Role of AMPA Receptor Subunit Glutamate Receptor 2 Trafficking in Sevoflurane-Induced POCD in Aged Rats

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Objective: To evaluate the role of α-amino-3-hydroxy-5-methylisoxazole-4-propionic acid (AMPA) receptor subunit glutamate receptor 2(GluR2) trafficking in sevoflurane-induced POCD in aged rats**.**

Methods: Ninety-six healthy male Wistar rats， aged 18~20 months， weighting 600~650 g， were randomly divided into 6 groups(n = 16 each): control group (group C)， propofol group(group P), propofol+surgery group(group PS), 1 MAC sevoflurane+surgery group(group 1MAC)， 1.3 MAC sevoflurane+surgery group(group 1.3 MAC)，1.5 MAC sevoflurane+surgery group(group 1.5 MAC). Group C inhaled 30% O_2 for 2 h. Rats in group P were infused with propofol at a rate of 0.5~0.7 $mg \cdot kg^{-1} \cdot min^{-1}$ for 2 h. In group PS, open tibial fracture surgery was performed when propofol was infused at a rate of 0.6±0.1 $mg \cdot kg^{-1} \cdot min^{-1}$ for 2 h. In group 1 MAC, 1.3 MAC and 1.5 MAC, open tibial fracture surgery was performed when rats were exposed to 2.4%, 3.1% and 3.6% sevoflurane in 30% O_2 for 2 h respectively. Rats in group P and PS also inhaled 30% O_2 for 2 h. Fear conditioning and Y maze test were performed on days 1， 3 and 7 after surgery to determine the sevoflurane concentration that could induce POCD in aged rats. Another seventy-two rats were equally and randomly divided into 4 groups: group C，group P， group PS and group POCD. Six rats of each were chosen on days 1, 3 and 7 after surgery to detect the expression of total protein of GluR2 and cell membrane GluR2 in hippocampus by western blot.

Results: Compared with group C, the percentage freezing time and spontaneous alternation were decreased on days 1 and 3 after surgery in group PS, 1 MAC, 1.3 MAC and 1.5 MAC ($P < 0.05$). Compared with group PS, the percentage freezing time and spontaneous alteration were decreased on days 1 and 3 after surgery in group 1.5 MAC ($P < 0.05$). Compared with group C, the expression of cell membrane GluR2 was decreased on days 1 and 3 after surgery in group PS and POCD ($P < 0.05$). Compared with group PS, the expression of cell membrane GluR2 was decreased on days 1 and 3 after surgery in group POCD ($P < 0.05$).

Conclusion: Anesthesia with 1.5 MAC sevoflurane can induce the impairment of fear memory and work memory in aged rats possibly through the AMPA receptor GluR2 trafficking from cell membrane to cytoplasm in hippocampus.