Title: RETURN OF COGNITIVE FUNCTION AFTER PROLONGED ALFENTANIL INFUSION


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Introduction—Alfentanil (A) is widely used as an intravenous anesthetic for brief outpatient procedures. Studies after outpatient procedures under A have shown a return to preoperative cognitive function in one to two hours. However, there are no reports of recovery from A after long procedures. In this ongoing study, we assessed the recovery parameters of 7 patients immediately after back surgery performed with an A-infusion and studied correlations between cognitive tests, plasma A concentrations ([A]) and postoperative respiratory drive.

Methods—Seven ASA Class I-III patients scheduled for elective lumbar discectomies gave their informed consent to participate in this IIB approved study. Trained athletes and patients with significant pulmonary disease, CO2 retention and obesity (100 lb > ideal body weight) were excluded from participating. Preoperatively, CO2 response, Trigger dot (TDT) and digit symbol substitution (DST) testing and linear analog pain scores (LAPS) were explained to patients and baseline test performed. Patients were premedicated with midazolam 2-4 mg IV. Prior to induction, .015 mg/kg of pancuronium IV was given. Induction consisted of alfentanil 75 mcg/kg over 90 secs. and, if required, thiopental 1-2 mcg/kg. Succinylcholine 1.5 mg/kg IV facilitated endotracheal intubation. Maintenance consisted of N2O 60-70% in O2, and A given as clinically indicated. The infusion was stopped 20-30 mins prior to the anticipated end of surgery, the total noted, and the time of discontinuation of N2O recorded. Patients were tested every 30 minutes for 4 hours and arterial blood gas and [A] were obtained. The testing and blood work were discontinued if the patient required pain medication. Relationships between DST, TDT, [A] and CO2 responses were evaluated using ANOVA for repeated measures with comparison by LSD test. (p<.05 significant).

Results—Surgery lasted an average of 199 min (159-236) and A dosage ranged from 12.5-38.4 mcg. Patients remained in the study a mean time of 140 min (118-155) postoperatively before requiring medication. There were significant (p < .05) changes from preoperative levels on all tests performed during this time. However, there were no significant changes in test results at the different postoperative times compared to one another. [A] did not significantly change during this period (Fig. 1). Ventilatory response to CO2 drive tests results remained depressed at 180 min. All patients performed significantly below baseline on the DST and TDT cognitive function studies through the first 140 postoperative min. (Fig. 2). These two tests were marked by wide variation in each patient's performance and great variability between patients. DST scores after 140 min ranged from 53-95%; TDT scores ranged from 4-54%.

Five patients continued in the study beyond 140 min. The data from their last tested time (169-266 min postop) showed significant decreases in [A] and increasing LAPS scores compared with all other postoperative times. Last time DST scores, while still depressed, demonstrated improvement and were not significantly different from baseline. Carbon dioxide slope and threshold levels remained significantly depressed. No correlations were found between either cognitive function test and [A], LAPS or CO2 drive data.

Discussion—Our infusion-based anesthesia lasted over 3 hours, and 10 to 40 times higher doses of A were used than in the shorter outpatient bolus based procedures.

Previous A recovery data showed good return of cognitive function in the first one to two postoperative hours, reflecting A's 90 min half-life. Our data demonstrates continued depression of all parameters for 140 min postop with only two of seven (29%) patients returned to <80% of their baseline DST. After 140 min, the cognitive function tests uniformly rose closer to baseline levels.

Variation in inter-patient recovery skills can be explained by the threefold range of A dosage and individual patient's metabolic and psychological make-up. This might explain why cognitive function tests did not always reflect [A]. Cognitive function tests correlated poorly with [A] and CO2 response and were subject to variability. There is a need to develop more objective, less patient-dependent tests.

Prolonged A infusion can result in unpredictable postop recovery in excess of what might be expected from A's elimination half-life. This may be due to individual factors or to peripheral mobilization. Patients may appear to recover quickly when stimulated yet still have depressed cognitive and respiratory functions as well as high [A].

Fig. 1

Fig. 2

References