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Fractal and Euclidean geometrical diagnosis of Cervix cytology

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Abstract

Conventional methods for evaluation of cervix cytology show reproducibility problems. To solve this, there was developed a diagnostic methodology based on fractal and euclidean geometry, mathematically differentiating normality, L SIL and H SIL. The aim of the present work is to confirm the clinical applicability of such diagnostic in a blind study. For this purpose, the clinic diagnosis of 15 normal cells, 15 ASCUS, 15 L SIL and 15 H SIL was masked. Cellular nucleus and cytoplasm were evaluated calculating fractal dimension, number of spaces occupied by the frontier and number of pixels occupied by the surface of each object. The mathematical diagnosis was established and compared with the conventional diagnosis, calculating specificity, sensibility, negative likelihood ratio and kappa coefficient. It was found that simultaneous measures of the nuclear surface and the subtraction between the frontiers of cytoplasm and nucleus, lead to differentiate normality, L SIL and H SIL. Both sensibility and specificity values were of 100 percent. Kappa coefficient was 1 and negative likelihood ratio was zero. 4 ASCUS showed mathematical measures of normality, while the remaining 9 showed values of L-SIL cells. The mathematical diagnostic prove to be useful for clinical evaluation of cervix cytology, differentiating normality, L SIL and H SIL, quantifying how close it is the cell to a higher severity stage, and clearing up the undetermination of the ASCUS cells.

Biography

Javier Rodríguez is physician from the Universidad Nacional de Colombia, founder and director of the Insight Group since 2001. He has more than 55 national and international original papers, with characterizations, diagnosis and predictions in different areas of medicine, such as fetal and adult cardiology, infectology, immunology, molecular biology, epidemics prediction, celular morphometry and psychology, as well as projects in physics. His investigations are based on the development of predictions from theories and laws of the theoretical physics. They can be applied to particular cases, avoiding the empirical method of trial and error.