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Preoperative Alternate Occlusion Decreases Motion Processing Abnormalities in Infantile Esotropia

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ABSTRACT

We have examined the effects of preoperative, full-time alternate occlusion on the development of visual motion processing mechanisms. Motion visual evoked potentials (MVEPs) were recorded longitudinally in 14 infantile esotropia patients during the course of standard preoperative occlusion therapy. The MVEP in these patients was initially asymmetric in a fashion consistent with a nasalward/temporalward response bias, with a motion asymmetry significantly higher than that of age-matched normals. The magnitude of the developmental motion asymmetry declined significantly after an average of 24 weeks of alternate occlusion. This result implies that the binocular motion-sensitive cells underlying the MVEP retain some degree of plasticity up to at least 1 year of age. Our data suggest further that the persistence of motion asymmetries in untreated infantile esotropia patients is maintained by an active process that can be disrupted by alternate occlusion. Alternate occlusion apparently eliminates a form of abnormal binocular interaction that supports the persistence of the motion asymmetry. We propose that one of the necessary pre-conditions for symmetricization of motion processing in infantile esotropia is the absence of abnormal competitive binocular interactions.

INTRODUCTION

Full-time alternate occlusion for patients with infantile esotropia has been advocated as a means to prevent abnormal binocular interaction from occurring before the achievement of therapeutic realignment.[1,2] It was suggested that full-time alternate occlusion would "keep the binocular slate clean" and, thus, preserve the normal development potential for binocularity. A corollary hypothesis is that alternate occlusion is not harmful. Indirect clinical evidence from enhanced final treatment results[3] suggests a beneficial role for preoperative alternate occlusion therapy, but there is no direct evidence that alternate occlusion has either a positive or negative effect, per se, on human visual system development.

This study was designed to examine the effects of full-time alternate-day occlusion by longitudinal monitoring of a newly recognized form of binocularity—sensory motion processing.[4] Binocularity was quantified by means of an objective test of the developmental status of binocular motion mechanisms applicable to infants as well as to adults.[4,5] This test measures the symmetry of monocular visual evoked responses to nasalward versus temporalward directions of motion.

This study was designed to examine the sensory effects of full-time alternate-day occlusion by longitudinal monitoring of asymmetries in monocular motion processing in infantile esotropia patients. Motion processing was quantified by means of a new objective visual evoked potential test, the monocular motion visual evoked potential (MVEP). We have recently argued that the monocular MVEP can access the responses of a binocular subsystem of motion processing pathways in both infants and adults.[4,5] The key feature of the responses is the degree of directionally selective asymmetry, specifically the degree of nasalward/temporalward asymmetry present in the monocular MVEP.

Relationship Between Motion Processing Asymmetries and Binocularity

Directional asymmetries of monocular optokinetic nystagmus (MOKN) and monocular smooth pursuit have long been known to be associated with the lack of binocularity in infantile esotropes. Ciancia[6] was the first to report the observation that infantile esotropes had smooth monocular pursuit movements toward adduction, and irregular, deficient, nystagmoid eye movements in monocular abduction pursuit (Fig 1). These monocular tracking asymme-

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