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Effects of Fentanyl Versus *Sufentanil in Equianesthetic Doses on Middle Cerebral Artery Blood Flow Velocity*

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Background: **Sufentanil has been reported to increase cerebral blood flow in comparison with fentanyl. However, because of the use of animal models, supraclinical doses and/or background anesthetic agents, the clinical applicability of these studies remains difficult to assess. Therefore, transcranial Doppler ultrasonography was used to determine the cerebral hemodynamic effects of equianesthetic doses of fentanyl and sufentanil on middle cerebral artery (MCA) blood flow velocity in patients without intracranial pathologic conditions.**

Methods: **Twenty-four unpremedicated American Society of Anesthesiologists physical status 1 and 2 patients undergoing elective nonintracranial neurosurgery were assigned randomly to receive equipotent blinded infusions of either sufentanil (15 μg/min) or fentanyl (150 μg/min) for anesthetic induction during spontaneous ventilation of 100% oxygen. Normocapnia, as measured by infrared capnography, was maintained by manually assisting ventilation, as necessary. The cerebral opioid effect was quantified using the spectral edge frequency parameter. The infusion was continued until either 1) spectral edge frequency decreased below 10 Hz or 2) 150 μg of sufentanil or 1,500 μg of fentanyl was infused, whichever occurred first. On average, the patients received 1.7 ± 0.55 μg/kg or 16 ± 4 μg/kg of sufentanil or fentanyl, respectively. The right MCA mean, peak systolic, and peak diastolic velocities and pulsatility index were measured continuously by transcranial Doppler ultrasonography.**

Results: **The mean arterial pressure decreased slightly in both groups, but only in the fentanyl group were the changes significant. The MCA velocity increased by approximately 25% in both groups. However, the relative changes in MCA velocity were not different between groups. The pulsatility indexes were unchanged in both groups.**

Conclusions: **These data suggest that, at clinically relevant doses in the absence of other drugs, cerebral blood flow velocity is increased by both fentanyl and sufentanil. Furthermore, there appears to be no significant differences in the cerebral hemodynamic profiles of the two drugs, as assessed by transcranial Doppler ultrasonography. (Key words: Cerebral blood flow. Monitoring, cerebral: transcranial Doppler ultrasonography; electroencephalography: spectral edge frequency capnography. Opioids: fentanyl; sufentanil.**

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THE effects of opioids on cerebral hemodynamics remain controversial. For example, fentanyl and sufentanil both are reported to either increase or decrease cerebral blood flow (CBF) and/or cerebrospinal fluid pressure depending on study conditions.[1–7,‡] The results vary according to the model used (animal or human), opioid regimen (supraclinical *vs.* routine dose), and presence of confounding variables (*e.g.*, background anesthetic agents or reduced intracranial compliance).

Transcranial Doppler ultrasonography (TCD) is a relatively new noninvasive technology that offers a reliable measurement of cerebral blood flow velocity and, potentially, therefore, a technique for assessing the cerebral hemodynamic effects of opioids. Several studies have reported that changes in CBF velocity (measured by TCD) were correlated closely with changes in cerebral hemodynamics induced by physiologic and/or pharmacologic challenges.[1,8–11] Therefore, we used TCD to measure CBF velocity in the right middle cerebral artery (MCA) of patients before and after infusion of either fentanyl or sufentanil to assess the effect of these agents alone on cerebral hemodynamics.

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