Optic neuritis detected with visual evoked potentials in experimental autoimmune encephalomyelitis mouse model

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Multiple sclerosis (MS) is an autoimmune, demyelinating disease of the central nervous system (CNS) and it is the major cause of non-traumatic disability in young adults. About 10 to 30% of MS patients have a clinical presentation that starts with an attack of optic neuritis (ON). Research on the pathophysiology of MS and associated ON is enhanced by the animal model experimental autoimmune encephalomyelitis (EAE). We aimed at investigating ON using visual evoked potentials (VEPs) in EAE mice. EAE is induced in C57BL/6 mice (n=23) through the injection with myelin oligodendrocyte glycoprotein (MOG). Non-invasive VEPs were recorded before the day of immunization and at different time points until 37 dpi. Clinical score was measured daily and healthy control group (n=12) was monitored at the same time points. At the terminal time point, OCT was performed and mice were sacrificed for histology.

EAE mice were divided in two groups, with optic neuritis (ON, 70%) and without optic neuritis (W/O, 30%), based on cutoff for both latency and amplitude. In both EAE groups, NGCC reductions were not found. While histology showed a significant demyelination ($p=0.003$) and axonal loss ($p=0.001$) in EAE ON compared to healthy but not in EAE W/O. Pearson's correlation was significant between latency and demyelination ($r=0.735$; $p<0.0001$) and between axonal loss and NGCC reduction ($p=0.027$; $r=-0.369$). Concerning clinical score, EAE were divided in 3 groups: binocular ON (bON), monocular ON (mON). EAE W/O showed no significant difference compared to healthy. On the other hand, EAE bON and mON both showed a significant increase of clinical score compared to healthy. Interestingly, EAE mON presented a higher motor disability compared to EAE bON ($p=0.002$). To conclude, non-invasive VEPs can be used to detect optic neuritis and to discriminate between clinical profiles with different degrees of motor disability.