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Case Report

Left dural carotid cavernous fistula mimicking an inflammatory process: A case report ☆,☆☆,★,★★

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ABSTRACT

A female in her 70s presented with altered mental status, left eye pain, ophthalmalgia, and diplopia following a fall. Brain MRI demonstrated contrast-enhancing left peri-insular T2 hyperintense changes that was read as possible herpes simplex encephalitis by neuroradiology. Cerebral angiogram revealed a Barrow Type D left sided carotid cavernous fistula. The patient was subsequently treated with endovascular transvenous coil embolization of the left cavernous sinus resulting in complete occlusion of the fistula. The goal of this case is to present a unique case of a carotid cavernous fistula radiologically mimicking herpes simplex encephalitis. Early recognition of carotid cavernous fistula on neuroimaging is important for prompt treatment of symptoms.

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Introduction

Carotid cavernous fistula (CCF) is an abnormal connection between the internal carotid artery (ICA) and/or external carotid artery (ECA) and the cavernous sinus, thus resulting in an arteriovenous shunt. The formation of CCFs can be spontaneous or secondary to trauma. Anterior-draining CCFs present with orbital symptoms and can be mistaken for infectious/inflammatory pathologies [1]. Symptoms of CCFs include blurred vision, headache, diplopia, proptosis, chemosis and ophthalmoplegia [2]. We describe a case of a patient who was originally misdiagnosed as HSV encephalitis based on neuroimaging who was eventually confirmed to have a CCF.

Case report

A female in her 70s with a history of thyroid eye disease and atrial fibrillation presented to the emergency department

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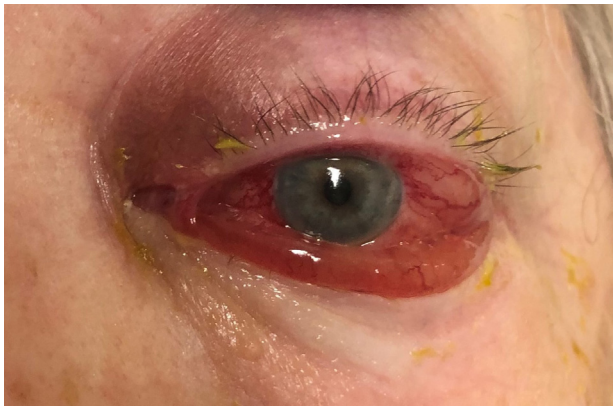

Fig. 1 – Patient's eye during hospital admission.

(ED) with monocular pathology and a decreased level of consciousness in addition to nausea, vomiting, left eye proptosis, chemosis, and ophthalmalgia. She also had symptoms of eye pressure and difficulty abducting her left eye. Two months earlier she presented to the ED after a fall in which a head CT was negative for intracranial hemorrhage.

Neurological examination revealed confused mental status and left eye ophthalmoparesis with chemosis and injection (Fig. 1). A brain MRI revealed a large (2.3 × 2.4 × 1.3 cm) focus of cortical/juxtacortical enhancement with adjacent edema involving the left insula and inferior left frontal lobe (Figs. 2A and B). MRI and head CT with contrast demonstrated abnormal hyperenhancement of the left cavernous sinus and left intraconal fat, dilation of the left superior ophthalmic vein, and left sided proptosis (Figs. 2A, 3A, and B). CT venography was negative for venous sinus thrombosis. The combination of the cortical enhancement and peri-insular edema was read by neuroradiology as representing infectious encephalitis secondary herpes simplex virus (HSV). Cerebrospinal fluid (CSF) showed 7/μL WBCs, 787/μL RBCs, 59 mg/dL protein, and 94 mg/dL glucose. HSV PCR was negative.

A diagnostic cerebral angiogram was subsequently performed and revealed a Barrow Type D left CCF with arterial flow from multiple meningeal branches of the ICA and ECA (Figs. 2C and D). Two days later, the patient underwent endovascular transvenous coil embolization of the left cavernous sinus resulting in complete occlusion of the fistula. On postoperative day 1, the patient showed a reduction in proptosis, chemosis, intraocular pressure, and conjunctival injection.

Discussion

This case highlights atypical radiological findings of CCF that were initially radiologically mistaken for HSV encephalitis. Initial findings on brain MRI showed left peri-insular and left frontal lobe T2-prolongation with mass effect on fluid-attenuated inversion recovered (FLAIR) images with parenchymal enhancement. These atypical imaging results can often be seen in HSV encephalitis, which delayed the correct diagnosis in this patient [3]. It is important to consider limbic system involvement as a manifestation of CCF. The correct diagnosis was not confirmed until the cerebral angiogram revealed the CCF. Transcranial ultrasound sonography is a potential imaging option to detect CCF, as it can identify atherosclerosis in the ICA [4]. Ultrasound can also help quickly rule out vascular pathology for patients presenting with similar symptoms [4].

The CCF was likely a result of the fall from 2 months prior. Our patient was diagnosed with Barrow Type D left CCF, which indicates there was an atypical connection between the meningeal branches of the left ICA, left ECA, and the cavernous sinus. Barrow Type D has an incidence of 21% of all CCFs and are commonly seen in elderly females, consistent with our patient demographics [2,5]. To avoid misdiagnosis, a thorough diagnostic workup is critical for early detection and diagnosis of CCF.

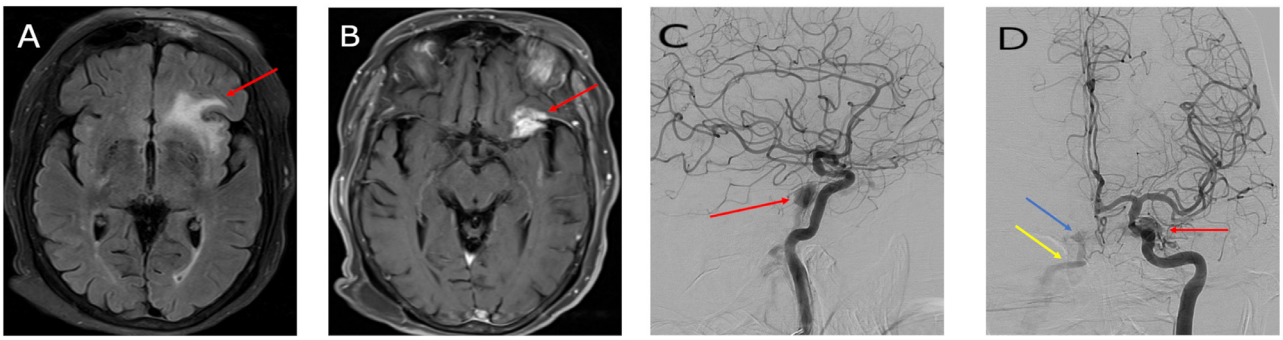

Fig. 2 (– A) Axial FLAIR sequence from a brain MRI demonstrates anteroinferior left frontal lobe and left sub-insular edema. (B) Axial T1-weighted post-contrast sequence from a brain MRI demonstrates abnormal enhancement in the anteroinferior left frontal lobe and left sub-insular region. (C) Arterial phase cerebral angiogram of the left ICA in the lateral projection demonstrates early filling of the left cavernous sinus consistent with an indirect CCF. (D) Arterial phase cerebral angiogram of the left ICA in the frontal projection demonstrates early filling of the left cavernous sinus (Red arrow) consistent with an indirect CCF. Note rapid flow across midline into the right cavernous sinus (Blue arrow) and right inferior petrosal sinus (Yellow arrow).

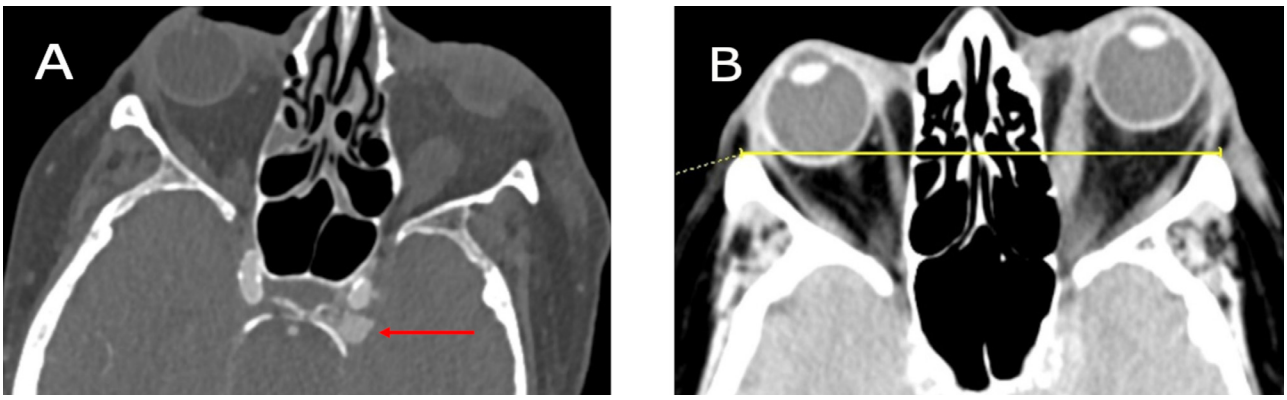

Fig. 3 (– A) Axial head CTA demonstrates early filling of the posterior left cavernous sinus, which is suspicious for a CCF. (B) Axial NCCT demonstrates left sided proptosis as indicated by significant anterior displacement of the left globe compared to the right.

Conclusions

This case emphasizes that a CCF can radiologically mimic HSV encephalitis. Cerebral angiography may be an indication if CSF analysis fails to demonstrate inflammation on lumbar puncture. To avoid misdiagnosis of a CCF, clinicians must conduct a comprehensive workup to reach an early diagnosis.

Patient consent

Written informed consent for patient information and images to be published was provided by the patient and is retained by the research team.

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