Slow accommodation release with a cerebellar lesion

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We saw a patient with reversible accommodation problems resulting from a subtentorial arachnoid cyst. We believe that the cerebellum plays a role in the organisation of the human central control system of accommodation.

Case report

A 20-year-old woman with difficulties in focusing on both far and near objects presented to us. She had an egg sized left subtentorial arachnoid cyst. Her corrected visual acuity was 20/20 bilaterally. On leftward gaze, nystagmus was evoked. Slight ocular saccades and hypometria were present. Convergence was good. Pupillary sizes were normal and isocoric. Light and near reaction were normal.

Accommodation amplitude was right eye 10.6 D and left eye 10.9 D. Accommodo-polyrecorder recordings showed increased accommodation times and relaxation times in both eyes. The accommodation times were right eye 1.43 and left eye 2.02 seconds. The relaxation times were right eye 1.85 and left eye 1.26 seconds. Mean and standard deviation of times obtained in age-matched normal subjects were

1.23 (SD 0.16) and 1.01 (SD 0.13) for accommodation time and relaxation time, respectively ($n=20$). Accommodation responses for linear accommodation loads examined by infrared optometer were normal (Fig 1). Dynamic responses to repetitive step stimuli were bilaterally impaired. The relaxation following to variable accommodation was insufficient and spastic. Ten days after the cyst removal, these abnormal responses disappeared (Fig 2), and accommodation and relaxation times became normal.

Comment

This patient showed normal accommodation amplitude. Accommodation and relaxation times were increased bilaterally. Responses to linear accommodation loads were normal but accommodation relaxation was insufficient.

On the cerebral cortex, neurons that discharge in temporal correlation with accommodation were found in the suprasylvian areas (LS) in the cat.¹ Accommodation was produced from electrical stimulation to LS.¹ Electrical stimulations on ipsilateral interpositus nuclei and on contralateral interpositus and fastigial nuclei in cerebellum are known to induce accommodation.² These nuclei are connected with parasympathetic oculomotor neurons in the midbrain.² Evoked accommodations were also reported by stimulation in cerebellar cortex areas 6 and 7. Inhibitory projections from these areas to the cerebellar nuclei are known.² An input to the cerebellum via pontine nuclei from LS has been proposed.³

The LS areas and cerebellum play their roles independently in the accommodation system.¹ Accommodation evoked by cerebellar stimulation was blocked by the cooling of superior cerebellar peduncle, whereas that by LS stimulation was not reduced by the same cooling procedure. A disturbed cerebellar pathway and a spared cerebral pathway may result in the abnormal dynamic accommodation with normal amplitude of accommodation as seen in our patient. Disturbed control of inputs to the oculomotor neurons in the midbrain may caused the accommodation spasm.

Only a few cases with accommodation resulting from central lesions have been reported clinically.⁴ Further clinical cases are needed for more understanding of the human accommodation mechanism.

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Figure 1 Linear accommodation load caused a sufficient and normal response in both eyes before cerebellar cyst removal.

Figure 2 Preoperatively, the first accommodation phase to step stimuli was preserved. However, the following relaxation was insufficient. This abnormality disappeared after the cyst removal.

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