Asociación Argentina
de Mecánica Computacional

Mecánica Computacional Vol XXXVII, págs. 565-565 (resumen)
A. Cardona, L. Garelli, J.M. Gimenez, P.A. Kler, S. Márquez Damián, M.A. Storti (Eds.)
Santa Fe, 5-7 Noviembre 2019

FRACTAL SLOPE DETERMINATION OF IMAGES WITH NOISE REDUCTION THROUGH WAVELET TRANSFORMATION OF SAMPLES OF RED BLOOD CELL POPULATIONS WITH DIFFERENT PATHOLOGIES

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Keywords: hemorheology, red blood cells, Box-Counting Dimension, parisites,Wavelet Transform.

Abstract. In hemorheology is desirable to develop and to complement existing traditional analytical methods in order to diagnose different pathologies that could relate with the dynamic hemoreological properties of the constituents of blood. Fractal dimension is a useful tool for the characterization of different red blood cells (RBCs) populations and their interactions because the determination of this dimension in the images depends on the morphology of the erythrocytes and on the aggregates in which they participate. In the present work it was propose to characterize images of RBC obtained from conventional optical microscopy. The RBCs were obtained from patients with β-thalassemia heterozygous (βTh-H), patients affected with parasites (trichinosis and ascariasis), leukemia, ferric deprived anemic patients and also healthy donors, which were used as controls. The digital images of the samples were acquired with a Mikova DCM500 digital camera incorporated on an optical microscope (objective: 40X). Noise elimination was performed with the application of wavelet transform on the images (through decomposition of the signal in a collection of wavelet signals and the selection of the more significant ones in order to reconstruct the original signal), then Fractal Dimension values were estimated through the Box-Counting Dimension. The samples of patients with parasitism and acute leukemia showed significant differences in their variance (Levene Test, $p<0.01$) but not in their mean. The samples of patients affected by ferric deprived anemic and chronic leukemia showed a less pronounced change in their variance, but they showed significant differences between their mean values (Dunn Test, $p<0.01$). For the samples of patients with βTh-H it was observed significant differences in the central tendency of the considered variable (Mann-Whitney Test, $p<0.01$). These results could show possible alterations in the morphology, aggregation or size of the RBCs from patients with the evaluated hematological diseases. The present work corroborate the importance of relate Fractal Dimension as a mathematical tool with the viscoelastic properties of the RBC membranes of healthy donors (control) and patients affected with different hematological pathologies