Timolol maleate—a new glaucoma medication?

The beta adrenergic blocker timolol lowers intraocular pressure as effectively as any currently used medication. Its potential efficacy for glaucoma therapy has sparked research into its clinical effects and mechanism of action. Current studies indicate that twice daily topical use of timolol decreases pressure in the eye without causing other significant ocular or systemic effects. Visual acuity testing, slit-lamp examination, visual field testing, and questioning of research subjects have revealed no side effects of treatment. The drug’s prolonged action eases compliance difficulties and because timolol alters neither pupil size nor accommodation, persons with cataracts and the young tolerate it better than miotics. Although timolol’s mechanism of action is debatable, preliminary research indicates that its pressure-lowering effect is additive to maximal treatment with acetazolamide, pilocarpine, and epinephrine. It may thus obviate surgery or prevent visual field loss in some patients.

At the recent ARVO meeting, five investigative groups presented papers concerning timolol. In addition to the drug’s consistent ocular hypotensive effect, two investigators presented data suggesting that 1 percent timolol applied topically to both eyes might lower blood pressure and pulse rate in some patients. The possible clinical significance of this effect is unknown, but it was not noted with the highest recommended dose of timolol (0.5 percent). Tonographic studies designed to explain the drug’s intraocular pressure-lowering effect yielded varying results. The ocular mechanism of action of timolol and other beta blockers remains obscure and requires further investigation.

Besides being the subject of many current clinical studies, timolol can also serve as an excellent research tool. Because it blocks $\beta_1$ and $\beta_2$ receptors equally and has no sympathomimetic activity, it can facilitate investigation of not only intraocular pressure dynamics but also other ocular mechanisms influenced by the autonomic nervous system. An animal model is currently being sought for timolol research. The drug does not lower intraocular pressure in the dog, cat, normal rabbit, or water-loaded rabbit. It has minimal effect on the eyes of rabbits made buphthalmic by posterior chamber injections of alpha-chymotrypsin. Preliminary evidence suggests that timolol may lower intraocular
pressure in the monkey eye\textsuperscript{4} and in the "glaucomatous" beagle.\textsuperscript{5} Finding an adequate and available animal model will greatly aid timolol studies.

Although initial results indicate great potential use for the drug, only large population long-term studies can establish its efficacy and safety. Such studies must demonstrate that timolol not only lowers intraocular pressure but also prevents optic nerve damage and visual field loss. Long-term studies will also answer questions concerning tolerance and tachyphylaxis. Definitive studies will have to consider such biologic variations as hypersusceptibility, intolerance, allergy, idiosyncrasy, and interactions with other medications. If long-term studies support the preliminary data, timolol will revolutionize the care of glaucoma patients.

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