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Local aggregation characteristics of microscale blood flows EFSTATHIOS KALIVIOTIS, Department of Mechanical Engineering and Material Science and Engineering, Cyprus University of Technology, JOSEPH M. SHERWOOD, Department of Bioengineering, Imperial College London, JONATHAN DUSTING, None, STAVROULA BALABANI, Department of Mechanical Engineering, UCL —
Erythrocyte aggregation (EA) is an important aspect of microvascular flows affecting blood flow and viscosity. Microscale blood flows have been studied extensively in recent years using computational and microfluidic based approaches. However, the relationship between the local structural characteristics of blood and the velocity field has not been quantified. We report simultaneous measurements of the local velocity, aggregation and haematocrit distributions of human erythrocytes flowing in a microchannel. EA was induced using Dextran and flows were imaged using bright-field microscopy. Local aggregation characteristics were investigated using statistical and edge-detection image processing techniques while velocity profiles were obtained using PIV algorithms. Aggregation intensity was found to strongly correlate with local variations in velocity in both the central and wall regions of the channel. The edge detection method showed that near the side wall large aggregates are associated with high local velocities and low local shear rates. In the central region large aggregates occurred in regions of low velocity and high erythrocyte concentration. The results demonstrate the combined effect of haematocrit and velocity distributions on local aggregation characteristics.

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