

## CASE REPORT

# One-Sided Headache Is a Symptom Suggesting Aneurysmal Lesion in Patients with Isolated Abducens Nerve Palsy

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### ABSTRACT

An isolated unilateral abducens nerve palsy or headache alone usually yields negative findings on neuroimages. The authors report an individual with right abducens nerve palsy who developed a sudden, persistent headache on the right side. Magnetic resonance imaging (MRI) and magnetic resonance angiography (MRA) revealed a giant aneurysm of the cavernous carotid artery that was located along the course of the right abducens nerve. The findings in this case of isolated abducens nerve palsy suggest that headaches should be considered as important signs for intracranial aneurysmal lesions.

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Aneurysm; headache; isolated abducens nerve palsy; MRA; MRI

## Introduction

An isolated unilateral abducens nerve palsy in an elderly individual is most commonly caused by microvascular disorders such as in diabetes,<sup>1,2</sup> and it is characterised by a sudden onset of diplopia.<sup>3</sup> In these cases, a lesion is usually not found even by the current neuroimaging techniques. Although a brain tumour needs to be ruled out in cases of chronic abducens nerve palsy, abducens nerve palsy caused by a brain tumour is mostly accompanied by other cranial nerve palsies.<sup>1</sup> In addition, reports on cases with isolated abducens nerve palsy caused by aneurysmal compression are rare.<sup>4,5</sup>

Performing neuroimaging because of the presence of headaches alone yields negative findings in most cases.<sup>6</sup> We report our findings of an elderly individual with an isolated unilateral abducens nerve palsy caused by a compression by a giant aneurysm. The symptoms developed suddenly and were accompanied by headaches.

## Case report

A 66-year-old woman was referred to our hospital for neuro-ophthalmological consultation. She had experienced binocular, horizontal diplopia, which

worsened in right lateral gaze. She could not determine the exact date of the onset, but she stated that she noticed a persistent diplopia 2 weeks prior to the visit to our clinic. However, she reported that she had had a 4-month history of recurrent diplopia before our examination. She stated that the diplopia had occurred several times, and it spontaneously disappeared within a few days on all occurrences. She was not diabetic, but she was taking high blood pressure medication.

Our initial examination showed that her visual acuities were 20/20 OU, and she had 25 prism dioptres of esotropia (ET) in the primary position. The deviation increased to 50 prisms ET in the right gaze and decreased to 8 prisms ET in the left gaze. The abduction movements in the right eye were impaired (Figure 1A). The forced duction and Tensilon tests were negative. Ptosis was not present on either side (Figure 1) and was not induced by fatigue on sustained upward gaze. The pupil diameter in dim lighting was 4.0 mm on both sides. Her pupils reacted well to both light stimuli and near fixation. Other neurological deficits were not detected.

She was diagnosed with isolated right abducens nerve palsy. She had not had any head trauma before she noticed the diplopia, but she



**Figure 1.** Horizontal eye position during horizontal gaze in a patient with isolated right abducens nerve palsy (A) on the initial examination and (B) 1 month after endovascular surgery. (A) The right eye remains at the primary position on right gaze (left), whereas both eyes move fully on left lateral gaze (right). At the primary position (centre), ptosis is absent in both eyes. (B) After the treatment, the right abduction movement was improved (left).

complained of headaches in the right temporal region. Blood analyses showed that the C-reactive protein and erythrocyte sedimentation rate (ESR) were within normal limits.

The sustained headaches required us to perform neuroimaging, which was performed 1 week later. We carefully followed her condition and confirmed that no additional neurological deficits appeared.

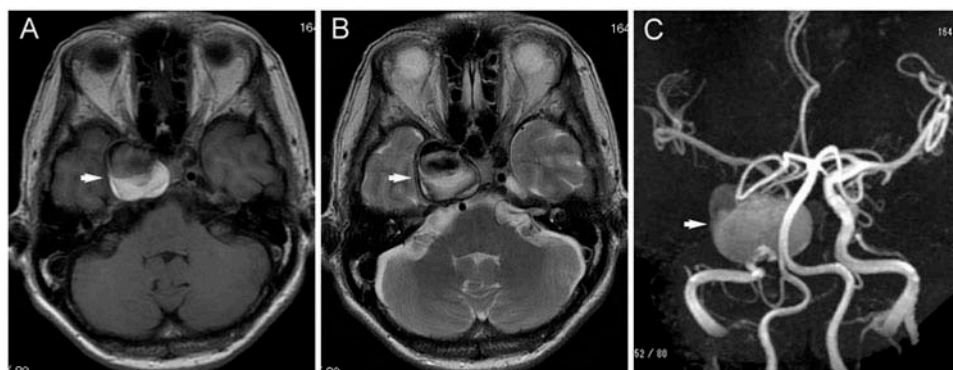
The magnetic resonance imaging (MRI) and time-of-flight (TOF) magnetic resonance angiography (MRA) revealed a giant aneurysm that was present ventral to the pons on the right side of the brain (Figure 2). The aneurysm protruded from the intracavernous carotid artery and was  $35 \times 28$  mm in size (Figure 2C). The aneurysm was located above the right abducens nerve. The MRA showed high-intensity signals combined with partially iso-intensity inside the aneurysm (Figure 2C). A heterogeneous pattern of intensities

was also seen in other MRI sequences, which suggested a development of a thrombus in the aneurysm.

She was transferred to the Department of Neuro-Surgery, and endovascular treatment was successfully performed for the aneurysm without significant complications. One month after the surgery, the patient stated that headaches had disappeared, but the right abducens nerve palsy still remained. However, the abduction limitation was relieved (Figure 1B).

## Discussion

An abducens nerve palsy is a relatively common intracranial disorder that causes horizontal diplopia. In elderly subjects who have vasculopathic risk factors, e.g., diabetes or hypertension, microvascular disorders are the major causes for isolated unilateral abducens nerve palsy.<sup>1,2,7</sup> However,



**Figure 2.** Neuroimages of a case of isolated abducens nerve palsy. (A) T1- and (B) T2-weighted MRI and (C) MRA images. The aneurysm protrudes from the right cavernous carotid artery and is located just ventral to the pons, where the right abducens nerve travels toward the lateral rectus muscle. High and low intensities are heterogeneously distributed inside the aneurysm (indicated by an arrow) in each image.

evidence should be sought for trauma, inflammation, demyelination and tumour in these cases.<sup>7</sup> Miller et al.<sup>8</sup> suggested that careful follow-up is necessary for these cases, and neuroimaging should be considered when spontaneous recovery is absent or new neurological symptoms appear. In cases with spontaneous recovery, no abnormal lesions responsible for the nerve palsy are usually found even by the updated MRI sequences. However, immediate neuroimaging for isolated abducens nerve palsy is still warranted.<sup>9,10</sup>

In cases of oculomotor palsy especially in cases with pupillary involvement, an immediate examination with neuroimaging is necessary to rule out the possibility that the palsy was caused by an aneurysm.<sup>11</sup> However, an aneurysm is a rare cause of abducens nerve palsy, with incidences of 3–4%,<sup>12,13</sup> and reports of cases with isolated unilateral abducens nerve palsy due to an aneurysm are still scarcer.<sup>4,5</sup> Our case had had recurrent diplopia episodes before her initial visit to our hospital. This history is strongly suggestive of an aneurysmal condition.<sup>4,14</sup> However, this cyclic pattern of improvement and deterioration may be confusing with spontaneous recovery at some time points.

On the other hand, headache is a very common neurological symptom that is caused by various conditions such as migraine, muscle contraction, brain tumour, and brain haemorrhage. Although a sudden and severe unilateral headache may indicate the development of an arterial dissection or subarachnoid haemorrhage, the frequency of detecting pathological findings in neuroimaging is quite low in cases with isolated headache without other neurological findings.<sup>6,15,16</sup> Our patient complained of a persistent headache on the right temporal region that was not so severe, and she did not complain until we asked her if she had had headaches.

MRA and MRI revealed the development of a thrombus in the aneurysm, which may account for the spontaneous recovery of the diplopia earlier, i.e., previous reliefs from diplopia may be due to the development of the thrombus. After these recurrent episodes of diplopia, rapid swelling of the aneurysm probably occurred, resulting in the sustained abducens nerve palsy with headache, which she experienced as a sudden occurrence.

The abducens nerve is lying within the cavernous sinus, whereas the oculomotor, trochlea, and trigeminal nerves are lying on the dural wall in the cavernous

sinus. These anatomical features may explain why the aneurysm from the cavernous carotid artery impaired the abducens nerve selectively. The abducens nerve and the sympathetic nerve fibres sent from the plexus on the internal carotid artery are closely located in the cavernous sinus. Thus, we carefully examined the pupillary function. However, Horner syndrome was not involved in this case.

In conclusion, headaches should be considered as important symptoms in cases of isolated abducens nerve palsy. Physicians should obtain a history of ocular symptoms such as recurrent diplopia and rule out an aneurysmal lesion responsible in these cases.

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## Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the article.

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