Zaninotto A L et al., Brain Disord Ther 2016, 5:3(Suppl)
http://dx.doi.org/10.4172/2168-975X.C1.011

Longitudinal study of neuropsychological, neuroimaging and cortical excitability of patients with diffuse axonal injury

Zaninotto A L, Hayashi C, Feltrin F, Nagumo N M, Neville I, Rodrigues P, Moura L, Guirado V P, Amorim RA and Paiva WS
University of Sao Paulo, Brazil

Introduction: Diffuse axonal injury (DAI) is prevalent in traumatic brain injury (TBI), often associated with poor outcomes, including cognitive impairments and psychiatric disturbance. Cognitive impairments resulting from the DAI are related to disorders in the white matter pathway connections, especially between the cortex and deep structures. Also, over-activation of NMDA-mediated excitatory processes and excess of GABA-mediated inhibition are described after TBI on the acute and sub-acute phases. Nevertheless, there are few studies regarding this circuitry on the chronic phase. Our primary aim was to assess cognition in patients with DAI at 6 and 12 months after the trauma. The secondary aim was to evaluate neuropsychiatric symptoms and RMI in patients with DAI at 3, 6 and 12 months after the trauma; and assess the cortical excitability on chronic phase (more than 12 months after the trauma)

Methods: This was a longitudinal, open label, one arm, no interventional study. Consecutive patients diagnosed with DAI aged 18 years or older were invited to participate. The study had four time-points: (1) between 1 to 3 months after the trauma – evaluation of neuropsychiatric symptoms and MRI; (2) 6 months after the trauma – evaluation of neuropsychiatric symptoms, MRI, and cognitive assessment; (3) 12 months after the trauma - evaluation of neuropsychiatric symptoms, MRI, and cognitive assessment; (4) more than 12 months after the trauma – evaluation of cortical excitability.

Results: From August 2010 to July 2015, 187 patients were diagnosed with DAI. 63 patients agreed to participate on the trial. N=47 patients completed the neuropsychiatric evaluation at 3, 6 and 12 months after the trauma. Multivariate test of pooled data showed no significant difference in depression (p=0.067) and anxiety symptoms (p=0.43) among the three time-points. No significant interactions were found between the severity of the trauma and the depression (p=0.898) and anxiety symptoms (p=0.622). MRI results showed a correlation between the number of lesions (MARS) and cerebral atrophy (r=0.51, p=0.0096). Our analysis did not find correlation between number of lesions (MARS) and attentional processes by Trail Making Test (TMT) form A and B, neither in verbal episodic memory by HVLT. The results of cognitive assessment between 6 and 12 months after the trauma, showed an improvement on response time by TMT forms A and B, (p=0.001); improvement on selective attention by Stroop test, card A, (p=0.044), B (p=0.003), and C (or interference, p=0.001). For episodic memory, our analysis showed an improvement on visuospatial memory by Rey Complex Figure (RCF) recall over time (p=0.013), but not on the RCF copy (p=0.657) scores. We also found improvement on immediate verbal memory assessed by HVLT (p=0.001) but a trend on delay recall (p=0.056). We did not find differences on the other cognitive tests. For cortical excitability, no significant differences between left and right hemispheres were found. Values of RMT, MEPs and ICF from DAI patients were found within the normality. However, short interval intra-cortical inhibition (SIICI) values were higher on DAI patients (DAI SIICI 1.60±1.15 versus 0.56±0.63; DAI pp02-Rel 1.57±1.28 vs. 0.40±0.44; DAI pp04-Rel 1.64±1.47 vs. 0.61±0.84) showing a disarranged inhibitory system.

Conclusion: No significative clinical or statistical changes were observed for depression or anxiety symptoms. We also did not observe any interaction between the severity of the trauma and the different time-points. We found a positive and significant correlation between the reduction of the white matter volume between three and 12 months after the trauma. Additionally we observed a time-dependent improvement on attentional processes, visuo-spatial and verbal episodic memory in patients with DAI. It seems that neuroplasticity play an important role in the first year of the trauma, leading to an open window to cognitive improvements. Also, as inhibition processes are GABA-mediated, it is likely to infer that DAI pathophysiology may deplete GABA leading to a disinhibition of the neural system.

ana.zaninotto@yahoo.com.br