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# The Correlations between Blood Viscosity and Other Results of Blood Test in Stroke : A Pilot Study

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## Objective
Blood viscosity has been reported to be one of the risk factors or predictors for cardio-cerebrovascular diseases. Previous studies have shown that patients with ischemic heart or cerebrovascular disease have higher blood viscosity than normal group. Blood viscosity has been known to be related to hematocrit, red blood cell (RBC) deformability, RBC and platelet aggregation, plasma proteins, lipid, etc. The Purpose of this study is to analyze correlations between whole blood viscosity (WBV) and other Results of blood tests in patients with acute and subacute stroke to see what values could be helpful in predicting blood viscosity in stroke.

## Method
We retrospectively recruited patients with cerebral infarction or hemorrhage who had been admitted within 3 months of the onset. Forty patients were enrolled. In these patients, we collected the Results of blood test including WBV. WBV was evaluated as systolic blood viscosity (SBV) measured at high shear rate of 300s-1 and diastolic blood viscosity (DBV) measured at low shear rate of 5s-1. The Results of blood test other than WBV included complete blood count with differential count (CBC/DC), hemoglobin A1c (HbA1c), erythrocyte sedimentation rate (ESR), protein, albumin, blood urea nitrogen (BUN), creatinine, total lipid, total cholesterol, triglyceride (TG), low density lipoprotein (LDL), high density lipoprotein (HDL) and tissue oxygen delivery index (TODI). The Results of total lipid, total cholesterol, TG, LDL and HDL performed within one week before and after the viscosity test were included, and the Results of HbA1c performed within one month before and after the viscosity test were included. The other Results of blood test including WBV were obtained from the same blood sampling.

## Results
The study population consisted of 29 infarction and 11 hemorrhage patients. The mean age of patients was 61.02 ± 13.10 years. SBV was significantly positive correlated with RBC ($p<0.01$, $\rho=.726$), hemoglobin ($p<0.01$, $\rho=.773$), hematocrit ($p<0.01$, $\rho=.755$) and LDL ($p<0.01$, $\rho=.611$), and significantly negative correlated with HDL ($p<0.01$, $\rho=-.592$) and TODI ($p<0.01$, $\rho=-.828$). DBV was significantly positive correlated with RBC ($p<0.01$, $\rho=.790$), hemoglobin ($p<0.01$, $\rho=.814$), hematocrit ($p<0.01$, $\rho=.795$), albumin ($p<0.05$, $\rho=.506$) and LDL ($p<0.01$, $\rho=.600$), and significantly negative correlated with HDL ($p<0.01$, $\rho=-.527$) and TODI ($p<0.01$, $\rho=-.808$).

**Conclusion**

This study showed that WBV was positive correlated with RBC, hemoglobin, hematocrit, albumin and LDL, and negative correlated with HDL and TODI in acute and subacute stroke. These findings suggested that the above blood test values may be helpful in predicting blood viscosity in stroke.