Tapentadol Inhibits Spontaneous and Miniature Excitatory Postsynaptic Currents in Rat Hippocampal Slices

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INTRODUCTION

Tapentadol, a newly atypical opioid analgesic, has been approved to treat acute and chronic pain. Moreover, tapentadol has been found to alleviate neuropathic pain effectively in recent studies. Since neuropathic pain might be associated with excessive glutamatergic transmission in CNS, we hypothesized that tapentadol may affect the glutamate system in CNS.

MATERIAL AND METHODS

- ◆ Isolated nerve terminals (synaptosomes) purified from male Sprague-Dawley rat cerebral cortex were used to examine the effect of tapentadol on glutamate release evoked by 4-aminopyridine (4-AP).
- ◆ whole-cell patch-clamp recordings in hippocampal slices were used to examine the effect of tapentadol on the increased spontaneous excitatory postsynaptic currents (sEPSCs) evoked by 4-AP.
- ◆ The effect of tapentadol on the tetrodotoxin-resistant miniature excitatory postsynaptic currents (mEPSCs) was examined as well.

RESULTS

Fig.1. (A) Tapentadol inhibits 4-AP-evoked glutamate release from rat cerebrocortical nerve terminals (B) in a concentration-dependent manner. (* $P < 0.05$).

Fig. 2. Tapentadol inhibit epileptiform activity-induced by 4-aminopyridine in hippocampal CA3 pyramidal neurons. (***) $P < 0.001$

Fig. 3. Effect of tapentadol on spontaneous excitatory postsynaptic potentials (sEPSCs) frequency and amplitude in hippocampal CA3 pyramidal neurons. (** $P < 0.01$)

Fig. 4. Effect of tapentadol on miniature excitatory postsynaptic potentials (mEPSCs) in hippocampal CA3 pyramidal neurons.

- ◆ Our results suggest that the alleviating effect of tapentadol on neuropathic pain may be ascribed to its presynaptic mechanism on glutamate release.

CONCLUSION

Fig. 5. Tapentadol reduces neuronal excitability in hippocampal CA3 pyramidal neurons.