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Case Report

Intermittent oculomotor nerve paresis and hollow appearance on MRI manifested by pituitary adenoma

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ABSTRACT

A 71-year-old man had sustained intermittent ptosis and double vision for 2 weeks. Neurological examination found unilateral oculomotor nerve (CN III) paresis manifesting as limitations of gaze, ptosis, and mydriasis. Neither headache nor any other cranial neuropathy was noted. Cerebral magnetic resonance imaging revealed a well-circumscribed mass in the pituitary fossa extending laterally into the left cavernous sinus. The segment of the left CN III lying in the oculomotor cistern was considerably compressed by the tumor. The cisternal segments of the left CN III showed an undescribed, "hollow" appearance. The left orbit and brainstem were intact. The patient underwent tumor resection via an endoscopic transsphenoidal approach. The tumor tissue was soft in consistency, involving xanthochromic fluid. The pathological diagnosis was pituitary adenoma accompanied with considerable hemorrhagic changes. The patent's ptosis and limitations of gaze showed remarkable improvements on postoperative day 1, with resolution of the hollow appearance of the affected CN III that was confirmed on day 3. We assumed that the intralesional bleeds and lateral tumor extension into the oculomotor cistern were associated with the intermittent paresis of the CN III as the sole presentation. A hollow appearance identified in the CN III might indicate a reversible dysfunction of the nerve that can anticipate an improvement by prompt surgical intervention.

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Introduction

Oculomotor nerve (CN III) paresis is a common neurological impairment. A number of conditions have been reported to cause CN III paresis, including diabetes mellitus, cerebral aneurysms, tumors, lesions in the pituitary fossa and cavernous sinus, infections, and subarachnoid hemorrhages [1]. Pituitary apoplexy, a distinct entity caused by acute ischemic and/or hemorrhagic changes in pre-existing pituitary adenomas, has been considered the primary cause of CN III paresis in patients with pituitary adenoma. Commonly, varying degrees of headache, nausea, impaired consciousness, and neuropathies of the 4th and 6th cranial nerves are simultaneously present in these patients [2–4]. In contrast, pituitary tumor presenting with CN III paresis as the sole symptom has rarely been documented [5]. In CN III paresis manifested by pituitary adenomas, early treatment, pupil-sparing, and minor oculomotor symptoms are considered as the indicators of good recovery [6]. Anatomically, CN III arises in the ventral midbrain, courses forward in the ambient cistern, passes the oculomotor trigone, and penetrates the lateral wall of the cavernous sinus, where the CN III is surrounded by a small cistern, the oculomotor cistern (CN III_{Cis}) [7]. The CN III_{Cis} is a distinct subarachnoid space with varying morphology [8]. Extensions along the CN III_{Cis} have been considered uncommon in cases of pituitary adenomas [9,10]. However, in a recent investigation, occult tumor invasion in the medial wall of the cavernous sinus was detected in 57.1% of pituitary adenomas [11].

Herein, we present a unique case of pituitary adenoma presenting with intermittent CN III paresis as the sole symptom.

Case report

A 71-year-old man had sustained intermittent ptosis and double vision for 2 weeks. At presentation, the patient showed left CN III paresis, manifested as ptosis, limitations of gaze in the lower and medial directions, and mydriasis (Fig. 1). The patient was well-oriented and did not report of recent headache or nausea. Functions of the trochlear, trigeminal, and abducens nerves were intact. The blood examinations showed normal findings. Cerebral magnetic resonance imaging revealed a well-circumscribed mass measuring 16 × 14 × 16 mm in maximal dimension, in the pituitary fossa, with lateral extension into the left cavernous sinus. It appeared as low intensity on T1- and high intensity on T2-weighted sequences and was marginally enhanced. Compression of the optic apparatus by the tumor was not present (Fig. 2). On volumetric fast imaging employing steady-state acquisition (FIESTA) sequence, a segment of the left CN III lying in the narrowed CN III_{Cis} was found considerably compressed by the tumor. Furthermore, cisternal segments of the left CN III showed a hollow appearance (Fig. 3). The left orbit and brainstem were intact. The patient underwent tumor resection via an endoscopic transsphenoidal approach. The tumor, soft in consistency and involving xanthochromic fluid, was totally resected. The affected CN III was found to be released from compression by the tumor. The histological appearance was consistent with pituitary adenoma accompanied with considerable hemorrhagic changes. The patent's ptosis and reduced field of view showed remarkable improvement on postoperative day 1 (Fig. 4). In contrast, his mydriasis persisted until day 8. The FIESTA sequence performed on postoperative day 3 revealed a marked resolution of the compression and hollow appearance of the left CN III, with clear identification of the surrounding CN III_{Cis}.

Discussion

The present patient sustained intermittent CN III paresis, which was considered as the sole symptom of a pituitary adenoma, and showed drastic improvement shortly after the

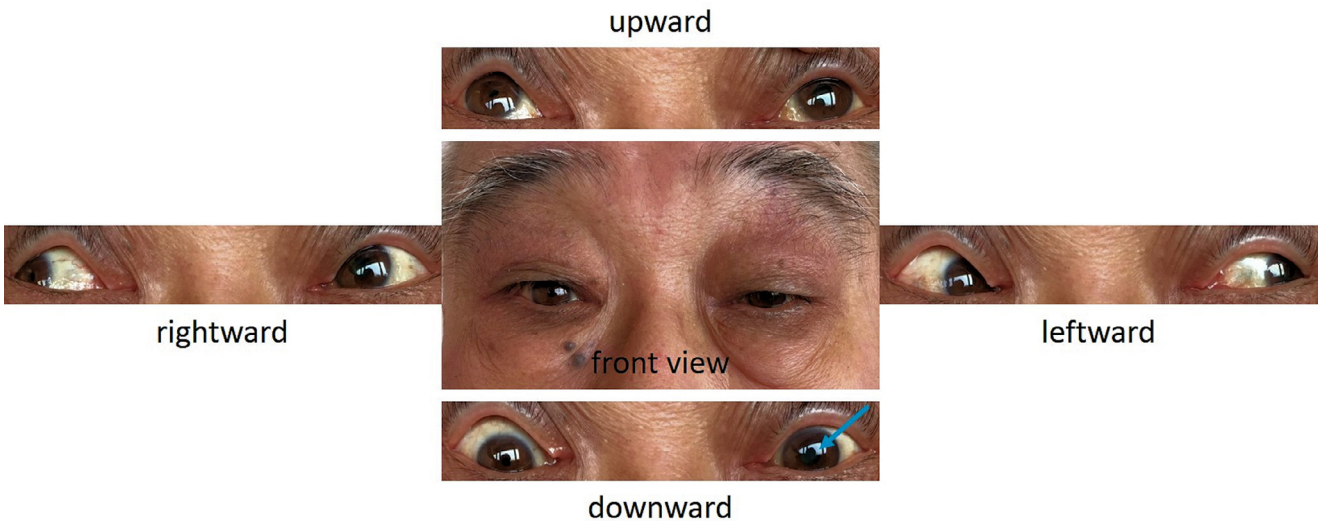

Fig. 1 – Preoperative photos of the patient's ocular movements, showing ptosis, limitations of gaze in the lower and medial directions, and mydriasis (downward gaze, *arrow*) in the left eye.

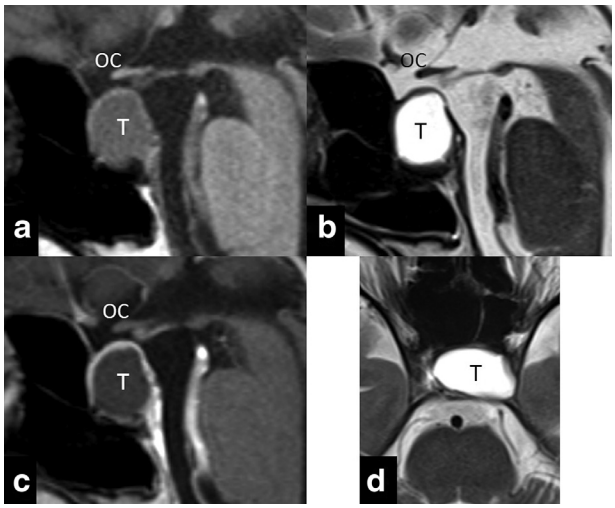

Fig. 2 – Preoperative sagittal T1- (a), sagittal (b) and axial (d) T2-weighted, and postcontrast sagittal T1-weighted (c) magnetic resonance images of the patient showing a well-circumscribed mass in the pituitary fossa. It appears as low intensity on T1- and high intensity on T2-weighted sequences, extending laterally into the left cavernous sinus (d), and is marginally enhanced (c). Compression of the optic apparatus by the tumor is not present (a-c). OC, optic chiasma; T, tumor.

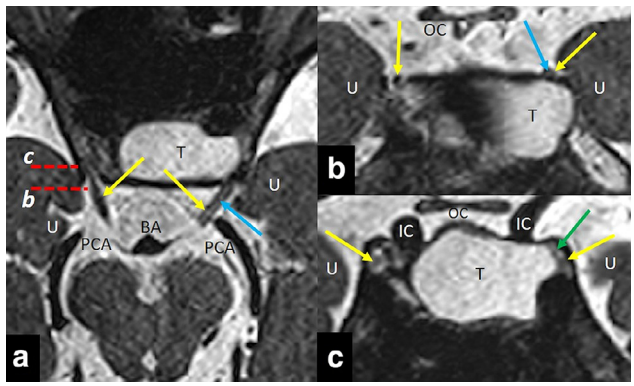

Fig. 3 – Preoperative axial (a) and coronal (b,c) fast imaging employing steady-state acquisition sequence showing the segment of the left oculomotor nerve that is considerably compressed by the tumor (a,c), in the narrowed oculomotor cistern (c, green arrow). The cisternal segments of the left oculomotor nerve show a hollow appearance (a and b, blue arrow). Coronal images (b) and (c) correspond to the levels b and c indicated in axial image (a). BA, basilar artery; IC, internal carotid artery; PCA, posterior cerebral artery; U, uncus; Yellow arrows, cisternal segments of the oculomotor nerve. (Color version of figure is available online.)

surgery. Given that the hollow appearance detected in the affected CN III also resolved after surgery, such appearance could indicate impaired function of the nerve, which would need prompt management. The peculiar appearance, to our knowledge, has not been described in the CN III or other cranial nerves. It may indicate a reversible nerve dysfunction. As previously reported, the volumetric FIESTA sequence was useful in observing the cisternal segments of the CN III adjacent to the cerebrospinal fluid [12].

The trochlear nerve has the longest intracranial course among all cranial nerves but is also the thinnest. It enters the roof of the cavernous sinus in the posterolateral apex of the oculomotor trigone. Afterward, it courses in the lateral wall of the cavernous sinus below the CN III [13]. Laboratory investigation showed that the mechanical forces necessary to disrupt the CN III were larger, compared to the trochlear nerve [14]. In contrast, compared to the CN III, the trochlear nerve is less frequently impaired in patients with pituitary adenomas [2,4]. This may, at least in part, be derived from the characteristic topography of the CN III segment lying in the $CN\ III_{Cis}$, which

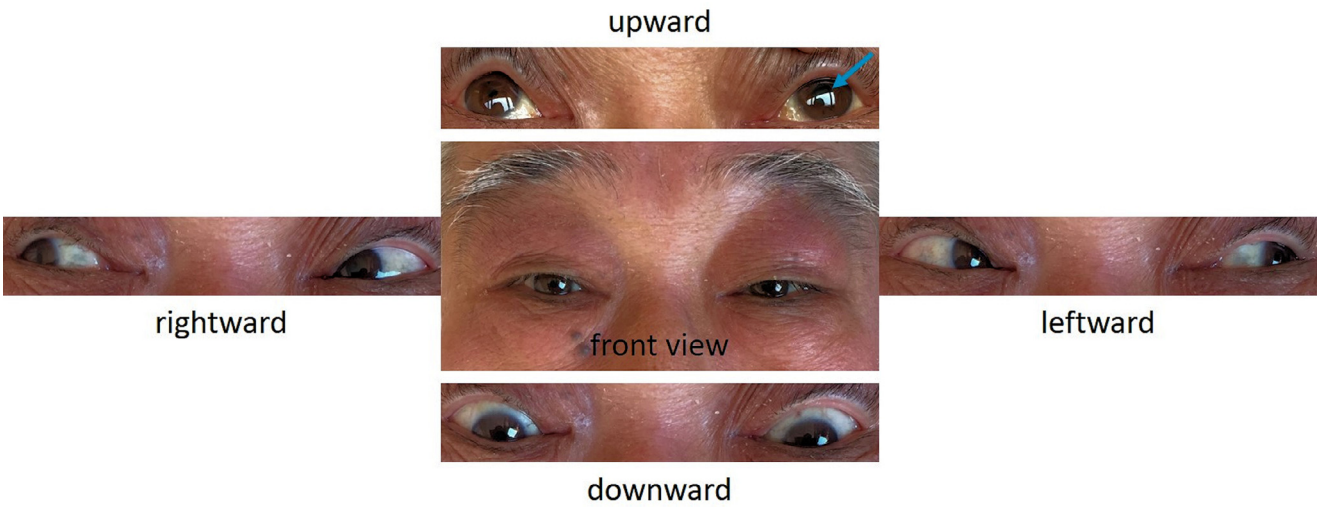

Fig. 4 – Photos of the patient's ocular movements on postoperative day 1, showing marked improvement of ptosis and limitations of gaze, while persistent mydriasis in the left eye (upward gaze, *arrow*).

could be predisposed to lateral extension of pituitary tumors [11]. In contrast, the trochlear nerve courses in the dural leaves of the lateral wall of the cavernous sinus, which can be a barrier for the direct compression and invasion of laterally extending, pituitary tumors [7]. We assumed that in the present case, intratumoral bleeds and lateral tumor extension in the left CN III_{Cis} might be associated with the unilateral, intermittent CN III paresis as the sole, but atypical, presentation.

Conclusion

In the present case, intralesional bleeds and lateral extension of the tumor into the CN III_{Cis} were considered to be associated with intermittent CN III paresis. A hollow appearance identified in the CN III could indicate a reversible dysfunction of the nerve that can anticipate an improvement by prompt surgical intervention.

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