MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE SUMY STATE UNIVERSITY MEDICAL INSTITUTE







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ABSTRACT BOOK

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CLUSTERS OF FRACTAL DIMENSION OF THE HUMAN CEREBELLUM (MAGNETIC RESONANCE IMAGING STUDY)

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Introduction. In recent years, in morphology, fractal analysis is used as a morphometric method that allows to assess the degree of complexity of the organization of various biological structures. The cerebellum is a multifractal structure that has several clusters that correspond to different components of its tissue with different densities - white matter, granular and molecular layers of the cortex.

The aim of the study was to determine clusters of fractal dimension of various components of human cerebellar tissue to develop an algorithm for differential fractal analysis according to magnetic resonance imaging.

Materials and methods. Digital T2 weighted images of magnetic resonance imaging scans of 30 healthy patients were used in the study. A fractal analysis of white and gray matter of the cerebellum cortex was performed using the pixel dilation method in author's modification.

Results. The fractal dimension (FD) of cerebellar tissue for its components was determined. Three clusters of FD values corresponding to the main components of cerebellar tissue and average brightness values corresponding to them were determined: cerebellar white matter (70.684 \pm 0.473), granular layer of cortex (84.263 \pm 0.475), molecular layer of cortex (96.263 \pm 0.449). The average fractal dimension for the brightness threshold 80 used for computer image segmentation (white matter) was 1,324 \pm 0,05, for the brightness value 90 (white matter and the granular layer of the cortex) was 1,570 \pm 0,028, for the value 100 (tissue of the cortex (brightness range 81-90) was 1.367 \pm 0.02, the FD of the molecular layer of the cortex (range 91-100) was 1.350 \pm 0.02, the average FD of the cerebellar cortex as a whole (range 81-100) was 1.562 \pm 0.018.

Conclusion. The differential fractal analysis may be used as an additional diagnostic technique fir the magnetic resonance imaging study. Three main clusters of the cerebellar tissue should be present. The values of the FD of the cerebellar white matter and cortex of the cerebellum may be used as criteria for diagnosing of the cerebellum using magnetic resonance imaging.

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