

Title: EFFECTS OF SUFENTANIL ON CEREBRAL BLOOD FLOW AND OXYGEN CONSUMPTION

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Introduction. In a previous study¹ we found dose related reduction of cerebral blood flow (CBF) and cerebral metabolic rate for oxygen (CMR_{O₂}) with large doses of fentanyl in the rat. Sufentanil, a new synthetic opioid analog has been shown to be five to ten times as potent as fentanyl with minimal cardiovascular depression.² This study was designed to examine the effects of sufentanil upon CBF and CMR_{O₂} in the same animal model.

Methods. Male Wister rats were anesthetized with halothane 2-3% in oxygen. Following tracheostomy, cannulation of femoral vessels, paralysis with d-tubo-curarine, while mechanically ventilated, a burr hole was made over the sagittal sinus for venous sampling. At the completion of surgical procedure halothane was discontinued and ventilation continued with 70% N₂O-30% O₂ for 30 minutes before the experiment. The animals were randomly assigned to control and different sufentanil groups. Animals in the control group were ventilated with 70% N₂O-30% O₂ throughout the experiment. Experimental animals were given loading doses of 5, 10, 20, 40, 80 or 160 µg/Kg sufentanil intravenously. Upon beginning the injection of sufentanil, 70% N₂ was substituted for N₂O. During measurement of CBF, an infusion of sufentanil continued at a rate of .033 x loading dose/minute to maintain a steady state of anesthetic depression as indicated by electroencephalogram (EEG). CBF was measured by a modified Kety-Schmidt technique using 133-Xe as tracer.³ CMR_{O₂} was calculated by measuring the difference in the O₂ contents of arterial and sagittal sinus blood. Arterial blood pressure, EEG and temperature, blood gases and pH were monitored during the study. Statistical test employed analysis of variance and Student's t test and P<0.05 was considered statistically significant.

Results. Mean arterial blood pressure (115-130mm Hg), temperature (37°), PaO₂ (115-130mm Hg) and PaCO₂ (36-39mm Hg) were similar in all groups. CBF decreased significantly in sufentanil groups compared to control group. The reduction in CMR_{O₂} occurred in groups with 20 µg/Kg and higher doses of sufentanil (see figure). Marked depression in EEG tracing with low frequency, high amplitude and burst suppression occurred in sufentanil groups. Short periods of epileptoid patterns and spikes were also evident on EEG in 80 µg/Kg and 160 µg/Kg groups.

Discussion. This study indicates that high doses of sufentanil cause a decrease in both CBF and CMR_{O₂} (Maximally by 47% and 36% respectively). The EEG patterns in 80 µg/Kg and 160 µg/Kg groups also indicate possible irritant effect of sufentanil upon the central nervous system. These findings are similar to those of high dose fentanyl. The origin of these abnormal EEG patterns and their effects on cerebral metabolism remain to be investigated.

References.

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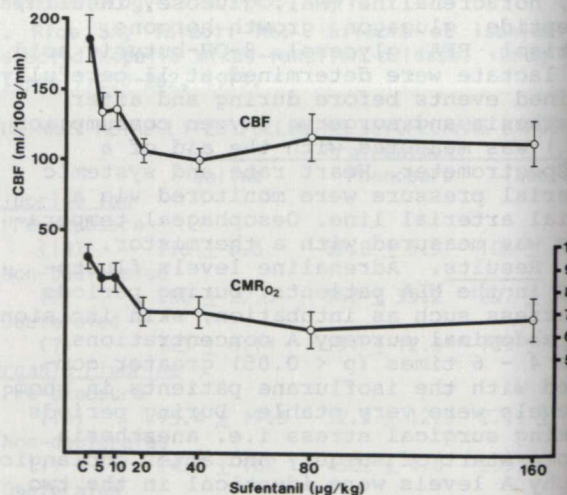


Figure.

CBF and CMR_{O₂} in control and sufentanil groups. The values are means ± SEM. Unfilled circles indicate values significantly different from the control.