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Myopia and Axial Length Contribute to Vitreous Liquefaction and Nuclear Cataract

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In a recent article in the November 2006 issue of the *Archives*, Kubo et al[1] report that an increase in axial length or myopia is associated with a higher grade of nuclear cataract. In the "Comment" section, they state, "The mechanism of the apparent relationship between axial length and nuclear cataract at the time of cataract surgery is unclear." They go on to suggest that "changes in vitreous circumstances caused by longer axial length may induce nuclear or other types of cataract." We would like to propose a mechanism to explain their observations. In 2004, we published an article titled "Importance of Vitreous Liquefaction in Age-Related Cataract."[2] We found that the extent of vitreous liquefaction was positively correlated with the extent of nuclear opacification, even after adjusting for age. In myopic eyes, vitreous syneresis occurs earlier, is more extensive, and increases with the degree of myopia.[3] Therefore, myopia increases the extent of vitreous liquefaction, which is associated with an increase in the risk of nuclear cataract.

Kubo and colleagues cite research by us and others to support the oxidative theory of nuclear cataract formation. The lens normally exists in a low-oxygen environment.[4] Increased exposure of the lens to oxygen causes nuclear cataract.[5] A potential source of oxidative damage to the lens is increased exposure to molecular oxygen from the retina. The intact vitreous gel ensures that oxygen from the retina can only reach the lens by diffusion, a relatively inefficient process over macroscopic distances. Replacement of the vitreous gel with liquid, as occurs after vitreous syneresis or vitrectomy, will increase fluid circulation within the vitreous chamber. Increased circulation of the vitreous fluid readily distributes oxygen from the retinal surface throughout the eye. We suggest that an intact vitreous gel helps to maintain the low level of oxygen around the lens by preventing bulk flow of the vitreous fluid.

We are pleased that the observations by Kubo and colleagues are consistent with one aspect of a hypothesis central to our research: that liquefaction of the vitreous is important in the pathogenesis of nuclear cataract.

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