Title: EFFECTS OF HIGH DOSE SUFENTANIL OR ALFENTANIL ANESTHESIA ON POSTERIOR TIBIAL NERVE SOMATOSENSORY EVOKED POTENTIALS

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Introduction. Posterior tibial nerve somatosensory evoked potentials(PTN-SSEP) are used to monitor spinal cord function during operations in which there is a risk of postoperative paraplegia. Balanced anesthesia using moderate doses of fentanyl, nitrous oxide and muscle relaxant is the technique of choice for PTN-SSEP monitoring. With this technique latencies are prolonged, while amplitudes are affected unpredictably (1). Resection of thoracic aortic aneurysms and correction of coarctation of the aorta are operations in which PTN-SSEP monitoring could be useful. High dose opioid anesthesia is an accepted technique for these procedures. We studied the induction effects of high dose sufentanil or alfentanil on PTN-SSEP and evaluated post-induction stability of latencies and amplitudes.

Methods. Twenty patients, aged 24-70 years scheduled for elective non-coronary cardiac surgery gave informed consent to participate in the institutionally approved study protocol. None had evidence of neurologic or endocrine disease. Premedication was with lorazepam 4-5 mg orally and nicomorphine 0.15 mg/kg i.m. 1 hr before surgery. In 10 patients anesthesia was induced with sufentanil (S) , 5 ug/kg in 5 minutes, followed by a continuous infusion of sufentanil, 5 ug/kg/hr. In the other ten patients anesthesia was induced with alfentanil (A), 125 ug/kg in 3 minutes, followed by a continuous infusion of alfentanil, 0.5 mg/kg/hr. Pancuronium 0.1 mg/kg was given for muscle relaxation. After intubation of the trachea the lungs were ventilated with oxygen-air (FiO_2=0.5). $PaCO_2$ was kept between 35-40 mm Hg. Nasopharyngeal temperature (NPT), end-tidal CO_2, arterial and central venous pressures were continuously monitored.

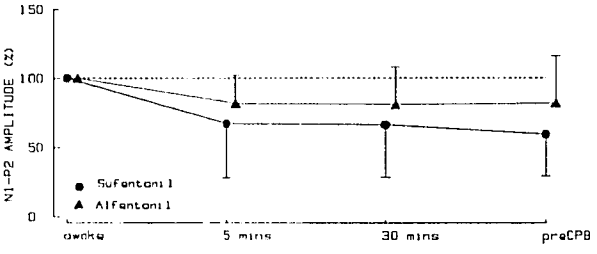
Recording technique. Cortical PTN-SSEP were recorded continuously using a Nicolet Pathfinder II. Posterior tibial nerves were stimulated bilaterally with constant current square wave pulses of 200 usec duration at a frequency of 3.1/sec. The stimulus intensity was 1 mA above the motor threshold; it was not increased after induction. Subdermal needle electrodes (impedance 6 Kohm) were inserted at Cz' referred to Fz for cortical recordings. Raw signals were filtered between 5 and 250 Hz. Analysis time was 160 msec. 512 sweeps were averaged. The following averages were analysed: immediately before and 5 min after induction, 30 min after induction and prior to cardiopulmonary bypass (CPB). All data are expressed as mean ± SD or percentage amplitude from awake values.
Statistical analysis was with one way ANOVA for correlated data. Differences between means were compared using a Tukey test.

Results. Awake PTN-SSEP could be recorded in all patients. The induction doses of S and A increased cortical latencies of N1 (S: 2.2 ± 2.1 msec, A: 0.1 ±0.8 msec) and P2 (S: 1.1 ± 2.8msec, A:1.6 ±1.2 msec), but these small increases were not statistically significant. 30 Minutes after induction and at the start of CPB (S: 77 ± 14 mins, A: 68 ± 24 mins after induction) N1 and P2 latencies were not significantly different from the postinduction values. Induction with S or A reduced N1-P2 amplitude to 60-80% of awake values. Fig.1 shows the percentage N1-P2 amplitude reduction during S or A anesthesia. Table 1 shows absolute latency and amplitude values ± SD.

Table 1 Latencies and amplitudes (± SD) of PTN-SSEP during high dose sufentanil or alfentanil anesthesia

		awake	5 mins	30 mins	preCPB
N1 latency (msec)	S	50.1 ± 4.86	52.3 ± 5.98	52.4 ± 5.90	53.0 ± 6.96
	A	48.5 ± 4.30	48.6 ± 4.34	49.1 ± 4.59	50.3 ± 4.38
P2 latency (msec)	S	64.1 ± 4.71	65.2 ± 5.89	65.6 ± 6.21	66.7 ± 7.38
	A	62.3 ± 3.79	63.9 ± 3.68	64.4 ± 3.76	66.4 ± 3.83
N1-P2 amplitude (uV)	S	2.93 ± 1.80	1.60 ± 1.21	1.59 ± 1.21	1.41 ± 0.78
	A	4.66 ± 3.58	3.91 ± 3.79	3.80 ± 3.25	3.38 ± 2.85
NPT (°C)	S	-	36.3 ± 0.34	36.2 ± 0.45	35.8 ± 0.67
	A	-	36.2 ± 0.39	36.1 ± 0.53	35.7 ± 0.68

Fig. 1: Percentage N1-P2 amplitude during high dose Sufentanil or Alfentanil anesthesia



Discussion. Induction of anesthesia with high doses sufentanil or alfentanil causes clinically insignificant changes in latencies and amplitudes of PTN-SSEP. From induction to CPB amplitudes remain remarkably stable at 40-70% of the awake values; gradual latency increase can be explained partly by the decrease in patient temperature (2).
We conclude that high dose opioid anesthesia with continuous infusions of sufentanil or alfentanil is an excellent anesthetic technique when intra-operative PTN-SSEP monitoring is indicated.

References.

1. Pathak KS,Brown RH,Cascorbi HF,Nash,CH Effects of fentanyl and morphine on intraoperative somatosensory cortical-evoked potentials. Anesth Analg 63:833-7, 1984.
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