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MR Angiography of the Primitive Trigeminal Artery: Report on Two Cases

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Although conventional or digital X-ray angiography is still the standard method in the diagnosis of intracranial vascular abnormalities, MR imaging is gaining a more prominent role in this respect. MR angiography is a new method of vascular imaging that provides projection images resembling conventional angiography [1, 2]. We present the MR angiographic findings in two patients with primitive trigeminal arteries, which were found incidentally on digital subtraction angiography (DSA) or MR imaging studies.

Case Reports

Case 1

A 54-year-old woman with a history of transient ischemic attacks was referred for intraarterial DSA to rule out extra- or intracranial arterial stenosis. Although the angiographic study did not demonstrate significant arteriosclerotic disease, the left common carotid arteriogram (Fig. 1A) showed a vessel originating from the distal petrous portion of the internal carotid artery and joining the basilar artery below the origins of the superior cerebellar arteries, a finding consistent with a primitive trigeminal artery. This abnormal artery had a slight concentric stenosis at its origin.

Case 2

A 59-year-old man was hospitalized for diagnostic work-up of secondary hypogonadism with a reported elevation of prolactin. Extensive endocrinological tests yielded normal results for all pituitary hormonal functions. Serum prolactin level was normal. CT had shown a paramedian defect of the dorsum sellae. An MR study of the sella was done to rule out a sellar tumor.

The T1-weighted spin-echo (SE) scans with 500/15/2 (TR/TE/excitations), slice thickness of 3 mm, and two overlapping series with a 0.8 slice-gap in sagittal and coronal orientations showed an abnormal intrasellar vessel (Fig. 2A) connecting the right carotid artery and the basilar artery, which had the typical course of a trigeminal artery. No X-ray angiography was performed.

MR imaging was performed on a 1.5-T system (Magnetom, Siemens AG, Erlangen). After obtaining T1-weighted SE images, MR angiography was performed in sagittal and axial orientations in both patients with a 3D-FISP sequence [3] (40/8, flip angle of 15°) with flow compensation in the read-out and slice-select directions [4]. The imaging volume had a thickness of 80 or 40 mm, with 64 (32) partitions, each slice having a thickness of 1.25 mm. The image matrix was 256 × 256, the acquisition time was 10.56 (5.28) min.

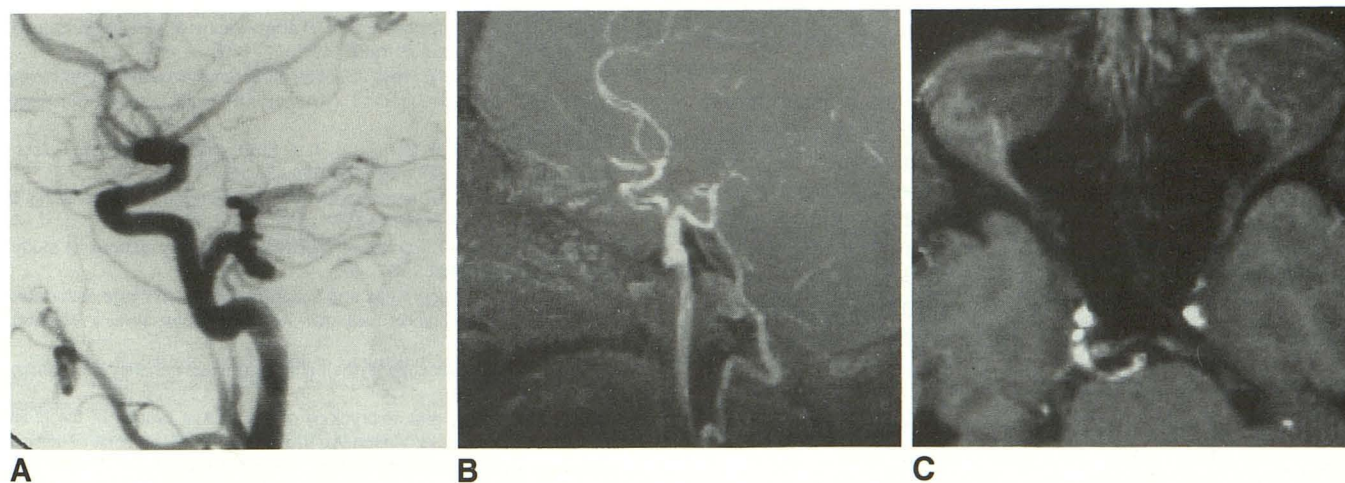


Fig. 1.—Case 1: Parasellar trigeminal artery.

A, Left common carotid intraarterial digital subtraction angiography shows trigeminal artery with a slight stenosis at its origin.

B, Oblique (30°) reconstruction of sagittal MR angiography more clearly shows abnormal carotid-basilar anastomosis.

C, Axial MR angiography shows parasellar course of trigeminal artery.

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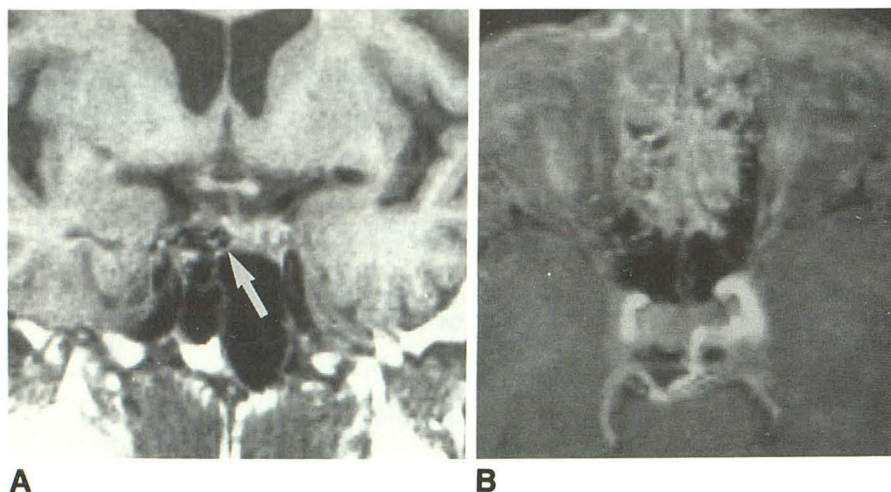


Fig. 2.—Case 2: Intraseptal trigeminal artery.
A, Coronal T1-weighted MR scan shows an abnormal intraseptal vessel (arrow) displacing the pituitary gland.
B, Axial MR angiography with selective reconstruction shows intraseptal course of primitive trigeminal artery.

The data sets were postprocessed by means of a ray-tracing algorithm incorporating a maximum-intensity projection algorithm to obtain 2D-projections of different views [4].

Results and Discussion

In both patients the MR angiograms of the primitive trigeminal artery provided better delineation of the vascular anomaly than did the T1-weighted SE images. The sagittal series with selective reconstruction of the pathologic side demonstrated the vascular abnormality with quality comparable to conventional angiography; angulated reconstructions more clearly showing the persistent embryonic anastomosis (Fig. 1B).

Axial MR angiography provided a unique view of the trigeminal artery. In this view a significant difference between the two cases could be seen: in patient 1 the trigeminal artery had a parasellar course (Fig. 1C), while in patient 2 the artery was intraseptal, piercing the dorsum sellae (Fig. 2B). This variation of the trigeminal artery [5] has not been recognized previously on angiographic studies. In the first patient the DSA and MR angiogram correlated well. However, the slight stenosis of the trigeminal artery was not definitively shown with MR angiography.

The primitive trigeminal artery, although the most common of the persistent carotid-basilar anastomoses, is a rare vascular anomaly with a reported frequency of about 0.02–0.6% of angiographic examinations [6, 7]. The trigeminal artery appears in the 3-mm stage of the embryo and, like the proatlantic, hypoglossal, and otic arteries, connects the carotid system with the anterior longitudinal arteries, which later fuse into the basilar artery [8]. Normally, these anastomoses exist for about 7–10 days [9], the trigeminal artery being the most important and last to close [10]. Failure of obliteration results in a persistent embryonic artery. Originating in the cavernous portion of the internal carotid artery, the primitive trigeminal artery either runs along the trigeminal nerve or crosses the sella displacing the hypophysis before joining the basilar artery.

The clinical relevance of this vascular anomaly is disputed. A higher incidence of intracranial vascular anomalies, like aneurysms, is reported in the presence of a persistent trigeminal artery [6], while others consider it to be an incidental finding without significance [7]. However, this vascular anomaly may be of functional importance in patients with carotid stenoses and may provide a pathway for cerebral embolism [11].

Before the introduction of MR, conventional angiography was the only method for the in vivo diagnosis of the primitive trigeminal artery. Since then, three cases diagnosed by means of MR imaging have been published [2, 12, 13].

MR angiography is noninvasive and provides projection images of the vascular system comparable to conventional angiography without the need for contrast medium injection. Postprocessing of the data sets allows angulated reconstructions or reconstructions of selected slices, similar in appearance to angiotomograms, allowing the separation of overlaying vessels. Multiple and uncommon views, like axial views of the trigeminal artery, are possible with MR angiography without significant inconvenience or risk to the patient. Despite the inferior anatomic resolution relative to intraarterial DSA or conventional angiography, MR angiography allows a definite diagnosis and excellent demonstration of anomalous vessels, like the primitive trigeminal artery.

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