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Discrepancies in the Whole Blood Viscosity Formula: Which One is Correct?

EDITORIAL COMMENT

The paper by Çalapkulu et al[1] entitled "Evaluation of Whole Blood Viscosity to Predict Stent Restenosis in Patients with Coronary Artery Disease" was read with great interest, and the authors are congratulated. However, there are some comments about the article.

In their retrospective case-control study, the authors evaluated the relationship between whole blood viscosity (WBV) and in-stent restenosis (ISR) in patients with prior coronary stent implantation. They wrote that they measured the high-shear rate viscosity (208 sec^{-1}) (HSR) and low-shear rate viscosity (0.5 sec^{-1}) (LSR) using De Simone et al[2] formula. However, they used formula for HRT (208 sec^{-1}) = (0.12 × HCT (%)) + 0.17 (total protein (g/L) – 2.07) and for LSR (0.5 sec^{-1}) = (1.89 × HCT (%)) + 3.76 (total protein (g/L) – 78.42), which is different from the original formula of De Simone et al.[2]

The original and validated with viscometer formulas are:[2]

HRT (208 sec^{-1}) = 0.12 × HCT (%) + 0.17 × total plasma protein (g/dL) – 2.07

LSR (0.5 sec^{-1}) = 1.89 × HCT (%) + 3.76 total plasma protein (g/dL) – 78.42.

The formula is valid only throughout the range of hematocrit (32%-53%) and plasma protein concentrations (5.4-9.5 g/100 mL).[2] According to the original formula, the range of HSR (208 sec^{-1}) was 2.7-5.9 cP, and the range of LSR (0.5 sec^{-1}) was 2.4-57.5 cP. However, in the Çalapkulu et al[1] study the HSR value was 16.8 ± 1.0 cP in the ISR group and 15.6 ± 0.9 cP in the control group, and the LSR value was 83.1 ± 8.4 cP in the ISR group and 80.8 ± 8.0 cP in the control group. These results were out of the original formula's calculated HSR and LSR ranges.

In the literature, several different formulas[3-7] were used in the calculation of HSR and LSR values; however, the only validated formula with a viscometer was De Simone et al[2] formula. So, the formula discrepancy could affect the study results.

In conclusion, the study results may check with the original formula. The comparison will show whether there is a differences in the results of the different formulas or not. This comparison will contribute to the literature on whether the formula discrepancy affects the results or not.

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Hasan Arı

Department of Cardiology, University of Health Sciences, Bursa Faculty of Medicine, Bursa High Specialty Training and Research Hospital, Bursa, Türkiye

Corresponding author:
Hasan Arı
✉ hasanari03@yahoo.com

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