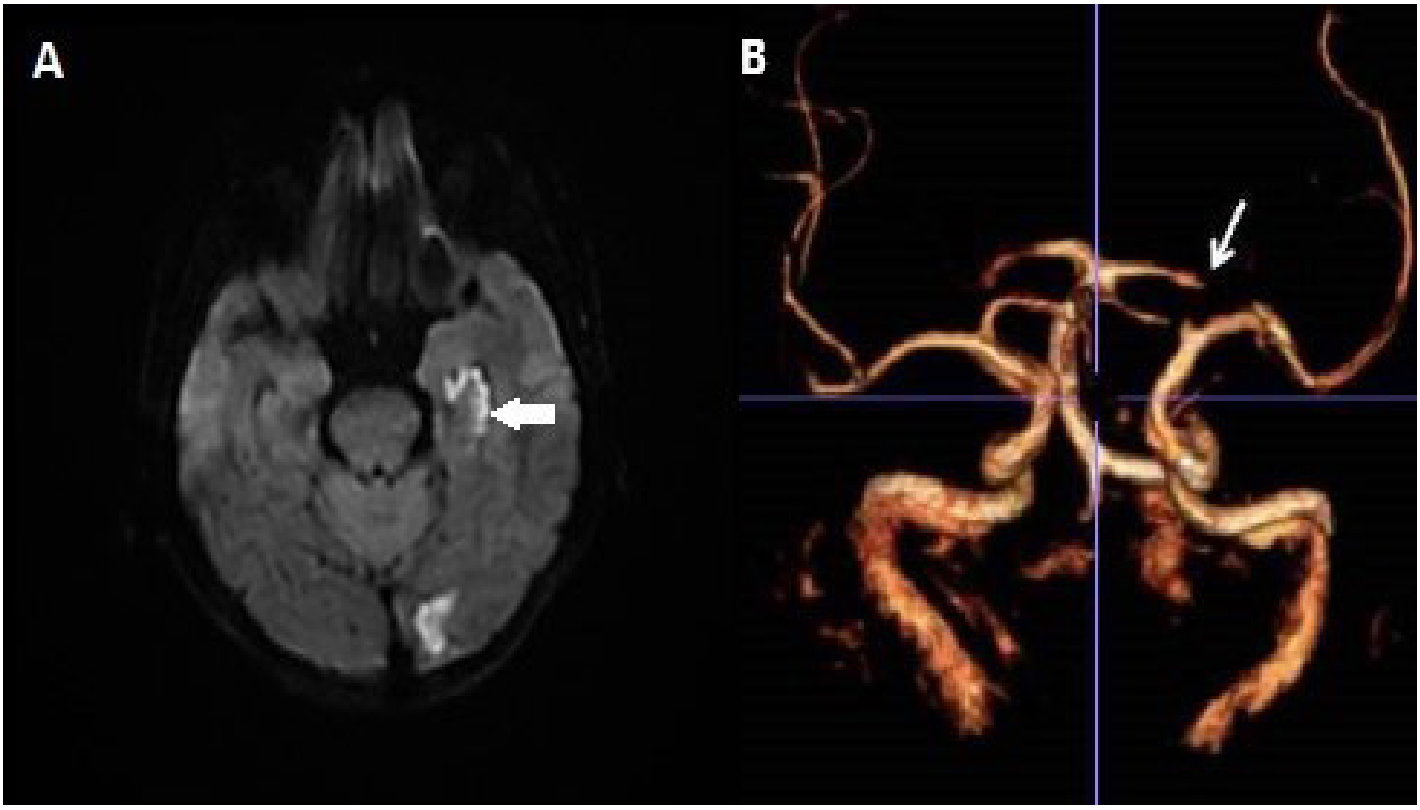

Figure 2: (A) Diffusion axial brain MRI cuts, showing the subacute ischemic lesions in the left occipital lobe and hippocampus (arrow). (B) 3D reconstruction of the cerebral circulation showing occlusion of the distal segment of the left PCA (arrow).

preventive dose anti-coagulation, as no indication for thrombolysis was found [16]; however, several recent studies show other promising interventions such as Tenecteplase for ischemia with proven occlusion or endovascular intervention [17,18]. Our patient had a good outcome, in fact, studies showed that similar presentations presented brain edema, infection, long-term disability, and even mortality [19], hence close monitoring and follow-up are essential for this patient.

Conclusion

The hippocampal structures have a pivotal role in memory processing. Damage to the hippocampus can impair memory processes [10}. Due to its vascularization by the PCA, the hippocampus is involved in large territorial strokes from adjacent structures. Symptoms like visual field defects, confusion, weakness, and general status alteration are always associated with it.

Memory problems were experienced by a 64-year-old patient who had several vascular risk factors and a distinct anterior hippocampal infarct brought on by PCA blockage. When there is an isolated hippocampal stroke, TGA is the most apparent symptom of presentation. Usually, the amnesia is transient and resolves within 24 hours after medical therapy.

Due to false negative and radiological delay on early CT scans, brain MRI/MRA can help in the diagnosis and identifying the ischemic area, in fact, blood tests, heart monitoring, and neurovascular imaging should be used in the diagnosis process. Antiplatelet and anticoagulant medication were part of the treatment, and Tenecteplase or endovascular intervention might also be used. The patient's result was favorable, but close monitoring is necessary due to potential complications.

Abbreviations

MRI	Magnetic Radiographic Imaging
MRA	Magnetic Radiographic Angiography
PCA	Posterior Cerebral Artery
DWI	Diffusion-Weighted MRI
TGA	Transient Global Amnesia
ED	Emergency Department
CN	Cranial Nerves
DTR	Deep Tendon Reflex

Conflict of interests

This manuscript has not been published and is not under consideration for publication elsewhere. All the authors meet the authorship requirements and have read and approved the manuscript. There is no conflict of interest.

A written and verbal consent was taken from the patient.

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