Fractal analysis

Fractal analysis has emerged as a powerful tool for characterizing irregular and complex patterns found in the nervous system. This characterization is typically applied by estimating the fractal dimension (FD), a scalar index that describes the topological complexity of the irregular components of the nervous system, both at the macroscopic and microscopic levels, that may be viewed as geometric fractals. Moreover, temporal properties of neurophysiological signals can also be interpreted as dynamic fractals. Given its sensitivity for detecting changes in brain morphology, FD has been explored as a clinically relevant marker of brain damage in several neuropsychiatric conditions as well as in normal and pathological cerebral aging. In this sense, evidence is accumulating for decreases in FD in Alzheimer's disease, frontotemporal dementia, Parkinson's disease, multiple sclerosis, and many other neurological disorders. In addition, it is becoming increasingly clear that fractal analysis in the field of clinical neurology opens the possibility of detecting structural alterations in the early stages of the disease, which highlights FD as a potential diagnostic and prognostic tool in clinical practice [1)].

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Díaz Beltrán L, Madan CR, Finke C, Krohn S, Di Ieva A, Esteban FJ. Fractal Dimension Analysis in Neurological Disorders: An Overview. Adv Neurobiol. 2024;36:313-328. doi: 10.1007/978-3-031-47606-8_16. PMID: 38468040.