PROPOFOL ENHANCES THE FIELD EXCITATORY POSTSYNAPTIC POTENTIALS IN CA1 HIPPOCAMPUS SLICES OF YOUNG AND AGED MICE

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Introduction: Propofol is a widely used intravenous anesthetic. Increasing age was shown to decrease the requirements for general anesthetics (1) For propofol induction in adult, age significantly affects BIS, SE, and RE indices of LOC (2). However, the mechanisms of ageing-induced potentiation of anesthetic actions have not been clearly explored. It has been reported in an animal study, that isoflurane enhanced suppression of excitatory synaptic transmission in the aged rat hippocampus (3). But the data from animals undergoing propofol anaesthesia are lacking. The aim of this study is to compare the effects of propofol on the field excitatory postsynaptic potentials (fEPSPs) in hippocampal slices of young and aged mouse.

Methods: Studies were approved by the local Animal Care Committee. Brain slices were prepared from C57BL6 male young (8-16 weeks) and ageing (>12months) mouse. The dendritic field excitatory postsynaptic potential was recorded from the CA1 stratum radium using patch clamp electrophysiological methods. A bipolar concentric stimulating electrode was placed along the Schaffer collateral for orthodromic stimulation. The effects of clinically-relevant concentrations of propofol were studied in the young and ageing mouse slices. Data are presented as mean ± SEM.

Results: In slices from young mice, a clinically relevant concentration (10 μM) of propofol increased the peak amplitude and area under the curve of fEPSP, but there were no effects on the half-width and decay. As for the peak amplitude of fEPSP, the potentiation effects of propofol occurred in a dose-dependent manner. In aging mouse slices, 10 μM propofol enhanced the peak amplitude and area under the curve of the fEPSP. 10 μM propofol prolonged the half-width but had no effects on the decay of fEPSP. The potentiations of peak amplitude and the area under the curve of the fEPSP in young mice are significantly greater than that in aging mice, while there is no difference in the time course of half-width and decay between young and aging mouse. Furthermore 10 μM propofol increased the pre-axonal potential in young hippocampal slices.

Discussion: The fEPSP of slices from aging mice demonstrates diminished sensitivity to the enhancing actions of propofol on the amplitude and area under the curve These data might provide a partial explanation as to why aging patients are prone to develop the adverse reactions from clinical propofol anesthesia.

References: 1. Anesthesiology 2000;92:55-61