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O-ONC-03 - HYPERSPECTRAL IMAGING AS A NOVEL INSTRUMENT FOR INTRAOPERATIVE BRAIN TUMOR DETECTION

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Resumen

Objectives: Direct visualization of brain tumors using hyperspectral cameras (HSC) as an original non-invasive intraoperative imaging method.

Material and methods: A hyperspectral imaging (HSI) is a technology based on a large number of small bands of the electromagnetic spectrum. The HSI of different tissue forms usually its own, characteristic pattern at certain frequencies that provides a potential approach to distinguish these tissues in a much bigger wavelength band than that of a human eye. This project develops an experimental intraoperative setup based on HSC and set of algorithms capable of discrimination healthy and pathological tissues during human brain tumor surgery. Reflected light is sampled using the HSC, processes and eventually provides to the surgeon analisis and compare to the pathological results of the sample obtained from the same aeras of the surgical field where the HSC registration was done. Spectral classification of the captured HSI was defined by Random Forest classifier and employed by supervised learning algorithm. The labelling of samples was performed using two levels: “normal - tumor tissue” and “primary - secondary tumor”.

Results: The experimental results were based on the HSI of 22 brain surgeries and about 30,000 imaging samples, using sensitivity, specificity and overall acuracy metrics. Using the whole pre-processing chain, the automatic discrimination between normal and tumor sample maintain > 99% accurate.

Conclusions: The preliminary results of the application of HSI in the brain tumor detection confirm high ability in accurate and automatic discrimination between different types of tissue during the brain oncological surgery.

Key words: *Brain tumor. Hyperspectral images. Intraoperative visualization.*