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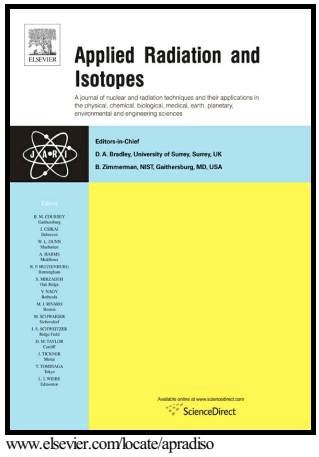

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GEOMETRICAL STUDY OF ASTROCYTOMAS THROUGH FRACTALS AND SCALING ANALYSIS

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Abstract

The tumor growth is a complex process characterized by the proliferation of uncontrollable cells which invade neighbor tissues. The understanding process of this type of phenomena is very relevant in order to establish diagnosis and proper therapy strategies and to start the valorization of its complexity with proper descriptors produced by the scaling analysis, which define the tumor growth geometry. In this work, obtained results through the scaling analysis for pilocytic astrocytomas, anaplastic and diffuse, are shown, which tumors of primary origin are. On them, it is calculated the fractal dimension and critical exponents of local roughness to characterize in vivo 3-D tumor growth. The acquisition of the images for this type of injuries was carried out according to the standard protocol used for brain radiotherapy and radiosurgery, i.e., axial, coronal and sagittal magnetic resonance T1 weighted images and comprising the brain volume for image registration. Image segmentation was performed by the application the k-means procedure upon contrasted images. The results show significant variations of the parameters depending on the tumor stage and its histological origin.

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