

Preservation of the Electrical-Evoked Vestibuloocular Reflex and Otolith-Ocular Reflex in Two Patients with Markedly Impaired Canal-Ocular Reflexes^a

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INTRODUCTION

Unlike caloric and rotational tests, the electrical-evoked vestibuloocular reflex (EVOR) offers the potential of site-of-lesion testing. Since the current activates peripheral afferents independent of peripheral receptors, the vestibular nerve and central pathways can be evaluated separately from the vestibular receptors. Furthermore, adaptive changes within the central VOR can be assessed even in patients with damaged peripheral receptors. We identified two patients with absent response to caloric stimulation and markedly decreased response to horizontal angular rotation who had preserved EVOR and otolith-ocular reflex (OOR) responses.

METHODS

Caloric and rotational stimulation of the horizontal semicircular canal was conducted with standard techniques.¹ For the EVOR, constant-current sinusoidal stimuli (± 4 mA) were applied through Ag-AgCl electrodes placed on each mastoid as the subject sat in a stationary chair in a darkened room.² For OOR testing, subjects sat with eyes open in darkness on a parallel swing facing the side so that the linear acceleration occurred along the interaural axis (0.3 Hz, peak acceleration $0.48 \times g$).³ Data were digitized at a rate of 200 S/second, fast components were removed, and a fast fourier transform was performed giving the magnitude, phase, and DC bias of the fundamental and first 5 harmonics.¹

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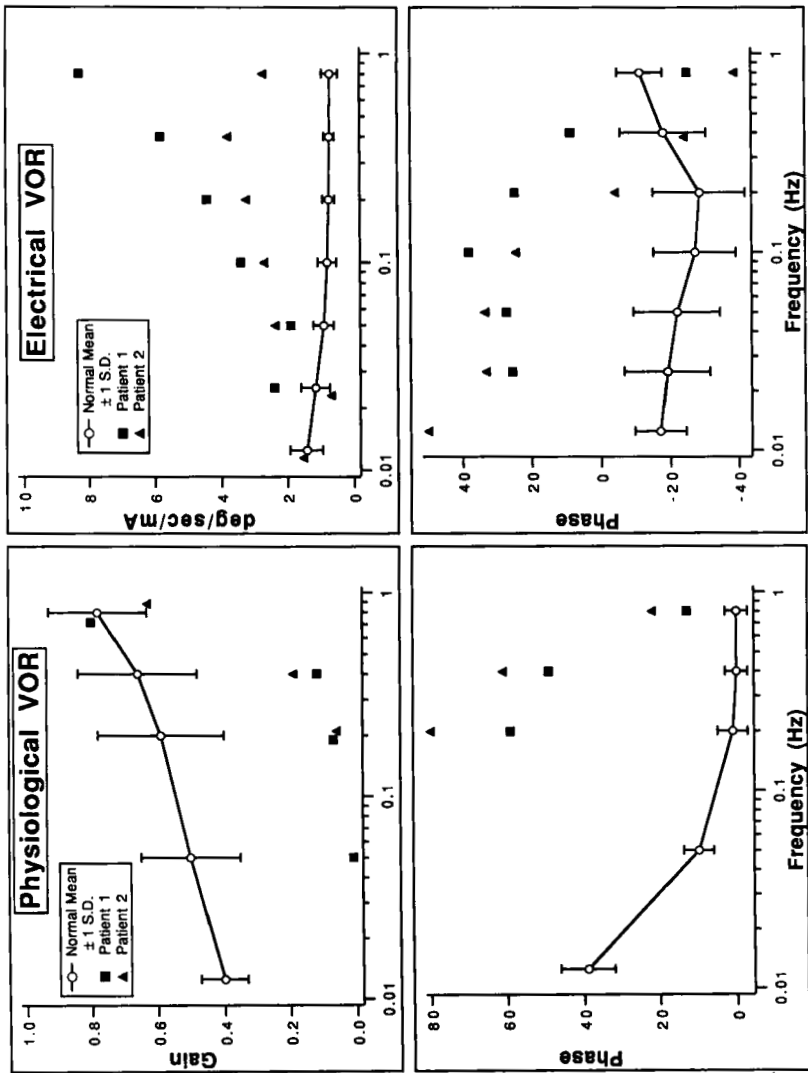


FIGURE 1. Plots of gain and phase versus frequency for the physiologic horizontal canal-ocular reflex and the EVOR in 2 patients with absent caloric responses. Normal mean (± 1 standard deviation) is given for comparison.

TABLE 1. Horizontal Linear Vestibuloocular Reflex in Two Patients with Idiopathic Bilateral Vestibulopathy (0.3 Hz, peak amplitude $0.48 \times g$)

	Gain		Phase Lead (deg)
	(deg/meter)	(deg/sec/g)	
Patient No. 1	8.2	47.0	+85
Patient No. 2	2.2	12.5	+60
Normal ($n = 10$)	4.7 ± 1.4	26.9 ± 8.0	$+20 \pm 9$

RESULTS

Both patients exhibited absent response to horizontal angular rotation at low frequencies but normal responses at higher frequencies (FIGURE 1, left side). By contrast, the EVOR gain was normal at low frequencies and progressively increased at higher frequencies, reaching values several times normal (FIGURE 1, right side). The OOR gain was increased in patient 1 and low normal in patient 2 (TABLE 1). All 3 responses in both patients had an increased phase lead at low frequencies.

CONCLUSION

The fact that these two patients with absent response to caloric stimulation and markedly decreased response to horizontal angular acceleration at low frequencies had hyperactive EVORs indicates that some afferent fibers were functioning normally. The gain and phase changes seen in the EVOR and OOR are probably the result of central compensation.

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