

sory retina. The pathologic process includes degeneration and breaks in Bruch's membrane (a barrier layer separating the retina and choroid), which allows choroidal vessels to invade the space beneath the retina (choroidal neovascularization) and leak fluid or blood.

Until a recent study by the Macular Photocoagulation Study Group, supported by grants from the National Eye Institute, the treatment of exudative macular degeneration by obliteration of choroidal neovascularization with argon laser photocoagulation had not been proved. A multicenter controlled clinical trial was undertaken in 1980 to answer the question "Is argon laser photocoagulation useful in preventing severe visual loss in eyes with evidence of macular degeneration and a choroidal neovascular membrane outside the fovea?" As few as 1 in 20 patients screened met the eligibility criteria. Of those patients selected, however, by 18 months after entry in the study, 60% of the patients whose eyes were untreated had lost six or more lines of vision compared with only 25% of those whose eyes had been treated. Twice as many patients whose eyes were treated had a visual acuity better than 20/40 at the most recent visit. Persistence of the treatment benefit remains to be determined.

Patients at greater risk, such as those who have lost central vision from exudative macular degeneration in one eye, should be examined periodically. Because persons are in the treatable stage for only a short time after onset of symptoms, it is important for both physicians and patients to be alert for symptoms of distortion, scotoma or blurred vision that may indicate the presence of choroidal neovascularization. Further investigation is being done in hopes of finding other laser wavelengths that may increase the success rate in this vision-threatening disease.

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**Severe Systemic Effects From Topically Applied  $\beta$ -Adrenergic Blocking Agents**

RECENTLY,  $\beta$ -adrenergic blockers (timolol maleate) have become commercially available for the medical treatment of open-angle glaucoma. These topically applied drugs lower intraocular pressure by decreasing the rate of aqueous humor formation. They are usually effective both alone and in combination with other ocular hypotensive agents in lowering intraocular pressure in an attempt to prevent the optic nerve damage and visual field loss that can ultimately lead to blindness.

Topically applied timolol can be associated with all the side effects characteristic of  $\beta$ -blocking adrenergic drugs. Severe systemic depression, bronchospasm and even death have been described in some patients using this medication. Topically applied  $\beta$ -blockers are contraindicated in patients with a history of bronchial

asthma or severe chronic obstructive pulmonary disease, and in patients who have had cardiac failure. Furthermore, special care must be taken to instruct patients in the proper technique of eye-drop installation to minimize systemic absorption from the vascular nasal mucosa.

After installation of a drop, the patient should apply gentle pressure along the side of the nose, over the lacrimal sac. This maneuver enhances intraocular drug penetration and minimizes nasal mucosal absorption.

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**Endothelial Cell Counts**

ENDOTHELIAL CELL COUNTING is one method used to determine the health, longevity and surgical vulnerability of a human cornea. A cornea maintains its clarity if there are enough endothelial cells covering its back surface to continuously pump fluid from it. This one-cell-thick layer of tissue does not replace itself by mitosis. Damaged cells are replaced by neighboring cells stretching to cover the denuded area. The more cells there are the more "reserve" the cornea has to withstand trauma and cell loss. Therefore, it is of clinical importance to know the cell population or cell density of a given cornea.

The technique of endothelial cell counting was first popularized by Bourne and Kaufman in 1975. The procedure is done using a specifically designed endothelial specular microscope that allows high-magnification photography of the actual endothelial cells in vivo. The microscope is calibrated with an internal grid so that the cells in a defined area can be counted much like blood cell counts. The count is reported as cells per sq mm. The microscope is expensive, the technique requires skill and the counting is time-consuming.

The cell density of the human cornea is higher at birth than in old age, the loss of cells being due to attrition. Hoffer and Kraff found that mean cell density in the age range of 40 to 90 years old is 2,400 cells per sq mm and that age was not useful as a predictor of cell density. In one study, in eyes with cell counts of less than 350 cells per sq mm, a cloudy, painful cornea (bullous keratopathy) developed within two years, requiring corneal transplantation. There are many causes of cell loss but surgical trauma is the most common and the most likely in elderly persons. Because patients whose eyes have low counts are at greater jeopardy, it is wise to know the cell density of an eye before considering an intraocular anterior segment operation, such as a cataract extraction with lens implantation. A small percentage of persons have corneas with very low cell density for unexplained reasons and this must be known before a surgical procedure. Because patients who have had a previous eye operation most likely have lower cell density, it is extremely important to do endothelial cell counts on those who are