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Translational Neuroimaging in Post-Concussion Syndrome: From Functional Insights to AI Applications

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Concussion, or mild traumatic brain injury (mTBI), affects over 42 million people annually worldwide, presenting a significant challenge as approximately 35% experience persistent post-concussion symptoms (PCS) despite conventional brain imaging (CT/MRI) often appear unremarkable. This talk will highlight how translational neuroimaging and AI provide functional insights to address the existing limited early prediction and lack of personalized management strategies for patients with PCS. I will share the feasibility of using machine learning models based on fMRI biomarkers and demographic features to predict long-term cognitive outcomes, specifically working memory decline. Furthermore, I will discuss the latest research harnessing the unique properties of thalamocortical coherence, derived from resting-state fMRI, as a crucial biomarker for promoting proactive concussion management and personalized precision care.

Keywords: Concussion, Mild traumatic brain injury (mTBI), Post-concussion symptoms (PCS), Functional magnetic resonance imaging (fMRI), Thalamocortical coherence, Working memory