

# **Improved haemorrheological properties by Ginkgo biloba extract (Egb 761) in type 2 diabetes mellitus complicated with retinopathy**

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## **Abstract**

**Background & Aims:** Abnormal haemorrheological property changes in erythrocyte deformability, plasma and blood viscosity, and blood viscoelasticity may play very important roles in the development of microangiopathies in diabetes mellitus (DM). In this study, we demonstrate the improvement in abnormal haemorrheological parameters in DM with ingestion of Ginkgo biloba extract 761 (Egb 761).

**Methods:** Haemorrheological parameters before and 3 months after Egb 761 oral ingestion were determined in 25 type 2 DM patients with retinopathy. These parameters included lipid peroxidation stress of erythrocytes, erythrocyte deformability, plasma and blood viscosity, blood viscoelasticity, and retinal capillary blood flow velocity.

**Results:** After taking Egb 761 orally for 3 months, the blood viscosity was significantly reduced at different shear rates, by  $0.44\pm 0.10$  ( $\gamma=400$ ),  $0.52\pm 0.09$  ( $\gamma=150$ ) and  $2.88\pm 0.57$  ( $\gamma=5$ ). Viscoelasticity was significantly reduced in diabetic patients by  $3.08\pm 0.78$  (0.1 Hz). The level of erythrocyte malondialdehyde (MDA) was reduced by 30%; however, the deformability of erythrocyte was increased by 20%. And lastly, retinal capillary blood flow rate was increased from  $3.23\pm 0.12$  to  $3.67\pm 0.24$  cm min<sup>-1</sup>.

**Conclusion:** In this preliminary clinical study, 3 months of oral administration of Egb 761 significantly reduced MDA levels of erythrocytes membranes, decreased fibrinogen levels, promoted erythrocytes deformability, and improved blood viscosity and viscoelasticity, which may facilitate blood perfusion. Furthermore, it effectively improved retinal capillary blood flow rate in type 2 diabetic patients with retinopathy.