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Title: THE TIME COURSE OF RESPIRATORY DEPRESSION AFTER ALFENTANIL ANESTHESIA: A DETAILED EVALUATION

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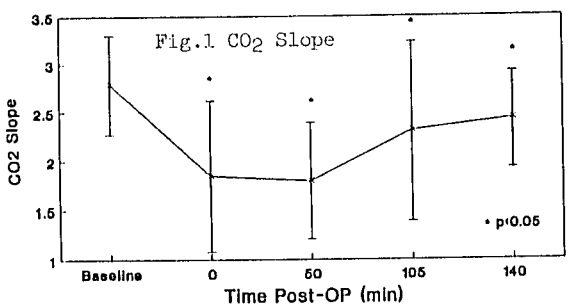
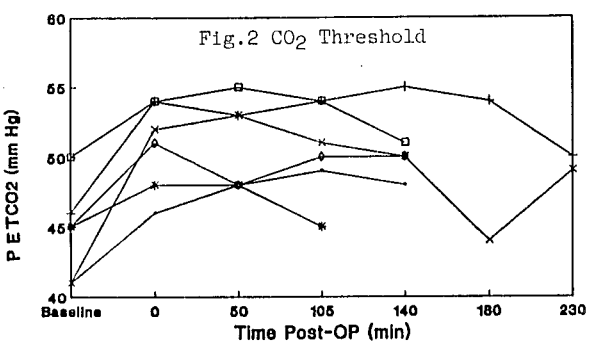
Introduction: Postoperative respiratory depression after narcotic anesthesia has been reported in association with a 2° peak in fentanyl plasma concentration.[1,2] Alfentanil(A), being short acting, might have an advantage over other narcotics allowing for rapid return to normal consciousness and respiration without a 2° peak in plamsa concentration. This ongoing study seeks to determine the amount and time course of postoperative respiratory depression after a continuous A infusion based anesthetic.

Methods: 7 ASA Class I-III patients scheduled for elective lumbar discectomy gave informed consent to participate in this IRB approved protocol. Patients were excluded on the basis of a history of CO_2 retention and significant pulmonary disease, obesity with weight > 110 kg and athletes in training. Prior to premedication patients were familiarized with a Trieger dot test, digit substitution test, linear analogue pain scale and CO_2 response equipment and baseline tests were performed. Premedication consisted of midazolam 2-4 mg IV. Pancuronium .015 mg/kg IV was given and after preoxygenation anesthesia was induced with A 75 µg/kg over 90 secs. If required, thiopental 1-4 mg/kg was given to complete induction. Succinylcholine 1.5 mg/kg IV facilitated endotracheal intubation. Maintenance consisted of N_2O 60-70% in O_2 and an A infusion started at 1.5 µg/kg/min. The rate was varied and bolus doses were given as clinically indicated. The infusion was stopped 20-30 mins prior to the anticipated end of surgery and the time from discontinuation of nitrous oxide was noted. When able, patients rated their pain every half hour postoperatively and performed a Trieger dot and digit substitution test until medication for pain was requested. In addition, blood was obtained for analysis of A plasma levels and arterial blood gas determination. The ventilatory response to CO_2 was measured using the Read rebreathing method.[3] A CO_2 response curve was plotted at steady state from the simultaneous VE and end tidal CO_2. Using linear regression analysis, the slopes of the CO_2 response curves was computed over the linear portion. The relationship between A plasma level and $PaCO_2$, slope of CO_2 response curve, Trieger dot test, and digit substitution test were determined using ANOVA for repeated measures.

Results: Plasma A levels were not significantly different when examined within patient groups for up to 140 min postoperatively. Plasma A levels therefore did not change significantly over this time. The CO_2 response curve was significantly depressed ($p < 0.05$) as compared to baseline at all test times with no difference evident when postoperative test times were compared to one another (Fig. 1). The slope of the CO_2 threshold was significantly different from the baseline ($p < 0.05$) but not different than the initial postoperative value (Fig. 2). The Trieger dot and digit substitution tests were also significantly different from the baseline ($p < 0.05$) and remained so for a mean of 140 min without significant improvement. All tests had returned to near baseline values at time of discharge from the Post Anesthesia Care Unit.

Discussion: The stated elimination half life of A is consistently found to be 90 min.[4] We did not find a decrease in A plasma level over a 140 min period following a prolonged infusion. Although a distinct 2° peak could not be identified, the predicted fall did not occur until the end of the study. This was reflected in a depressed slope and shifted threshold for CO_2 which remained unchanged during the 140 mins sampling period but recovered by the end of the study. The potential consequence of this are exemplified by patient #2 who repeatedly became apneic and desaturated over the first 2 hours despite an apparently normal appearance and recovery of cognitive function as determined by these tests. We recommend that all patients who receive a prolonged narcotic infusion be monitored with pulse oximetry until they can maintain respiration and saturation without stimulation.





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