

## **Vitreous, Aqueous, and Serum Levels of Vascular Endothelial Growth Factor and Angiopoietin-2 in Patients With Proliferative Diabetic Retinopathy and Diabetic Macular Edema**

**Purpose.** Proliferative diabetic retinopathy (PDR) and diabetic macular edema (DME) may be a response to abnormal angiogenic growth factors, such as vascular endothelial growth factor (VEGF) and angiopoietin (Ang)-2. The purpose of this study is to compare vitreous, aqueous, and serum levels of VEGF and Ang-2 in diabetic patients who have PDR and DME with those of nondiabetic patients, and to identify correlations between the vitreous, aqueous, and serum levels of these angiogenic cytokines.

**Patients and Methods.** Aqueous humor, vitreous fluid, and serum samples were obtained during cataract and vitreous surgery from 16 eyes of 16 patients with PDR (10 eyes) and DME (6 eyes), as well as from 8 eyes of 8 nondiabetic patients with macular holes, and analyzed for levels of VEGF and Ang-2.

**Results.** The mean vitreous level of VEGF was significantly higher in the samples from patients with PDR ( $182.1 \pm 19.0$  ng/mL) and from patients with DME ( $152.2 \pm 46.3$  ng/mL) when compared to that of the samples from the control group ( $63.0 \pm 37.2$  ng/mL) ( $P < .001$ ;  $P < .01$ , respectively). The mean vitreous level of Ang-2 was significantly higher in patients with PDR ( $369.3 \pm 352.2$  pg/mL) and in patients with DME ( $495.3 \pm 434.7$  pg/mL) than in the control group ( $28.6 \pm 20.9$  pg/mL) ( $P < .001$ ;  $P < .05$ , respectively). There was a significant correlation between vitreous and aqueous levels of VEGF ( $r = 0.985$ ;  $P < .001$ ), but not between vitreous and aqueous levels of Ang-2 ( $r = 0.087$ ;  $P =$  not significant [NS]). There was no correlation between glycosylated hemoglobin (HbA1c) and intraocular levels of VEGF (vitreous and aqueous) or Ang-2.

**Conclusion.** VEGF and Ang-2 are significantly elevated in vitreous and aqueous humor in the eyes of patients with PDR and DME when compared to control eyes of patients without diabetes. Among diabetics, there is no correlation between HbA1C and intraocular levels of VEGF or Ang-2. Correlations do exist between the vitreous, aqueous, and serum levels of VEGF, but not of Ang-2, in patients with PDR and DME. Measuring the aqueous humor level of VEGF may be useful in analyzing the pathogenesis of PDR and in predicting disease activity.

**Key words:** angiopoietin, diabetes, macular edema, proliferative diabetic retinopathy, vascular endothelial growth factor