

CASE REPORT

# Persistent trigeminal artery presenting as intermittent isolated sixth nerve palsy

R.S. Kalidindi<sup>a,\*</sup>, F. Balen<sup>a</sup>, A. Hassan<sup>b</sup>, A. Al-Din<sup>b</sup>

Departments of <sup>a</sup>Radiology and <sup>b</sup>Neurology, Pinderfields General Hospital, Wakefield, UK

## Introduction

Persistent primitive carotid-basilar anastomoses are embryological vascular remnants and are uncommon.<sup>1</sup> The most frequent embryonic communication between the carotid and vertebrbasilar systems is a persistent trigeminal artery (PTA). This has been observed in 0.1-0.2% of cerebral angiograms, usually as an incidental finding.<sup>2</sup> Although the presence of PTAs is generally thought to be of uncertain significance, these arteries and their variants have been identified as a rare cause of cranial nerve dysfunction, including incomplete oculomotor nerve palsy, trigeminal neuralgia and hemifacial spasm,<sup>3,4</sup> and there has been a reported case of a PTA variant with an aneurysm causing isolated sixth nerve palsy.<sup>5</sup> We report a case which, to our knowledge, is the first documented classic (non-variant) PTA without an associated aneurysm presenting with an intermittent isolated sixth nerve palsy. The salient anatomical and imaging features of the PTA are reviewed.

## Case report

A 57-year-old lady suddenly noticed the onset of diplopia which was worse on looking towards the left. These symptoms resolved spontaneously over 2 weeks. Three months later the diplopia returned and again improved over 2 months. Subsequently she went on a fairground ride and found that her symptoms got significantly worse coming off the ride. On examination, she had an isolated sixth nerve palsy on the left. The other cranial nerves

were intact. There was no focal abnormality in the peripheral neurological system. She initially had non-contrast CT of her brain, which was reported as normal. She went on to have MRI of the brain with MRA. A lumbar puncture was planned but not performed in view of the MRI findings.

MRI showed an abnormal vessel (PTA) joining the cavernous portion of the left internal carotid artery and the distal basilar artery (Fig. 1). No aneurysms were identified. The vertebrbasilar arteries proximal to the anastomosis were hypoplastic (Fig. 2). These findings were confirmed on MRA (Figs. 3 and 4). Further dedicated imaging of the brain stem and the cavernous sinus was performed for better demonstration of the relationship of the abnormal vessel with the cranial nerves (Figs. 5 and 6). Post-gadolinium imaging did not show any obvious enhancement of the sixth nerve. Based on the imaging, a diagnosis of left-sided PTA with compression of the sixth nerve was made and we assumed the site of compression to be within the cavernous sinus.

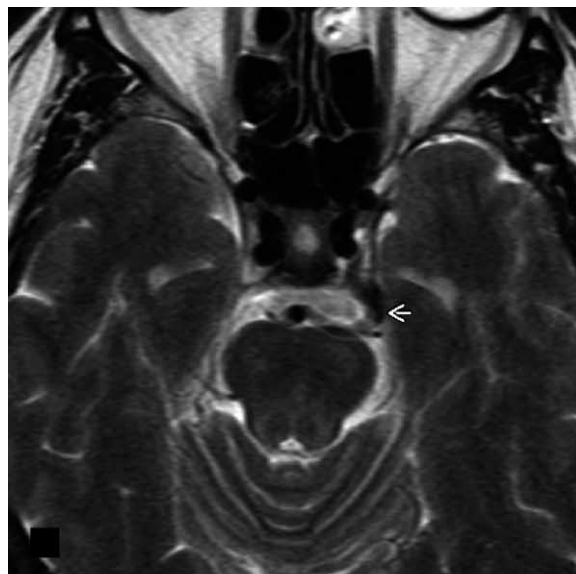
Spontaneous recovery of cranial nerve disorder due to vascular compression has been reported. In such cases, cranial nerve dysfunction was believed to have been caused by the transient increase in blood flow or dilatation of the vessels; the nerve could tolerate the mechanical compression and recover in several weeks.<sup>6</sup> This could explain the intermittent nature of symptoms in our patient.

## Discussion

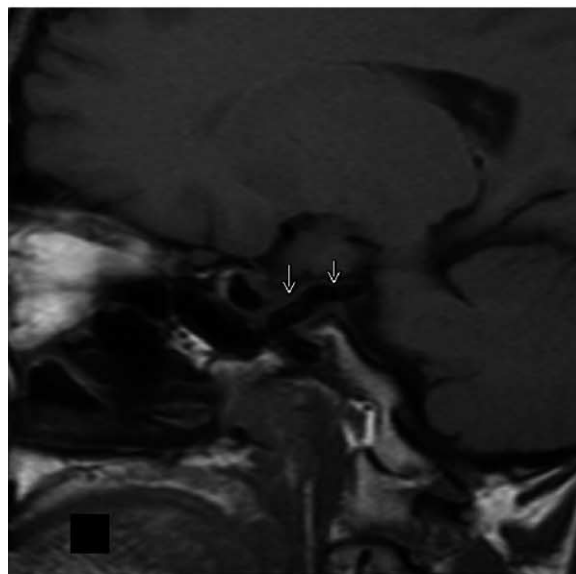
The most common causes and associations of non-traumatic isolated sixth nerve palsy are idiopathic palsy, diabetes, hypertension, multiple sclerosis, intracranial neoplasm and viral infection.<sup>7,8</sup> Intracranial aneurysms are also a known cause of sixth nerve palsy, usually in combination with other

\* Guarantor and correspondent: R. Kalidindi, 19 Tall Trees, Leeds LS17 7WA, UK. Tel.: +44 1924 212372; fax: +44 1924 212368.

E-mail address: ksvraju@hotmail.com (R.S. Kalidindi).



(a)

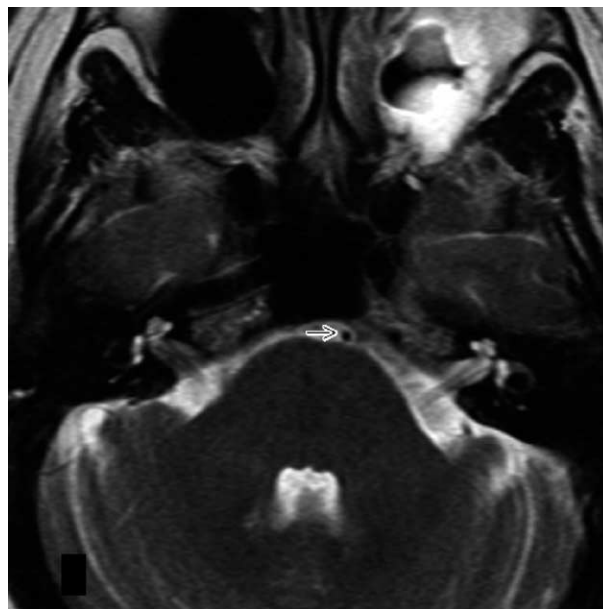


(b)

**Figure 1** (a) Axial T2- and (b) sagittal T1-weighted images of the brain showing an abnormal vessel (persistent trigeminal artery) joining the cavernous portion of the left internal carotid artery and the distal basilar artery.

cranial nerve palsies. PTAs and PTA variants have an association with intracranial aneurysms and could therefore occasionally cause sixth nerve palsy. However, as in our case, the aberrant vessel itself could be the cause of cranial nerve dysfunction without any associated aneurysms.

During interpretation of MRI performed for evaluation of patients with a sixth nerve palsy (with or without other cranial nerve dysfunction) it



**Figure 2** Axial T2-weighted image of the brain showing a hypoplastic basilar artery inferior to the carotid-basilar anastomosis.

is important to look for evidence of PTA with or without an aneurysm at its origin from the internal carotid artery (ICA). Knowledge of the anatomical relationships and imaging features of this artery is therefore very important for interpretation of these MR studies.

The PTA can take a lateral or a medial course. When it arises from the posterolateral aspect of the intracavernous portion of the ICA, it runs underneath the abducent nerve and continues caudally between the trigeminal and abducent nerves to join the distal basilar artery. When it arises from the posteromedial aspect of the intracavernous carotid artery, it runs caudally through the sella turcica and pierces the clival dura at the dorsum sellae to join the basilar artery. Cranial nerve displacement or distortion is less likely in this variation, but identification of a PTA with a trans-sellar course is crucial if trans-sphenoidal surgery is planned.<sup>2,9</sup>

On conventional MRI the basilar artery is often hypoplastic in its precommunal portion, enlarging to a more normal calibre above the communication. This can be an important ancillary sign in subtle cases, although the actual anastomosis may also be demonstrated.<sup>10</sup> Sagittal T1-weighted MRI may show the combination of the vertical and horizontal segments of the ICA and the proximal portion of the PTA creating the outline of the Greek letter T (the Tau sign).<sup>11</sup> MRA confirms the presence of PTA and shows its course, the source images being particularly helpful for the course.

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