ABSTRACT

BACKGROUND

Glaucoma is an intraocular pressure (IOP)-related optic neuropathy. Topical beta-blockers lower IOP by decreasing aqueous humor flow. Because patients show variability in their IOP responses to the drug, this study was designed to study the amount of variation in aqueous humor flow in response to topical timolol.

DESIGN

A prospective, randomized controlled clinical fluorophotometry study.

PARTICIPANTS

Study subjects, without glaucoma or ocular hypertension, were recruited using established inclusion and exclusion criteria in an approved IRB/BIME protocol.

METHODS

Subjects were examined by visual acuity testing, biomicroscopy, gonioscopy, fundoscopy, IOP measurement, pachymetry, and A-scan. For fluorophotometry, 2% topical fluorescein was administered to each eye and allowed to reach steady state concentration. Subjects repeatedly received 1 drop of timolol 0.5% to their treated eye and 1 drop of artificial tear to their placebo eye. Fluorophotometry scans were performed hourly between 8 AM and noon. Data were analyzed using Oldham’s correlation method.

MAIN OUTCOME MEASURE

Aqueous humor flow was calculated from hourly scans in the timolol-treated and placebo-treated eyes.

RESULTS

Thirty subjects were studied with an average age of 35 ± 14 years. Aqueous humor flow was calculated from hourly scans in the timolol-treated and placebo-treated eyes. Oldham's method was used to calculate an Aqueous humor flow from the decay rates of fluorescein tracer. The flow rates were compared using the paired Student's t-test. An ordinary least squares regression was used to model the relationship between aqueous humor flow in placebo-treated and timolol-treated eyes. Oldham’s method was used to calculate an unweighted correlation adjusted for mathematical coupling.

CONCLUSIONS

As expected, timolol decreased aqueous humor flow, but aqueous flow varied in treatment response according to individual baseline flow. We observed that individuals with higher aqueous flow showed greater response to timolol in comparison to those with lower aqueous flow. Future research will entail exploring a possible association between timolol response and beta-adrenergic receptor genotypes.

REFERENCES

1. As expected, aqueous humor flow decreased significantly after topical timolol administration, but there is variation in response to topical timolol in normal subjects.

2. Patients with higher aqueous flow phenotypes demonstrated a greater difference in flow between placebo-treated and timolol-treated eyes. More studies are needed to conduct a pharmacogenetic association study to identify genotypes that contribute to the variable flow and IOP response to beta-blockers.