Reviewer's report

Title: Shear Rate Specific Blood Viscosity and Shear Stress of Carotid Artery in Patients with Lacunar Infarction

Version: 1 Date: 14 August 2012

Reviewer: Dimitrios Sokolis

Reviewer's report:

This is a nicely-written paper with a two-fold aim: 1) to assess a novel methodology for calculating vascular shear stresses, utilizing duplex ultrasonography and dynamic blood viscosity measurements, and 2) to examine variations in shear stress along the carotid artery among control subjects and patients with lacunar infarction.

I am not well versed in the literature to comment on the novelty of those objectives, but I have serious concerns pertaining to the statistical significance of the variations presented between the different methods of calculating shear stresses and viscosity, and I also have a few suggestions that may help in the presentation of the current findings, which are detailed below.

Major compulsory revisions

1. It would be interesting for the readers to see representative ultrasonographic images of the carotid artery in different sites (common carotid artery vs. carotid bulb vs. internal carotid artery and left vs. right carotid) of control subjects vs. patients with lacunar infarction. These photos would help the reviewer and the readers to appreciate the extent of differences in the basic hemodynamic measurements (internal vessel diameter, maximum centerline velocity, and intima-media thickness) with site and disease, from which the peak-systolic and end-diastolic shear rate calculations are derived that are shown in Table 2 of the manuscript.

2. On page 8 (Statistical Analysis subsection of the Subjects and Methods section: this should be numbered 8 and not 9, and should not be typed boldface), it is mentioned that "Descriptive data for the major characteristics were expressed as means ± standard deviations (SD) or percentage as appropriate.", but in Table 3 it is stated that "Adjusted* (mean ± SE) peak-systolic and end-diastolic shear stresses (dyne/cm2) of both common carotid arteries". Please, specify what descriptive measure was used: standard error or standard deviation? The same measure should be used throughout the paper. There is no also no need to repeatedly state that parameters were mean ± SD in the Tables, as done in Tables 1, 3, and 4.

3. Similarly, it is unnecessary to specify in some Tables the type of statistical test used for the determination of p values, as this information is provided in the Statistical Analysis subsection on page 8: "An independent t-test was used to
determine the statistical differences in the continuous variables, whereas a chi-square test was used for categorical variables."

4. Reference to Table 1 is missing in the text. This is necessary in the first paragraph of the Results section (page 8) of the manuscript.

5. It is stated on page 9 that "Compared with the shear stresses using shear rate specific BV, significant differences were observed for the shear stresses using Hct-derived BV or BV at 300 s-1. Blood viscosities also showed significant differences between the shear rate specific BV and others. There was no significant difference between BV of hematocrit-derived and BV at 300 s-1, and also for their calculated shear stresses.". However, looking at the values listed in Table 4, no statistically significant differences are apparent, given that the shear stress and blood viscosity values presented are very similar with all three different methods of measurement. For instance, 14.0 ± 6.4 and 14.4 ± 7.2 are found to be significantly different at p=0.047 and comparison of 14.0 ± 6.4 and 14.4 ± 8.2 gave p=0.605, although both comparisons seem to be non-significant. Please, comment and clarify.

6. In addition to the previous comment, please also note that as mentioned on page 9 "The PS and ED shear stresses at the both CCAs using shear rate specific BVs were significantly lower in the patients with lacunar infarction than the controls, even adjusted for age, sex, and cardiovascular risk factors, as shown in Table 3. Shear stresses of the both CCAs using blood viscosities at 300 s-1 or hematocrit-derived BV also showed significant differences between the two groups.". All three methods of measuring shear stress and viscosity displayed identical variations between control subjects and patients with lacunar infarction. What is the rationale for choosing one method over another? Please, comment and explain.

**Level of interest:** An article whose findings are important to those with closely related research interests

**Quality of written English:** Acceptable

**Statistical review:** Yes, and I have assessed the statistics in my report.

**Declaration of competing interests:**

I declare that I have no competing interests.