

Pseudo hyperdense middle cerebral artery sign in a patient with HSV encephalitis –A case report and literature review

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Abstract

Hyperdense vessel sign is defined as focal increased attenuation of a vessel (either artery or vein) seen on non-contrast Computed tomography (NCCT). This is due to vessel occlusion, mainly by a thrombus or embolus. The high attenuation of a thrombus is due to the extrusion of plasma in the thrombus with a subsequent increase in the local hematocrit level. It is most observed in the middle cerebral artery (MCA) in ischemic stroke. However, hyperdense signs can also be observed due to other causes which are deemed as false positive.

Here we report a 26-year-old male patient with no past medical history, presented to our emergency department with history of fever, headache, and confusion for 2 days. On the day of admission, he had 3 episodes of seizure and was therefore brought to the hospital. On assessment, the patient was conscious but not communicating. Physical examination showed neck stiffness, power is normal in all four limbs. NCCT brain showed subtle hypodensity involving the right parietotemporal region with hyperdense MCA. Subsequently, computed tomography (CT) angiography of the head was done and revealed normal blood vessels with a pseudo-hyperdense MCA sign on the right side. Lumbar puncture showed findings suggestive of viral encephalitis with positive herpes simplex virus (HSV) polymerase chain reaction (PCR).

Keywords: Hyperdense MCA sign, HSV encephalitis, pseudo hyperdense MCA, CT brain angiography, case report

Introduction

Hyperdense MCA (HMCA) sign is defined as a focal increased attenuation of the middle cerebral artery (MCA) - most commonly in the proximal segment- seen in non-contrast-enhanced computed tomography (NCCT). It is due to vessel occlusion, mainly by a thrombus or embolus occurring in early ischemic strokes, subsequently confirmed by angiography^[1]. However, a range of conditions can produce a falsely dense-appearing MCA in the absence of thrombus — the pseudo-hyperdense MCA sign — which can mislead clinicians toward an incorrect diagnosis of ischemic stroke. False positive results are occasionally seen in cases of atherosclerotic calcified disease as well as cases of high hematocrit like polycythemia, and in rare cases of herpes simplex encephalitis (HSV).^[2] Correct recognition of this sign as a false positive has assumed greater importance with the advent of thrombolytic therapy for stroke. Here we report a case of herpes simplex encephalitis (HSV) encephalitis with a hyperdense MCA sign in the initial NCCT brain.

Case report

This 26 year old patient with no past medical history, was admitted with a history of fever, headache, and confusion for 2 days. The patient had 3 episodes of seizure, and was therefore brought to the hospital. On assessment, he was conscious but not communicating, restless and irritable. There were no focal neurological deficit, but he had signs of meningeal irritation.

His initial NCCT brain showed subtle hypodensity involving the right parietotemporal region with a hyperdense right MCA^[fig 1,2]. Subsequently, CT angiography was done and revealed normal blood vessels.^[fig 3] We proceeded with lumbar puncture which showed elevated cell count with lymphocytic predominance and elevated protein level. HSV Polymerase chain reaction (PCR) was positive. All his other laboratory parameters were within normal limits. The patient was started on acyclovir, antiepileptics and supportive care according to the protocol. He gradually improved and was discharged home after 25 days with complete recovery.

Discussion

Hyperdense vessel sign can be observed in all intracranial arteries in early ischemic stroke. Also, it can be observed in intracranial veins in cerebral venous thrombosis. However, when identifying the hyperdense sign, it is more commonly recognized in the middle cerebral artery. Hyperdense MCA sign is one of the earliest signs of acute ischemic stroke appearing within 90 seconds of stroke onset. In the advent of thrombolysis, it is a useful sign for selecting patients for treatment.^[3] False positive HMCA can occur due to other causes such as atherosclerotic calcified disease as well as cases of high hematocrit like polycythemia, and in rare cases of herpes simplex encephalitis.

Several published cases demonstrate the real-world stakes of this pitfall. In one report, a 56-year-old man presenting with disorientation, slurred speech, and generalized weakness

was found to have a hyperdense right MCA on CT and was being prepared for thrombolysis. However, magnetic resonance imaging (MRI) showed no diffusion restriction and patent MCAs bilaterally on MR angiography. Re-assessment of the CT found the vessel measured only 46 HU, with similar hyperdense dots noted in the contralateral MCA branches — leading to a corrected diagnosis of pseudo-hyperdense MCA sign, with his symptoms ultimately attributed to hyponatremia [4].

In another reported case, a 60-year-old man presenting with seizures had an apparently hyperdense left MCA with adjacent hypodense parenchyma on CT. However, the absolute attenuation value of the hyperdense-appearing left MCA was only 36 HU, compared with 35 HU on the normal-appearing right side. MRI ultimately revealed an infiltrating left frontal and temporal mass rather than thrombus [5].

A further case linked pseudo-hyper density to malignancy, describing a pseudo hyperdense right MCA sign with an HU value of 59, compared with surrounding structures such as the calvarium and transverse sinus, in a patient with brain cancer. CT angiography confirmed that the right MCA remained patent [6].

Varkey et al [7] have reported a similar case to ours, where a 67 year old patient presented with left sided weakness, progressive drowsiness with low grade fever. His CT showed hypodensity in right temporal and frontal regions with hyperdense MCA sign. CT angiography showed patent vessels and CSF HSV PCR was positive.

Our patient had a clear history of fever with altered sensorium and seizures which point to the infective etiology. In our case, the observed pseudo-hyperdense MCA sign can be best justified by the hypoattenuating brain parenchyma adjacent to the MCA, which is caused by encephalitis.

Across these reports, several consistent recommendations emerge: the presence of a true hyperdense sign can be confirmed by measuring attenuation value compared with the normal-appearing contralateral side; mimics of a hyperdense sign, including vascular calcification, raised hematocrit, and intravenous contrast medium, should be considered; and careful attention should be paid to the surrounding brain parenchyma to assess for hypodensity or other differentiating features suggestive of tumor, infection, or contusion [5]. When the diagnosis remains equivocal after density comparison, confirmatory imaging with MRI/DWI or CT angiography is warranted before proceeding with thrombolytic therapy [4].

Conclusion

The hyperdense MCA sign remains a valuable and highly specific early indicator of thromboembolic occlusion on non-contrast CT, but its pseudo variant — driven by hematocrit, calcification, contrast administration, or adjacent parenchymal density changes — is a well-documented diagnostic pitfall with direct implications for thrombolysis decisions. Systematic side-to-side density comparison using established HU thresholds, combined with attention to the adjacent parenchyma and confirmatory imaging when uncertain, is the recommended approach to avoid misdiagnosis. Clinicians should remain alert to false-positive findings when formulating a diagnosis. In all cases, both clinical and radiological correlation are essential to prevent delays in treatment.

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Patient's consent

Patient written informed consent has been taken to use his images and relevant information for publication.

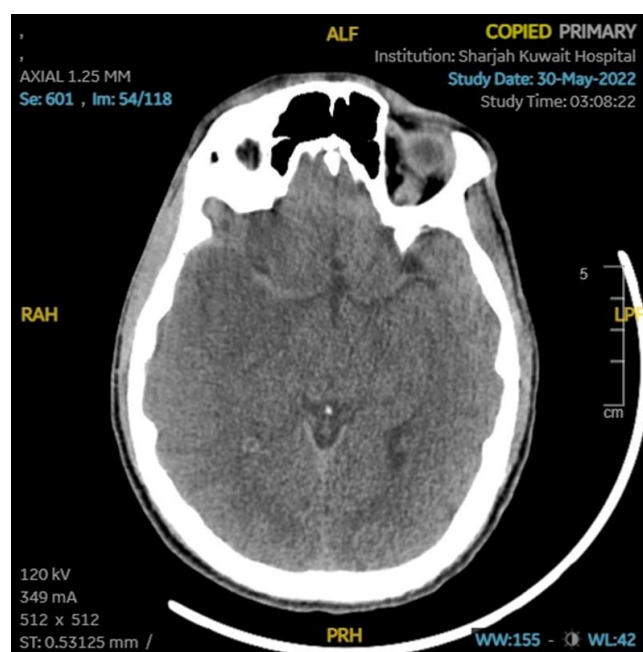


Fig 1: -CT brain axial images showing hyperdense right middle cerebral artery



Fig 2: CT brain axial images showing hyperdense right middle cerebral artery

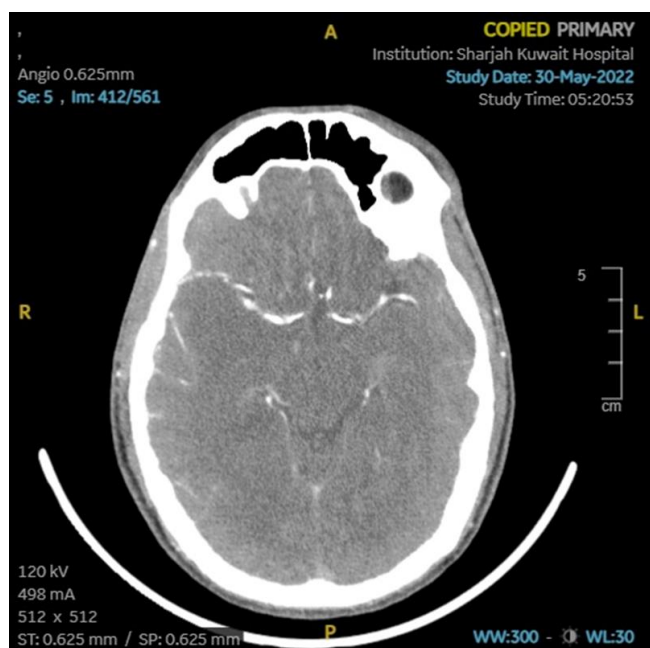


Fig 3: CT brain contrast images showing normal middle cerebral artery on both sides

References

1. Gács G, Fox AJ, Barnett HJ, Vinuela F. CT visualization of intracranial arterial thromboembolism. *Stroke*,1983;14(5):756-62. doi: 10.1161/01.str.14.5.756. PMID: 6658961.
2. Koo CK, Teasdale E, Muir KW. What constitutes a true hyperdense middle cerebral artery sign? *Cerebrovasc Dis*,2000;10(6):419-23. doi: 10.1159/000016101. PMID: 11070370.
3. Chieng JSL, Singh DR, Chawla A, Peh WC. The hyperdense vessel sign in cerebral computed tomography: pearls and pitfalls. *Singapore Med J*,2020;61(5):230-237. doi: 10.11622/smedj.2020074. PMID: 32754771; PMCID: PMC7905153.
4. Krishnan P. Pseudo-hyperdense MCA sign: The value of comparing CT densities of vessels on both sides. *Journal of Cerebrovascular Sciences*,2021;9:41. 10.4103/jcvs.jcvs_5_21.
5. Jha B, Kothari M. Pearls & oy-sters: hyperdense or pseudohyperdense MCA sign: a Damocles sword? *Neurology*,2009;72(23):e116-7. doi: 10.1212/ WNL.0b013e3181a92b3b. PMID: 19506216.
6. Lekoubou A, Srinivasan P, Kanekar SG. Pseudohyperdense Middle Cerebral Artery and Brain Cancer: An Unusual Association. *Stroke*,2023;54(2):e34-e35. doi: 10.1161/STROKEAHA.121.038322. Epub 2022 Nov 4. PMID: 36330796.
7. Maramattom BV, Wijdicks EFM. A misleading hyperdense MCA sign. *Neurology*,2004;63(3):586–6. www.neurology.org/doi/abs/10.1212/01.WNL.0000130358.23500.6E