Inter-erythrocytic Cohesive Forces (RBC aggregation) are Related to Blood Velocity

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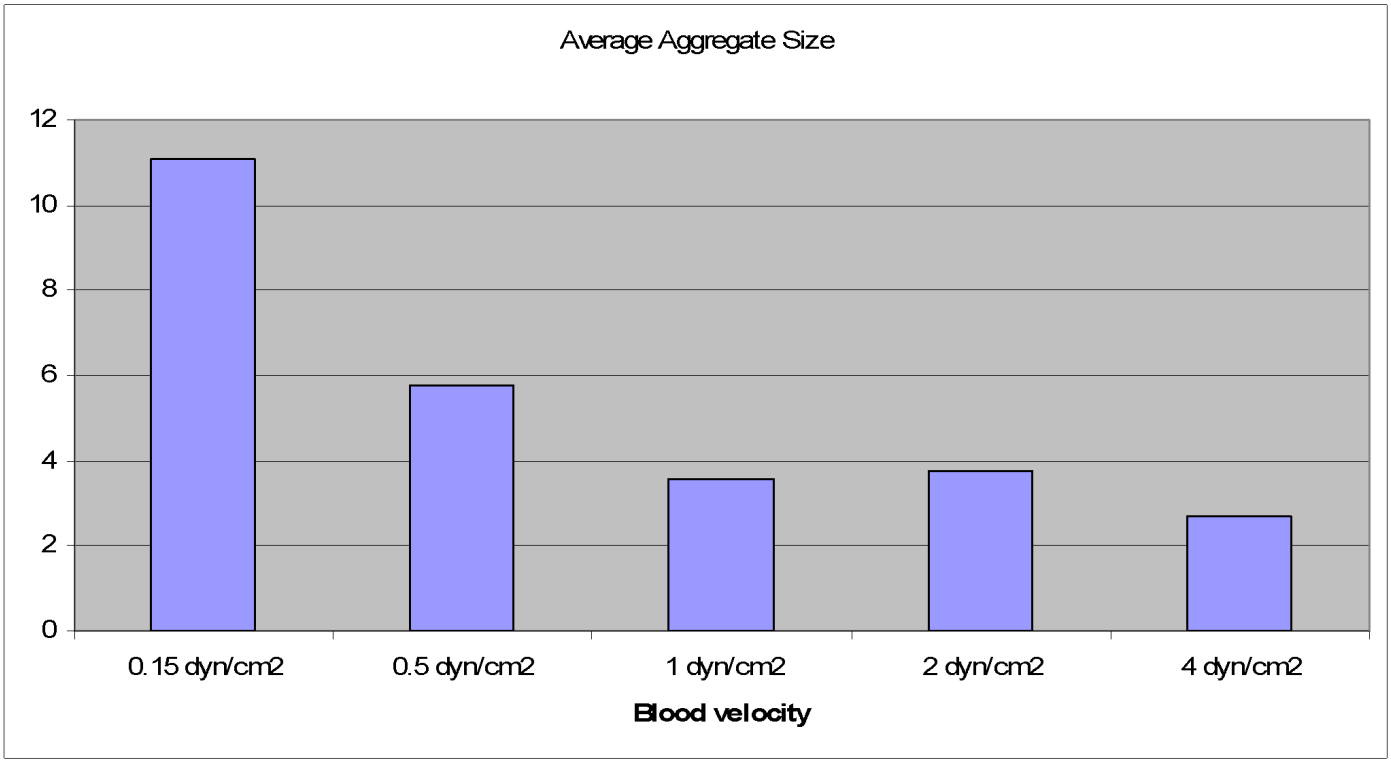
Introduction: Blood flow in the microcirculation is affected by fibrinogen and erythrocyte aggregation (EA). Since fibrinogen is constant in all blood vessels in the same individual, a change in EA will directly affect microcirculatory blood flow. The shear force of blood flow changes in different blood vessels according to their respective flow velocity. We hypothesized that EA is amplified in small blood vessels compared with large blood vessels due to different blood velocity.

Methods: Blood samples collected from 142 patients undergoing angiography were analyzed for RBC dynamics (aggregation/desegregation) using an in vitro system. RBC dynamic analysis was performed at a range of shear stress conditions (0.15, 0.5, 1.0, 2.0 and 4.0 dyn/cm^2) corresponding to different blood vessels sizes (capillaries to large arteries).

Results: EA increased significantly in low velocity blood vessels. The average aggregate size was larger in small vessels compared to large vessels (graph). The drop in aggregation with the increase in blood velocity supports the theory that EA occurs mainly in small vessels. EA was minimal in large arteries. Fibrinogen levels correlate with EA only in small blood vessels (r=0.4, p=0.001).



Conclusion: This in vitro model suggests that EA, a major determinant of blood flow in the microcirculation, occurs only in low velocity blood vessels.