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Vitreal syneresis in rhesus monkeys.*

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The eyes of 15 rhesus monkeys were evaluated. Various degrees of vitreal syneresis were observed in 28 of the 30 eyes. The observed vitreal structures varied from fine strands randomly spaced throughout the vitreous to thick, intertwining, fibrous networks with some clumping of the collagenous condensate at the fiber junctions. Qualitatively, the degree of syneresis was slightly more extensive in the eight older mature males than in the seven younger animals. In all animals a clear view of the fundus could be obtained with the opthalmoscope. The vitreous structures may be one cause of variability in ocular dose-response relationships for exposure to laser radiation. The effect on retinal exposure experiments of the finer vitreal structure is considered minimal.

Vitreal syneresis is documented in human* and described in other mammalian species (horse, dog, chimpanzee).* Vitreal syneresis is a pathological condition caused by a change in the normal colloidal gel. In this paper we will describe the characteristics of vitreal syneresis found in normal rhesus monkeys and will illustrate some aspects of these structures which may cause variability in ocular exposure experiments.

Materials and methods. Fifteen rhesus monkeys (eight males, 5 to 7 years of age; four males and three females, 2 to 3 years old) were tranquilized with 50 mg of ketamine (intramuscularly) and anesthetized with pentobarbital (30 mg/kg, intravenously). Their pupils were dilated with a cycloglyptic-mydratic combination. The anterior structures of the eye and the retina were examined with the slit lamp and the opthalmoscope.

A narrow beam of the light from a helium-neon (HeNe) laser was projected into the animal's vitreous, and the scatter of the light by the strands was observed with the slit-lamp biomicroscope. The eyes from one of these animals were enucleated. Samples of vitreous were placed on a microscope slide and examined.

Results. Vitreal syneresis was observed in 28 of the 30 rhesus monkey eyes examined with the slit lamp. The degree of observed syneresis varied from the formation of thin, white, opacified strands randomly distributed within the vitreous space to the formation of a thick, intertwined network of the collagenous condensate (Fig. 1A), with some clumping of structure at various intervals (Fig. 1B). The light from a 3 mm HeNe laser beam incident on the cornea (left arrow, Fig. 1B) was diffused and scattered by the dense vitreal clump (right arrow, Fig. 1B). The observed structures extended from the posterior lenticular pole to deep into the vitreous. In eyes where the syneresis was more extensive, the viscosity of the vitreous appeared to be comparable to that of water. The vitreous structure moved or floated within the vitreous space when the animal's head was gently tapped. In all cases, a clear view of the fundus was obtained with no evidence of vitreous structure (Fig. 1C). In some animals a fine, milky network appeared to fill the vitreous,

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†In conducting the research described in this report, the investigators adhered to the "Guide for Laboratory Animal Facilities and Care" as developed by the Committee on the Guide for Laboratory Animal Facilities and Care, of the Institute of Laboratory Animal Resources, National Academy of Sciences—National Research Council."
Fig. 1. A, Slit-lamp photograph (×16) of syneresis of the vitreous observed in a rhesus monkey. (Collagenous strands have become interwoven and form a dense structure.) B, Slit-lamp photograph (×16) of another eye in which an HeNe laser beam incident from the left (arrow) is scattered or diffused by the clump of condensate on the vitreal strand (right arrow). The beam appeared to be terminated by this structure. C, Fundus photograph (×10) of the eye shown in A. A clear view of the fundus of all eyes examined was obtained with the ophthalmoscope. D, In vitro photomicrograph (×120) of vitreal strand and observed spherical structures. These spheres were reflective (silver in appearance) and were closely associated with the fibers which surrounded them.

whereas in others there was an appearance of "sheets" of the fine-strand network at discrete depths within the vitreous. In general, more dense structures were observed near the periphery (both nasally and temporally); the central areas seemed to be more often unaffected. The same degree of syneresis was not necessarily bilateral; several animals had one eye affected while the contralateral eye offered no evidence of strands or the structure was not as dense or extensive. The degree of syneresis was somewhat more extensive in the older animals than in the younger animals. A vitreal strand and associated spherical body were observed at a higher magnification in vitro (Fig. 1, D).

Discussion. The presence of vitreal syneresis in rhesus monkeys emphasized the importance of careful ocular examination before animals of this species are used in eye research. This is particularly important in experiments involving light beams of small diameter which may be affected by the abnormal structure. For example, the effect of laser radiation on the retina may vary considerably for the same dose delivered to the cornea, depending whether the beam was transmitted through clear vitreous or diffused by a condensed fibril. Although some degree of vitreal syneresis was observed in 28 of the 30 eyes examined, the eyes which exhibited only fine vitreal strands or those that showed diffused structure near the periphery were considered acceptable for laser exposure experiments.

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Binocular interactions in the human visual evoked potential after short-term occlusion and anisometropia. CHRISTOPHER W. TYLER,* AND MARSHA F. KAITZ.**

The human visual evoked potential was recorded during 9 hr. of monocular occlusion or deprivation of fine detail by anisometropia. Some decrement in the response from the occluded eye was evident, but the major result was a sustained increase in the response from the nonoccluded eye. The anisometropic condition produced no decrement for stimulation of the deprived eye, but again there was an increase in the response from the non-deprived eye. Under some conditions the changes became apparent after only 6 hr. of deprivation. The data may be interpreted in terms of binocular competition or reciprocal inhibition at the level of the visual cortex or lateral geniculate nucleus.

The nature of binocular interaction, although intriguing as a fundamental problem of the organization of the visual system, is of major importance in the etiology of ophthalmological disorders involving abnormal or unequal stimulation of the two eyes. For example, abnormal stimulation occurs in strabismus and often leads to strabismic amblyopia. Unequal stimulation can be caused by unequal refraction (anisometropia), unequal magnification (aniseikonia), clouding of the ocular media, or other impairment of the image (anopsia) or can occur as a secondary effect of organic pathological conditions in one eye.

The first point in the visual system where binocular interaction takes place is the lateral geniculate nucleus (LGN). This is arranged in layers of neurons which are excited only by monocular stimulation but which do show binocular inhibition between the monocular layers. A second point at which binocular interaction is present is at the synaptic input to cortical neurons.

In humans, it is possible to investigate binocular interactions either in patients with naturally occurring pathologies or in normal observers under experimental conditions. Little is known about the psychophysics of binocular interaction in pathological conditions, but some interesting observations have been imparted by electrophysiological techniques. Several authors have found no consistent difference between the electroretinograms of normal and amblyopic eyes, suggesting that little change occurs at the retinal level.

At higher levels, however, binocular interactions have been reported consistently. In a study on strabismic amblyopia, Shipley observed that although the visual evoked potential (VEP) from stimulation of the amblyopic eye was generally reduced in comparison to that of the normal eye, steady diffuse illumination of the amblyopic eye markedly reduced the response from the normal eye. Illumination of the normal eye had little effect on the response from the amblyopic eye. One possible explanation offered for this result is reciprocal inhibition between the two monocular pathways. It is possible that the lack of inhibition...