SHORT REPORT

Plus-minus lid syndrome

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Abstract

A patient presented with ipsilateral ptosis and contralateral superior eyelid retraction due to a nuclear third nerve syndrome. The CT brain scan revealed a paramedian mesencephalic lesion contiguous with the oculomotor nucleus, sparing the midbrain tectum and the posterior commissure.

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Acquired neurological abnormalities of eyelid position may appear either as an insufficient opening of the eyelids, or as an eyelid retraction. Insufficient eyelid opening is blepharospasm if the closure of the lids is tonic, due to an overactivation of the orbicularis oculi. Ptosis results from a passive closure of the lids, due to a defect of Müller's muscle or to a defect of the levator palpebrae. A defect of Müller's muscle results from a lesion on the oculosympathetic pathway and causes a moderate unilateral ptosis (Horner's syndrome). A deficit of the levator palpebrae may result from a nuclear or fascicular lesion of the oculomotor nerve. If the lesion involves the subnucleus of the levator palpebrae, located in the caudal part of the oculomotor nucleus, the ptosis is bilateral, symmetric and complete;[1] if the lesion is located in the oculomotor fascicles, it is strictly unilateral but of variable intensity. A supranuclear lesion is infrequent: cortical ptosis is mild and bilateral, but predominantly contralateral.[1] It has recently been suggested that a bilateral ptosis could also be caused by a single lesion of the supraoculomotor area, located immediately dorsal to the oculomotor nucleus.[2] Finally, unilateral or bilateral ptosis are frequently observed in myathenia gravis.[1]

Superior eyelid retraction, encountered less frequently, is a condition in which a white band of sclera between the lid margin and the upper corneal limbus is exposed.[1] It is usually bilateral, and especially when associated with other signs such as convergence nystagmus or light-near dissociation of the pupils, has a high localising value to the posterior commissure.[1 3] Thyroid eye disease is one of the most common causes of bilateral lid retraction.[1]

Acquired association of a unilateral ptosis with an eyelid retraction on the other side is exceptional, previously described in ocular myasthenia gravis, orbital myositis, or after lesions of the oculomotor nerve.[1] We observed this syndrome in a patient with a nuclear oculomotor nerve syndrome.[4] We report another similar case and discuss the pathophysiology of this sign.

Case report

A 78 year old man was admitted to hospital after the sudden onset of a right hemiplegia. He had had mild hypertension and a myocardial infarction three years before. On physical examination, 12 hours after onset, the patient was alert and well oriented, and his blood pressure was 160/90 mmHg. A moderate weakness was present on the right side, involving the distal extremity of the upper limb and the face. There was no sensory deficit or abnormalities of the visual fields. There was a complete left ptosis. The right upper lid was retracted, leaving a white scleral band uncovered (fig 1A). The patient could briefly close his right eye, but obviously with great effort. During downward eye movements of this eye, there was no relaxation of the retracted lid (fig 1B). Passive opening (fig 1, except A) or closure of the left eye did not influence the right lid retraction. The pupils were normal in size and reactivity to light. Examination of eye movements showed a complete paralysis of adduction, elevation and depression of the left eye. On the right side, the eye was tonically deviated downward (fig 1A) and could not elevate voluntarily beyond the horizontal plane (fig 1C). Abduction and adduction seemed normal on the right eye (fig 1D, E). Vertical oculocephalic eye movements were abolished bilaterally upward, and downward only on the left eye.

A CT scan showed an infarct involving the parahippocampal gyrus and isthmus of the cingulate gyrus (fifth temporal gyrus), and a small paramedian mesencephalic infarct, located ventrally and laterally to the aqueduct, extending from the midline to the area of the red nucleus, laterally (fig 2). The aqueduct was clearly visible, with no dilatation of the third ventricle. The patient was seen on follow up one year later: his weakness on the right side had disappeared, but the eyelids abnormalities were unchanged.

Discussion

This patient presented an unusual eyelid abnormality, a unilateral ptosis and contralateral superior eyelid retraction, which we call

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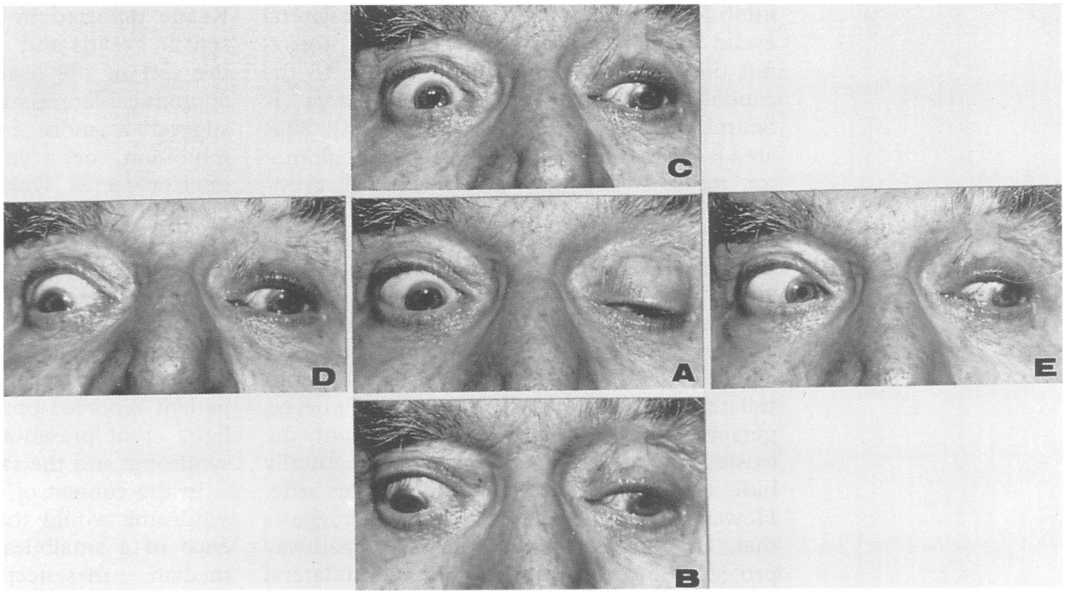

Figure 1 Left ptosis and right superior eyelid retraction in the primary position (A). Left third nerve paralysis; right superior rectus paralysis (C). Note persistent superior eyelid retraction on downgaze (C), and when the ptotic lid is artificially elevated (B on downgaze, C on upgaze, D on rightward gaze, E on leftward gaze).

the "plus-minus lid syndrome". This aspect was present immediately after the onset of stroke, and persisted unchanged over a period of a year. The association of a left oculomotor nerve paralysis with a right superior rectus (SR) paralysis is consistent with a left nuclear oculomotor nerve syndrome.[1 5] The right SR paralysis in our patient therefore indicated that the lesion involved the lateral part of the left oculomotor nucleus, where the subnucleus of the right SR motor neurons are located. Left ptosis could result either from a lesion of the oculomotor nerve fascicles or from a lesion of the LP subnucleus. However, from this unique subnucleus, the central caudal nucleus, located on the midline at the caudal extremity of the oculomotor nuclear complex, the motor neurons of both LP emerge.[6] The existence of an eyelid retraction thus indicates that the central caudal nucleus was intact. The mesencephalic lesion of this patient was therefore located near the midline, because it involved the lateral aspect of the oculomotor nucleus, but did not reach the midline and the caudal part of this nucleus because it spared the central caudal nucleus. Likewise, absence of mydriasis indicates that the Edinger-Westphal nucleus, located on the midline at the rostral part of the third nucleus, was intact. Finally, the CT showed that the infarct did not involve the pretectal region.

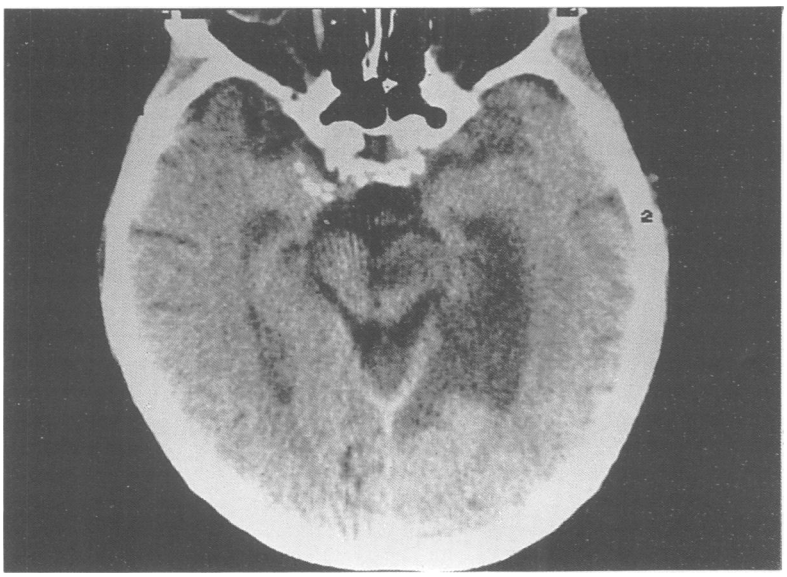

Figure 2 CT scan without contrast: left paramedian mesencephalic and left inferior temporal infarcts.

In a previously reported case, we described a patient with a paramedian mesencephalic haematoma responsible for a nuclear third nerve syndrome, and a very similar abnormality of the eyelids.[4]

What structure, in the context of a stroke, could be responsible for the contralateral superior eyelid retraction without any involvement of the posterior commissure? Aberrant regeneration of the oculomotor nerve seems most unlikely in our patient, because eyelid retraction was already present a few hours after stroke. The law of equal innervation of the extraocular muscles (Hering's law), which applies to the levator palpebrae muscles, can also, by the bias of an overactivation, explain a superior eyelid retraction contralateral to a ptosis.[7] Presence of this rare phenomenon is demonstrated when the lid retraction disappears when the contralateral ptotic lid is manually elevated.[1] This was not the case in our patient.

The spastic aspect of the permanent eyelid retraction in our patient favours the theory of an overactivation resulting from an ipsilateral failure of the levator palpebrae inhibition, as suggested by Keane.[8] Supranuclear innervation of the levator palpebrae remains hypothetical, but recent experimental data agree with the existence of an inhibitory pathway projecting onto the central caudal nucleus.[9] The exact location of this pathway remains unknown at present, but the pathway probably originates in the nuclei of the posterior commissure.[9] Thus medial lesions of these nuclei of the posterior commissure itself would indeed destroy this

inhibitory pathway and produce a bilateral eyelid retraction. This pathway would project, not directly to the third nucleus, but to the caudal part of the supraoculomotor area (K Schmidtke, personnal communication). This area is located medially, between the oculomotor nucleus and the periaqueductal grey.[9] Dendrites from the levator palpebrae neurons would stretch up into this region, and thus contact these inhibitory pathways in the immediate vicinity of the central caudate nucleus.[9] It has yet to be determined if the axonal pathway from the supraoculomotor area to the third nucleus is ipsilateral, contralateral or bilateral (J A Büttner-Ennever, personal communication). In our patient, the existence of an ipsilateral ptosis could naturally hide an eventual lid retraction on this side. However, contralateral lid retraction suggests that, at the least, this inhibitory pathway projects onto dendrites of the contralateral levator palpebrae motor neurons. The effect of selective damage of the supraoculomotor area is unknown. A patient with a tumour involving this region, described by J A Büttner-Ennever *et al*, had a bilateral ptosis, although the histological data showed that the central caudal nucleus was not totally spared.[2] The CT scan does not allow precise clinico-anatomical correlations; however, we suggest that the lesion in our patient involved a paremedian region, contiguous with supraoculomotor area, and interrupted inhibitory fibres between the nuclei of the posterior commissure and the central caudal nucleus.

In healthy subjects, eyelid movements are closely coordinated with vertical eye movements: the lid margin thus always follows the eyeball. The eyelid retraction in Collier's sign is attributed to a lesion of the nuclei of the posterior commissure or to the posterior commissure itself. In this case, the coordination is preserved, and the lids, though retracted on primary position, follow the eyes in a normal fashion.[1] Absence of superior eyelid relaxation during attempted downgaze (lid lag phenomenon) has previously been mentioned in a patient with a bilateral permanent tonic eyelid retraction.[10] Necropsy revealed two small symmetrical lesions involving only the lateral part of each oculomotor nucleus, extending between this nucleus and the periaqueductal grey, and sparing the posterior commissure. Keane reported in 1975 three patients with spastic eyelids and a lid lag phenomenon but the size of the lesion did not allow precise anatomical correlations.[8] This feature could suggest a more intense levator palpebrae inhibition, or a loss of levator palpebrae-inferior rectus synkinesis. More precisely, it could be due to a lesion located more distally on the inhibitory pathways, in the region where the levator palpebrae dendrites project. The contiguity of the supraoculamotor area and the adjacent third nerve nucleus would explain the coexistence of a "plus-minus lid syndrome" with a nuclear third nerve syndrome. The patient reported previously by Pierrot-Deseilligny *et al* presented a nuclear third nerve syndrome and the same lid abnormalities.[5]

In the context of a stroke, a plus-minus lid syndrome would therefore suggest the existence of a small lesion located in the paramedian mesencephalon, involving the ipsilateral levator palpebrae fascicles as they emerge from the central caudal nucleus, and the inhibitory pathways projecting on the levator palpebrae motor neurons immediately before their entrance in the central caudal nucleus.

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