J Laser Opt Photonics 2018, Volume 5
DOI: 10.4172/2469-410X-C1-021

Giant cell tumor of bone detection based on polarization imaging and deep learning

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Giant Cell Tumor of Bone (GCT) is a deadly disease and has a high morbidity. Therefore, the early diagnosis of GCT is of great significance. According to histopathology, the medical experts give the diagnosis empirically, but it is not absolutely reliable. The change of the biological tissue characteristic parameters caused by pathological change results in the change of the intensity and the polarization of the incident light correspondingly, which provides the theoretical basis for detecting biological tissue lesions by using polarization imaging technology. Hence, polarization imaging is a potential tumor diagnosis aid. As a biomedical imaging characterization method, the Mueller matrix contains abundant information about the microstructure of tissue and is more and more widely used in the detection of tissue lesions. And by using the polarization imaging technique, the Mueller matrix of GCT can be obtained. Then, microstructure information of the diseased tissue will be extracted from the tissue, which can be utilized to detect biological tissue lesions of GCT effectively. In this paper, we propose a novel Convolution Neural Network (CNN) to detect biological tissue lesions of GCT based on polarization Mueller matrix imaging. In other words, expertise based on histopathology is transformed into the computer's own learning ability to improve the accuracy of lesion prediction with CNN. Our proposed method has been validated experimentally with microscopic images of GCT and it has the potential to be used for detecting lesions of GCT.

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