Physics > Medical Physics

Probing Tissue Multifractality Using Wavelet based Multifractal Detrended Fluctuation Analysis: Applications in Precancer Detection

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The refractive index fluctuations in the connective tissue layer (stroma) of human cervical tissues having different grades of precancers (dysplasia) was quantified using a wavelet-based multifractal detrended fluctuation analysis model. The results show clear signature of multi-scale self-similarity in the index fluctuations of the tissues. Importantly, the refractive index fluctuations were found to be more anti-correlated at higher grades of precancers. Moreover, the strength of multifractality was also observed to be considerably weaker in higher grades of precancers. These results were further complemented by Fourier domain analysis of the spectral fluctuations.

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