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An Experimental Study Comparing the Respiratory Effects of Tapentadol and Oxycodone in Healthy Volunteers

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Abstract

Background: There is a clinical need for potent opioids that produce little or no respiratory depression. In the current study we compared the respiratory effects of tapentadol, a mu-opioid receptor agonist and noradrenaline reuptake inhibitor, and oxycodone, a selective mu-opioid receptor agonist. We hypothesize that tapentadol 100 mg has a lesser effect on the control of breathing than oxycodone 20 mg.

Methods: Fifteen healthy volunteers were randomized to receive oral tapentadol (100 and 150 mg), oxycodone 20 mg or placebo immediate release tablets in a crossover double-blind randomized design. The main end-point of the study was the effect of treatment on the ventilatory response to hypercapnia and ventilation at an extrapolated end-tidal PCO_2 of 7.3 kPa (55 mmHg, VE55); VE55 was assessed prior and for 6-h following drug intake.

Results: All three treatments had typical opioid effects on the hypercapnic ventilatory response: a shift to the right coupled to a decrease of the response slope. Oxycodone 20 mg had a significantly larger respiratory depressant effect than tapentadol 100 mg (mean difference -5.0 L min-1, 95% confidence interval: -7.1 to -2.9 L min-1, $P<0.01$), but not larger than tapentadol 150 mg (oxycodone vs. tapentadol 150 mg: $P>0.05$).

Conclusions: In this exploratory study we observed that both tapentadol and oxycodone produce respiratory depression. Tapentadol 100 mg but not 150 mg had a modest respiratory advantage over oxycodone 20 mg. Further studies are needed to explore how these results translate to the clinical setting.

Keywords: breathing; hypercapnic ventilatory response; opioid-induced respiratory depression; opioids; respiratory depression.

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