ABSTRACT

Blood Viscosity and the Expression of Inflammatory and Adhesion Markers in Homozygous Sickle Cell Disease Patients With Chronic Leg Ulcers and those Without Ulcers

Andre St. Aubyn Bowers

Sickle cell disease (SCD) is characterized by altered blood rheology due to a reduced haematocrit and a resulting lowered viscosity which affects the efficacy of oxygen transport and delivery. The present study sought to give an indirect measure of oxygen delivery by way of the oxygen delivery index (ODI = haematocrit/viscosity) in subjects with normal and abnormal haemoglobin genotypes as well as in subjects with chronic leg ulcers ($SS_{u)}$ and SCD controls ($SS_{n)}$. Whole blood viscosity was measured at 23 sec^{-1}, 46 sec^{-1} and 230 sec^{-1}, using a Wells Brookfield Cone and Plate Viscometer. Haematocrit was determined using an AC.Tron Coulter Counter. Plasma concentrations of TNF-α, IL-1β, IL-10 and ICAM-1 were determined using ELISA in SS_u vs. SS_n. The ODI was statistically different between AA vs. AS but not AA vs. SS. However, the ODI was significantly lower in SS_u at 46 sec^{-1} and 230 sec^{-1} compared with SS_n. Plasma concentrations of TNF-α (p<0.001), IL-1β (p<0.04) and IL-10 (p<0.001), were significantly greater in sickle cell group. WBV in the SS_u group at 46 sec^{-1} and at 230 sec-1 was 1.9 (95%CI; 1.2, 3.1) and 2.3 (1.2, 4.4) times greater than SS_n group. IL 1β (median, IQR: 0.96, 1.7 vs. 0, 0.87; p<0.01) and ICAM-1 (226.5, 156.48 vs. 107.63, 121.5 p<0.005) were significantly greater in SS_u group compared with SS_n. However there was no difference in TNF-α (2, 3.98 vs. 0, 2.66) & IL-10 (13.34, 5.95 vs. 11.92, 2.99) concentrations between SS_u and SS_n. Inflammatory and adhesion markers and whole blood viscosity may play a role in the pathogenesis of leg ulcers in sickle cell disease by way of inflammation-mediated vasoocclusion/vasoconstriction.

Keywords: Andre St. Aubyn Bowers; homozygous sickle cell; blood viscosity; leg ulcers; adhesion markers.