Congenital “see-saw” movement

A rare anomaly of ocular motility

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The purpose of this article is to present a very unusual type of unco-ordinated ocular movement which, to our knowledge, has not yet been reported.

Case report

A 6-year-old boy was referred because of abnormal eye movements since birth. Clinical and neurological examination, x rays of the skull, and EEG revealed no abnormalities.

Eye Examination

The visual acuity was 6/15 in the right eye and 6/6 in the left.

The eye movements were strikingly abnormal:

PRIMARY POSITION:	Mild right divergent squint (Fig. 1a).
ATTEMPTED DEXTROVERSION:	Left hypertropia. Right eye abducted normally and showed nystagmoid movements (Fig. 1b).
ATTEMPTED LAEVOVERSION:	Right eye hypertropic and showed defect of adduction. Left eye abducted normally (Fig. 1c).
ATTEMPTED SUPRAVERSION:	Right eye diverged mildly with no elevation. Left eye moved up and inwards (Fig. 1d).
ATTEMPTED SUPRA-DEXTROVERSION:	Right eye showed defective abduction and no elevation. Left eye went up but showed defective adduction (Fig. 1e).
ATTEMPTED SUPRA-LAEVOVERSION:	Right eye adducted only. Left eye moved up and abducted well (Fig. 1f).
ATTEMPTED INFRAVERSION:	There was a “see-saw” movement. The right eye moved up and outwards, while the left rotated down and slightly outwards (Fig. 1g).
ATTEMPTED INFRA-DEXTROVERSION:	The right eye moved up and outwards, while the left rotated down and inwards (Fig. 1h).
ATTEMPTED INFRA-LAEVOVERSION:	The right eye moved up and outwards, while the left rotated down and outwards (Fig. 1i).

On attempt to elicit convergence or Bell’s phenomenon, the right eye moved up and outwards while the left eye rotated down and outwards.

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FIG. 1 Eye movements in nine positions of gaze

(e) Attempted supra-dextroversion	(d) Attempted supraversion	(f) Attempted supra-laevoversion
(b) Attempted dextroversion	(a) Primary position	(c) Attempted laevoversion
(h) Attempted infra-dextroversion	(g) Attempted infraversion	(i) Attempted infra-laevoversion

Simultaneous electromyography (EMG) of the left superior and right inferior rectus muscles was carried out on an 8-channel dynamic recorder, linked to a digital and digital-to-analogue computer of average transients, for duration and amplitude analysis. Coaxial needle electrodes were used. The patient was directed to gaze in the primary direction, upwards, and downwards, and in the six other directions of gaze, as in Fig. 1.

The recordings demonstrated normal duration ($1:00 - 1:30 \pm 0.09$ m. sec.), amplitude ($350-480 \pm \mu V$), and interference pattern in the two muscles examined. The only abnormal finding was a clear co-contraction of the two contralateral antagonists, manifested by a maximal and simultaneous EMG firing of the right inferior rectus and left superior rectus. This paradoxical co-contraction was present on repeated relocations of the needle electrodes and in all upward-downward movements (see Fig. 2, overleaf). The presence of normal duration, amplitude, and interference pattern helped to exclude peripheral nerve or muscle (infranuclear) damage.

Discussion

The commoner abnormalities of eye movement related to supranuclear or internuclear affections are the acquired conjugate gaze palsies, observed in lesions of the cortico-pontine oculomotor tracts, and the dissociated gaze palsies appearing in lesions of the medial longitudinal fasciculus or internuclear ophthalmoplegias.

It is most probable that some of the complete or partial congenital ophthalmoplegias (Zauberman and Magora, 1969), congenital oculomotor apraxia (Cogan, 1952) and many Duane's retraction syndromes (Sato, 1960; Papst and Esslen, 1960; Orłowski and Wojtowicz, 1962; Blodi, van Allen, and Yarbrough, 1964; Huber, Esslen, Klöti, and Martenet, 1964; Zauberman, Magora, and Chaco, 1967) may also have their origin in supranuclear or internuclear lesions. Less frequently encountered are the congenital or acquired types of unco-ordinated eye movement, in which convergent or divergent spastic movements are substituted for attempted versions. A rare case of this type, with histopathological documentation, was reported in a patient suffering from an upper brain stem glioma (Burian, van Allen, Sexton, and Baller, 1965). A similarly rare abnormality, observed in acquired mid-brain or cerebellar lesions, is manifested by skew deviations in all directions of gaze, the homolateral eye being turned down and rotated inwardly, while the

FIG. 2 Electromyogram of right inferior rectus (upper channel) and left superior rectus (lower channel)

Calibration 500 μV , 2.5 m.sec., per square Amplitude 350–480 μV

Average duration 1.00–1.30 m.sec. Full interference pattern

Note near-maximal co-contraction of both muscles in attempted infraversion

contralateral eye is rotated up and outwardly. This bizarre occurrence is, in general, transient and related to the terminal stage of the disease (Walsh, 1957).

Although the clinical picture in our patient resembles the previously mentioned cases of acquired skew deviation, it differs in that the patient was otherwise healthy, and that the lesion was congenital in origin and was permanent and predominant on infraversion. The prominent sign was the “see-saw” type of abnormal eye movement, mainly evident on infraversion and, to a lesser degree, on attempted supraversion. Furthermore, downward rotation of the right eye could not be elicited in attempted conjugate or duction movement. The cause of this see-saw type of movement was co-contraction of contralateral antagonistic muscles. This was ascertained by the simultaneous maximal electrical activity of the left superior and right inferior rectus muscles. The normal EMG pattern excluded a peripheral neuromuscular lesion and indicated a disturbance above the nuclear level. The clinical characteristics of our case seem to indicate an abnormal internuclear connexion between contralateral antagonistic muscles.

Summary

An unusual case of unco-ordinated ocular movement is presented. On attempted supraversion the right eye was hypotropic, while on attempted infraversion, there was a “see-saw” movement, whereby the right eye went up and the left eye went down.

Simultaneous EMG of the right inferior rectus and left superior rectus muscles revealed normal electrical activity in the field of action of each of these muscles, demonstrating an abnormal co-contraction of the two contralateral antagonists. An internuclear anomaly is suggested for the origin of this condition.

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