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Functional near-infrared spectroscopy on acute sport-related concussion: Can a brain activation pattern be used as a biomarker of concussion?

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Statement of the Problem: Currently, the diagnosis and follow-up of acute Sport-Related Concussion (SRC) is based mainly on symptom score. This may lead to underreported or underestimated episodes of concussion among contact-sport players or pre-emptive return to play. Studies using task-related functional Magnetic Resonance Imaging (fMRI) reported abnormal brain activation patterns during neurocognitive tasks in SRC. This can be used as an objective parameter to assess players with suspected concussion and to track their recovery. However, the results are not consistent between fMRI studies. Functional Near-Infrared Spectroscopy (fNIRS) can be a valid alternative to assess the cerebral activation in concussed patients illuminating their brain with NIR light. No study has been conducted on SRC within 72 hours of injury using fNIRS. The objective of this study is to identify a pathological brain activation pattern that can be used as a biomarker for concussion using fNIRS.

Methodology & Theoretical Orientation: An observational study on concussed athletes within 72 hours from injury and non-concussed athletes is conducted using fNIRS. Results are compared with clinical assessment, validated neurocognitive tests (e.g. WAIS-IV) and neuroimaging techniques (e.g. Magnetic Resonance Spectroscopy).

Finding: Preliminary results show the capacity to detect brain activations using fNIRS. Further measurements are needed to detect a constant activation pattern in SRC and establish its relationship with neurocognitive tasks and imaging techniques.

Conclusion & Significance: fNIRS is a valid tool to detect brain activation. Further measurements are needed to define the type of fNIRS signal that can be used as a biomarker of SRC.

Biography

Mario Forcione is a Medical Graduate in La Sapienza, University of Rome in 2015. Currently, he is a PhD student of the University of Birmingham and is working in the project "Brain Injury and Trauma Monitoring Using Advanced Photonics".

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