عنوان مقاله:

Noninvasive measurement of cerebral cortex hemoglobin oxygenation with Near-Infrared spectroscopy

محل انتشار:

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خلاصه مقاله:

Near-Infrared (NIR) is the region of light with wavelength from 650 nm to 1100 nm. In this region light can penetrate into higher depth compared to visible light in biological tissues. In NIR region there is a special optical window from 700 nm to 900 nm in which dominant absorber chromophores inside the brain are oxy-hemoglobin and deoxy-hemoglobin. non-invasive Functional Near-Infrared Spectroscopy (fNIRS) is a portable low-cost efficient method for monitoring hemodynamic change in cerebral cortex. Since fNIRS and Functional Magnetic Resonance Imaging (fMRI) both measure hemoglobin oxygenation, it is acceptable to compare these two methods for cortex related cognitive task studies and drug addiction studies. in cases that other diagnostic techniques like fMRI are not applicable and might be harmful for example in case of a patient with cardiac pacemaker, or when fMRI is not available or for claustrophobic patient an alternative method should be available. in many studies for specific tasks because of subject's positioning limits inside fMRI, an inexpensive method that allows data acquisition from a sitting or standing subject fNIRS is a reliable alternative. When it's about cerebral cortex fNIRS can be an alternative for fMRI considering that fNIRS price is much lower and for many cognitive task designs subject's mobility and position are important factors and with fNIRS we do not have to be that concerned about these issues. In this article Principles and equations for this technology will be described and as an example we designed a cognitive task and used fNIRS device to measure cerebral activity in left prefrontal cortex of healthy male adult to show accuracy and efficiency of this device for cerebral cortex activity monitoring. Also, Value of this method in attention & cognitive disorders specially in children thanks to higher depth of light penetration in their brain compared to adults will briefly be discussed.

کلمات کلیدی:

NIR-spectroscopy, hemodynamic monitoring, cognitive tasks, hemoglobin, fNIRS