Pearls & Oysters: Hyperdense or pseudohyperdense MCA sign A Damocles sword?

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PEARL: HYPERDENSE MCA SIGN

- The hyperdense middle cerebral artery (MCA) sign is an insensitive but specific sign suggestive of vascular thrombosis in patients presenting with ischemic stroke.

OY-STERS: PSEUDOHYPERDENSE MCA SIGN

- The presence of a true hyperdense sign can be confirmed by measuring attenuation value as compared to the normal-appearing contralateral side.
- Mimics of a hyperdense sign (i.e., a pseudohyperdense sign) include vascular calcification, raised hematocrit, and intravenous contrast medium.
- Careful attention should also be paid to the surrounding brain parenchyma to assess for hypodensity or any differentiating features suggestive of tumor, infection, or contusion.

Unenhanced CT of the head is usually the first diagnostic study performed for the investigation of acute neurologic signs and symptoms. Specific diagnostic features are helpful for accurate and prompt management of these patients. A hyperdense sign of the MCA was first described in 1983¹ as an indirect sign of ischemic stroke. Subsequently, numerous articles have detailed the causes of this sign, measured the attenuation differences between normal and thrombosed vessels, and elucidated other conditions which may give a false impression of a hyperdense MCA sign.² We present a case report of a patient who presented with seizures and had a pseudohyperdense MCA sign. We discuss the differential diagnosis of hyperdense MCA sign and features to differentiate it from pseudohyperdense MCA sign.

CASE REPORT A 60-year-old man presented with generalized seizures. Apart from confusion, there were no other neurologic abnormalities. A CT was performed which demonstrated an appar-

ent hyperdense MCA on the left side with hypodensity of the adjacent brain parenchyma (figure, A). However, the absolute attenuation value of the hyperdense-appearing left MCA was 36 Hounsfield units (HU) and on the normal-appearing right side was 35 HU. MRI and magnetic resonance angiography demonstrated a mildly enhancing infiltrating left frontal and temporal mass (figure, B) with a patent MCA (figure, C) and no evidence of infarct. Biopsy confirmed a low-grade astrocytoma.

DISCUSSION The hyperdense MCA sign on unenhanced CT of the head in patients presenting with presumed acute ischemic stroke has been reported to have high specificity and positive predictive value for thromboembolic occlusion of the MCA. It is associated with poor prognosis. In a study³ to establish objective criteria for hyperdense MCA sign, the authors concluded that an absolute attenuation value of abnormal MCA above 43 HU and a ratio of dense abnormal MCA attenuation to normal-appearing contralateral MCA attenuation of more than 1.2 correctly identified all the hyperdense MCAs associated with acute ischemic stroke.

It is important, however, to recognize conditions in which the hyperdense MCA sign is misleading. It has been noted that the MCA may appear hyperdense without any intraluminal thrombosis. This pseudohyperdense MCA sign may be seen in the presence of conditions affecting the density of intraluminal content, wall density, and extraluminal density.⁴ Intraluminal hyperdensity may be due to increased hematocrit, contrast medium from a different source, or increased serum density from ingested substances such as cocaine. Partial volume averaging artifact from vascular wall hyperdensity, such as in vascular wall calcification, can also result in pseudohyperdensity. This may be seen with diabetes, hypertension, and elevated cholesterol, or it may be idiopathic. The hyperdense MCA sign is generally transient, but hyperdensity due to vessel wall calcifi-

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Figure Head CT (A), brain MRI (B), and brain magnetic resonance angiography (C)

(A) Head CT: unenhanced CT head axial image which demonstrates a relatively hyperdense appearing left middle cerebral artery (MCA) with hypodensity of adjacent brain parenchyma. The absolute attenuation value of the left MCA was 36 HU and of the right MCA was 35 HU. (B) Brain MRI: axial T2-weighted image of the brain demonstrates a hyperintense infiltrating mass of the left posterior frontal and temporal lobe with mass effect. Normal flow void is also noted through the left MCA branches. (C) Brain magnetic resonance angiography: maximum intensity projection image of MRA of the brain which demonstrates a patent MCA on the left side (arrow).

cation will be stable, and so comparison with a previous study, if available, will help to confirm the diagnosis. Another important cause of pseudohyperdense MCA sign is a normal density MCA appearing hyperdense due to adjacent abnormal parenchymal hypodensity. This may appear in the setting of infection, tumor, or contusion. Comparison of the attenuation value of the abnormal-appearing vasculature with other vessels in the intracranial cavity will reveal no significant differences, as it did in our case. Abnormal enhancement may also help to differentiate ischemia from infection and tumor. Characteristic areas of involvement may help diagnose infections such as herpes encephalitis. Evidence of calcification may also suggest a neoplastic or dysplastic lesion.

Further imaging with MRI can help to distinguish these situations.

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