

Dual Endothelin Receptor Blockade with Bosentan Increases Ocular Blood Flow in Patients with Glaucoma and Healthy Subjects

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Background

Glaucoma is one of the most important causes for legal blindness in the industrialised nations. Several lines of evidence indicate that reduced ocular blood flow and altered blood flow regulation may contribute to the pathogenesis of glaucomatous optic neuropathy. Data from both human and animal studies support the hypothesis that the endothelin system is involved in the processes that lead to vascular dysregulation in glaucoma. The current study seeks to investigate whether bosentan, a dual endothelin receptor antagonist, may alter ocular blood flow in patients with glaucoma and healthy subjects.

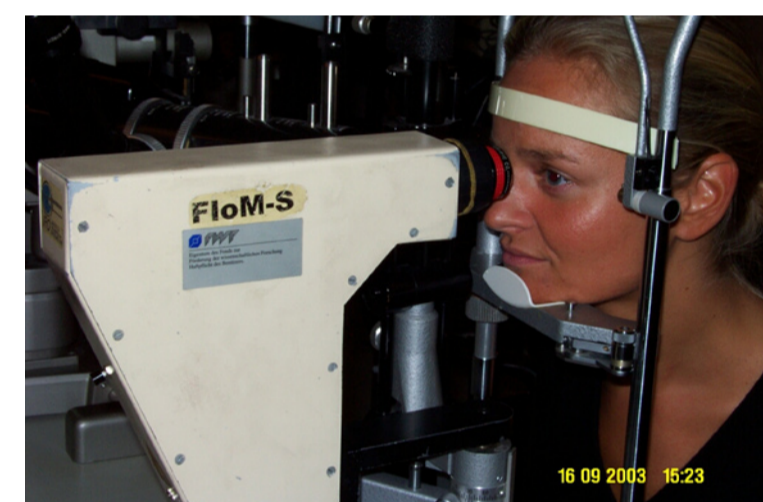
Methods

14 patients with primary open angle glaucoma and 14 sex and age-matched healthy volunteers were included in the study. Both experimental groups received bosentan (Tracleer®) 500 mg daily for 8 days. Ocular haemodynamics were assessed at baseline and on the last day of drug administration. Retinal vessel diameters and retinal red blood cell velocity were recorded with a retinal vessel analyser (Figure 1) and laser Doppler velocimetry, respectively. Choroidal and optic nerve head blood flow were measured with laser Doppler flowmetry (Figure 2).

Figure 1. Retinal vessel analyser



Figure 2. Laser Doppler flowmeter



Results

- Retinal arteries and veins showed a significant dilatation after administration of bosentan in both groups (+5% to 8%, $p = 0.01$) (Figures 3 and 4).
- Retinal blood velocity (Figure 5) and retinal blood flow increased up to +45% after administration of bosentan ($p < 0.01$). Administration of bosentan increased subfoveal choroidal blood flow in the healthy controls and the glaucoma group between 12% and 17% ($p < 0.02$).
- Baseline optic nerve head blood flow tended to be higher in healthy subjects compared with glaucoma patients, but this effect did not reach the level of significance ($p = 0.08$). Administration of bosentan significantly increased optic nerve head blood flow in both groups between 11% and 24% ($p < 0.01$) (Figure 6). The effect of bosentan on ocular blood flow parameters was comparable between the glaucoma patients and the healthy controls.

Conclusions

The data of the present study provide evidence that dual endothelin receptor inhibition by administration of bosentan increases ocular blood flow in both patients with glaucoma and healthy age-matched subjects. The administration of bosentan may be a therapeutic option for increasing ocular blood flow in patients with glaucoma. Whether the administration of bosentan stabilises the progression of the disease has yet to be investigated.

Figure 3. Change in retinal arterial diameter

All data are presented in means \pm SD

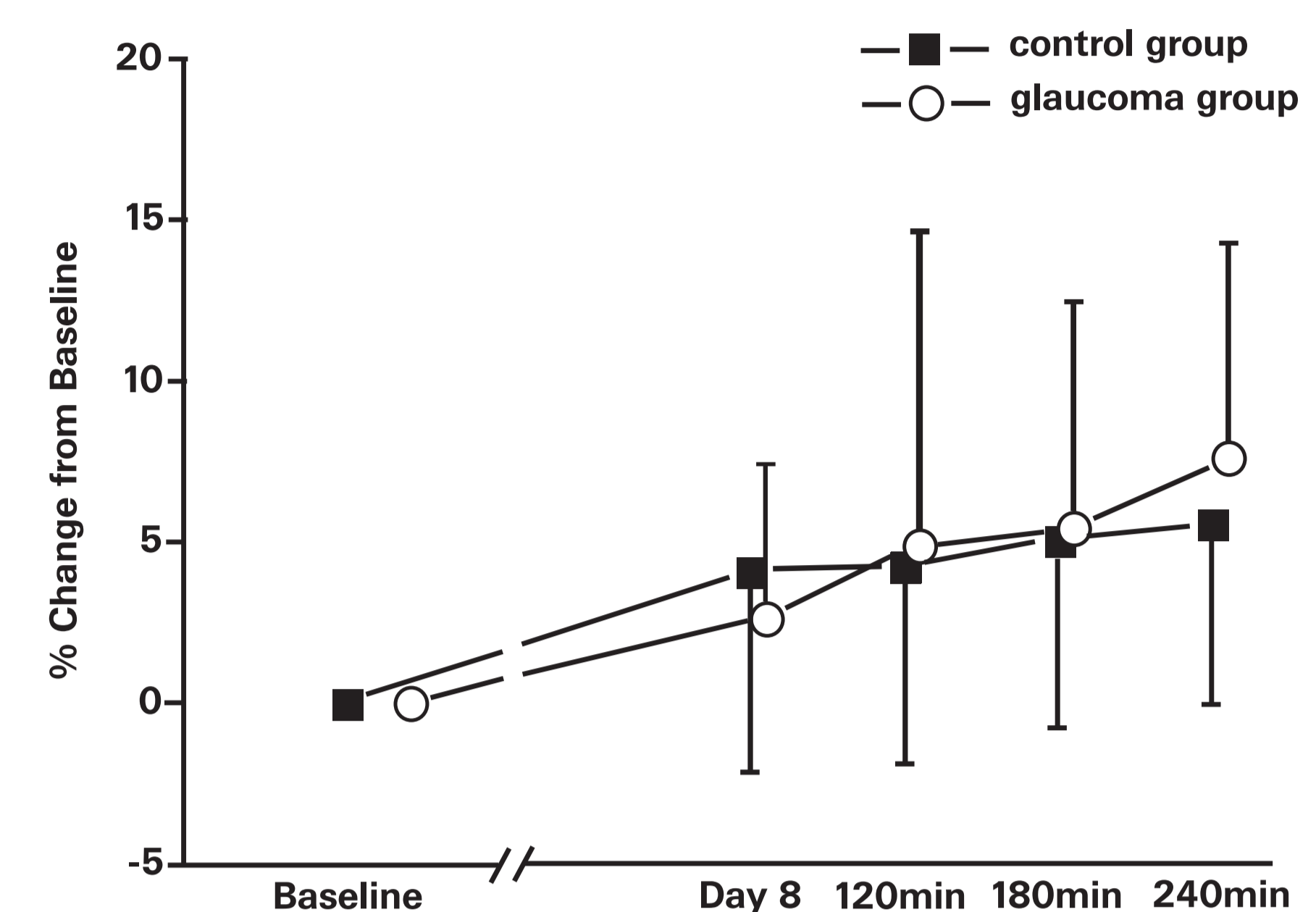


Figure 4. Change in retinal venous diameter

All data are presented in means \pm SD

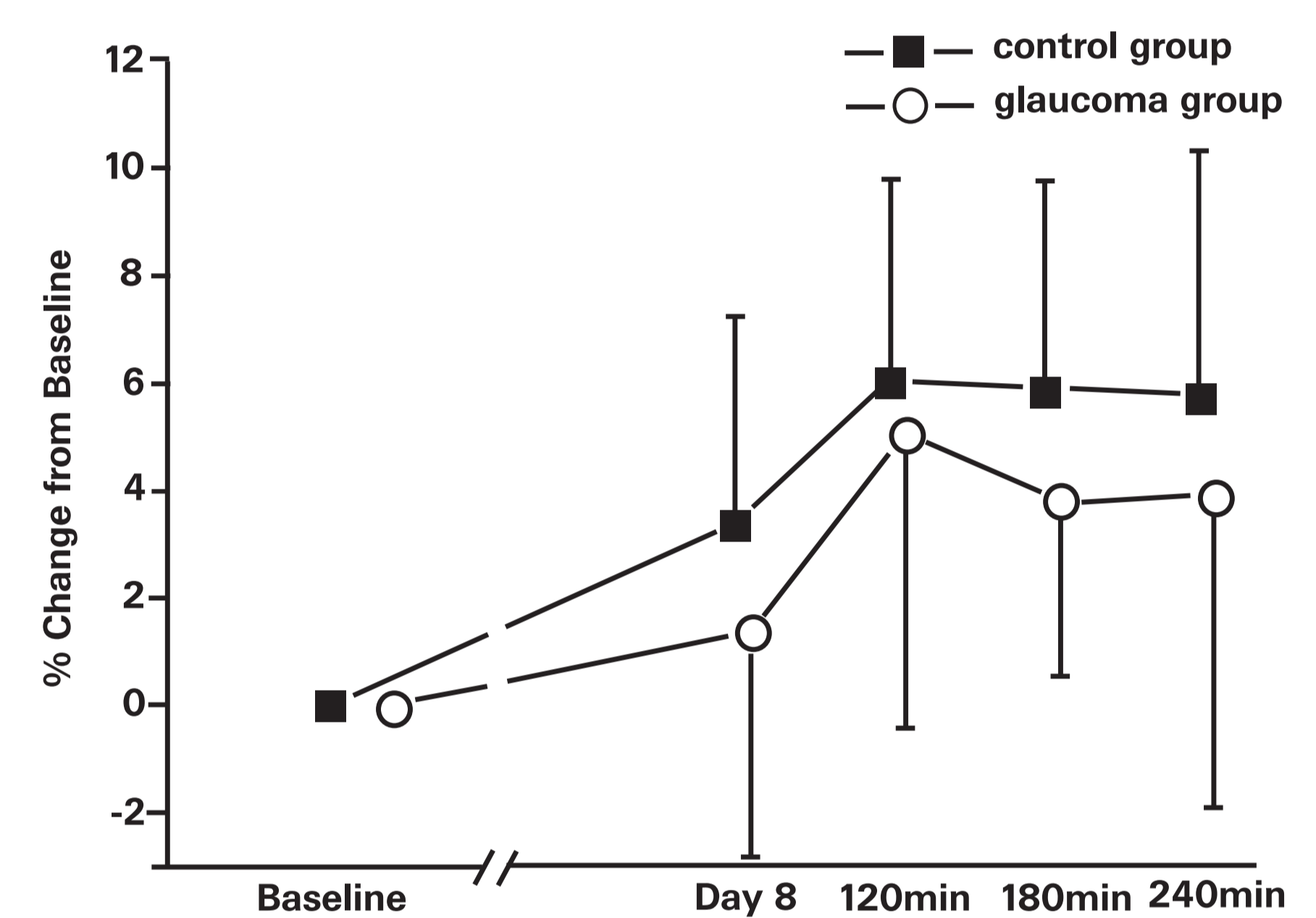


Figure 5. Retinal blood flow velocity

All data are presented in means \pm SD

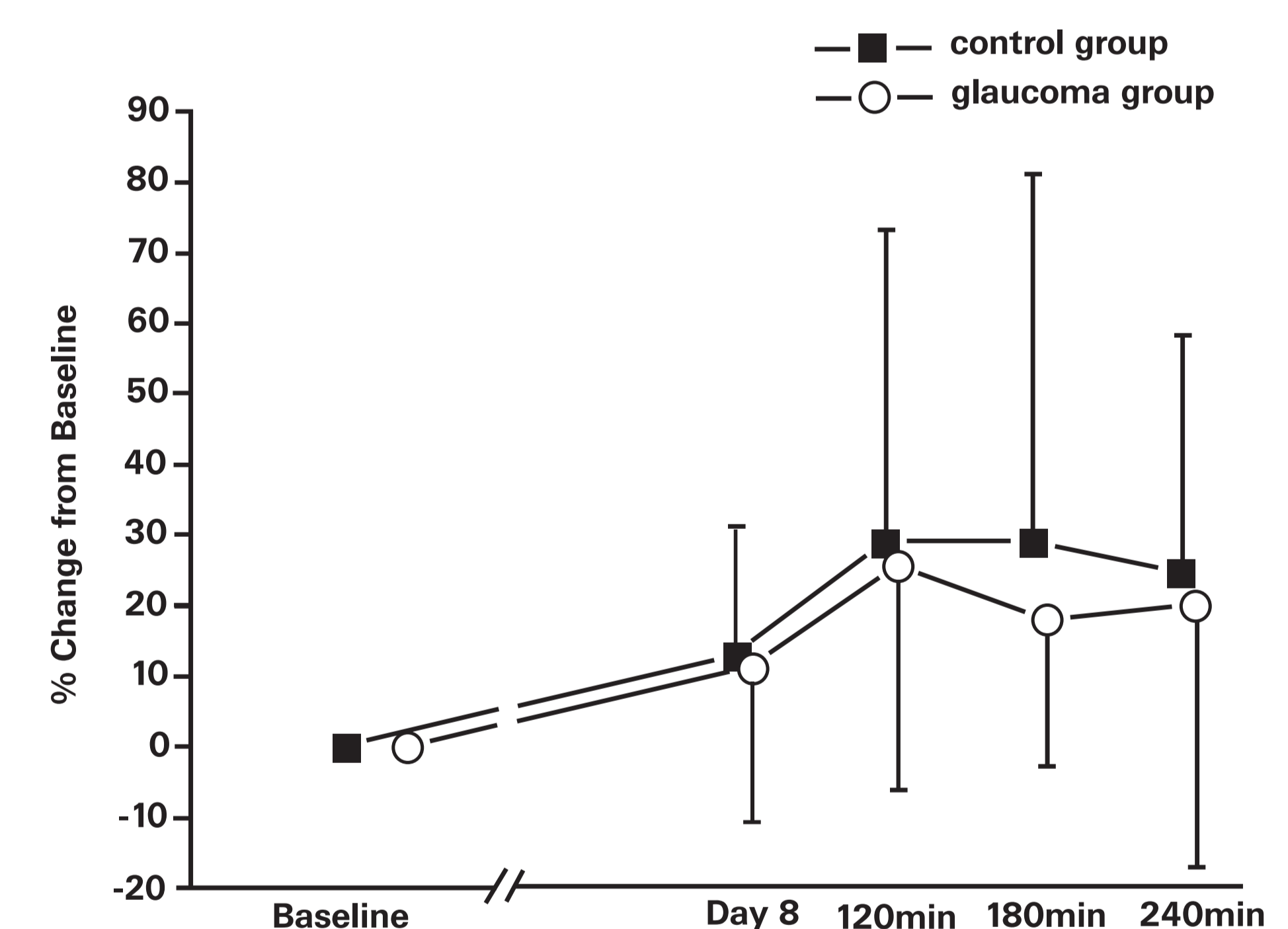


Figure 6. Optic nerve head blood flow

All data are presented in means \pm SD

