Investigation of Potential Removal of Cataract Lenses Using Excimer Lasers.

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Cataract formation, the pathological clouding of the ocular lens is a common ophthalmic disease requiring surgical intervention. Current surgical techniques involve replacing the natural opacified lens with a synthetic lens of fixed focal length. Such procedures leave the patient without any fine focussing ability and dependant on eyeglasses.

In the normal eye, focussing is accomplished by changing the muscular tension on the thin membrane encapsulating the soft lens material (thus altering the shape of the lens). Ideally, cataract removal would preserve the membranous envelope so that a synthetic gel can be injected and the focussing mechanism preserved.

Selective removal of the opaque lens is currently achieved by phacoemulsification, a technique using an ultrasonic probe to liquify the cataract and allow needle aspiration. This procedure is somewhat difficult and has not proven completely successful.

An alternate method of opaque lens removal by excimer laser ablation will be investigated. The excimer laser may offer the advantage of non-thermal cataract ablation without damage to the surrounding membranes. Preliminary studies with short pulses (10-20 ns) indicated 308 nm (XeCl) radiation as the most suitable among the excimer laser wavelengths for this procedure given that laser light of this wavelength can be easily transmitted through optical fibers. Ablation with short pulse XeCl radiation was relatively slow, and radiation with higher energy long pulses (60-80ns) will now be studied. Ablation thresholds, and ablation rates will be determined, and related to degree of opacity of the lens and its uv transmittance. In addition, the composition of both gaseous and particulate products will be studied and the effects of ultraviolet laser radiation on the surrounding membranes, and other intraocular structures will be addressed. Finally, the optimal fiber laser delivery system will also be studied.

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