TITLE: CONTINUOUS INFUSION VS. INTERMITTENT BOLUS ADMINISTRATION OF FENTANYL OR KETAMINE FOR OUTPATIENT ANESTHESIA

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Introduction: Outpatient surgery has become increasingly popular because of savings in terms of both hospital beds and expenses. Difficulty in precisely controlling the depth of anesthesia has limited the use of intravenous (IV) anesthetics in this setting. Repeated administration of small doses of IV drugs is time consuming and results in oscillating plasma levels which are either higher than required or subtherapeutic. By using continuous infusion techniques, anesthesiologists can more closely titrate the drug to meet patient needs during the operation. Furthermore, minimizing the "peaks and valleys" would probably reduce the amount of drug administered and might decrease side effects and recovery time. This study was designed to evaluate intraoperative and postoperative effects of fentanyl (F) and ketamine (K) when given by a continuous infusion (I) technique compared with the conventional intermittent bolus (B) technique.

Methods: One-hundred unpremedicated young women who presented for outpatient gynecologic surgery were randomly assigned to receive either intermittent IV bolus injections or a continuous infusion of either F or K (N=25 in each group) for maintenance anesthesia with 70% nitrous oxide in oxygen after a standardized induction with thiopental 4 mg/kg IV. Dosing of IV boluses (1 ml) and adjustments in IV infusion rates were dependent upon clinical signs. Approval was obtained from the Committee on Human Research and informed consent from patients. Baseline mood assessment and Trieger tests were obtained before surgery. Cardiovascular changes were recorded at 1-min intervals using a Dinamap™ monitor/recorder. Total dose administered and time to awakening (responding to simple commands) were recorded. Adequacy of anesthesia was assessed by the surgeon and anesthesiologist. Postoperatively, patients completed repeat Trieger tests at 30 min intervals. Side effects and recovery (discharge) time were noted. A follow-up questionnaire was completed 24 hr after surgery. Data were analyzed using SPSS one-way analysis of variance and chi-square analysis.

Results: The four groups were comparable with respect to demographic data (age 24±1 yr, weight 60±2 kg) and duration of anesthesia (23±1 min). The continuous infusion techniques resulted in 45% and 43% decreases in the doses of F and K, respectively (Table 1). Similarly, the times to awakening and discharge were significantly decreased in the I groups. Intraoperative side effects were less in the FI group than in the FB group (Table 2). Optimal anesthetic conditions were found in a higher percentage of patients receiving FI vs. FB. Trieger scores (Table 3) were consistent with a more rapid recovery in the I groups (vs. B groups). Incidences of postoperative side effects (e.g. nausea, vomiting, dizziness) did not differ significantly between the B and I groups. However, excessive sedation was noted in 48% and 52% of patients in the FB and KB groups, respectively, compared with 4% and 8% in the FI and KI groups, respectively. Patient assessments of the anesthesia and future preference were similar in all groups.

Discussion: Compared with the traditional intermittent bolus technique for administering adjunctive IV drugs, the intraoperative use of continuous infusions of F or K significantly decreases their dosage requirements. The intraoperative conditions were superior and recovery was more rapid in the I groups. In conclusion, when using F or K as adjuvants during general anesthesia, continuous infusion techniques would appear to offer significant advantages over conventional intermittent bolus techniques.

Table 1: DEMOGRAPHIC AND ANESTHETIC DATA+

Group	Solution	Total Dose (µg or mg)	Awakening Time (min)	Discharge Time (hr
FB	50µg/ml	422 ± 19	5.3 ± 0.6	1.4 ± 0.
FI	2 µg/ml	233 ± 14*	2.0 ± 0.3	1.0 ± 0.
KB	25mg/ml	176 ± 11	8.3 ± 1.0	1.6 ± 0.
KI	1 mg/ml	101 ± 8*	3.3 ± 0.5*	1.4 ± 0.

+ Mean values ± SEM
* I drug group significantly different from B group (P<0.05)

Table 2: INCIDENCES OF INTRAOPERATIVE SIDE-EFFECTS AND CONDITIONS

Group	Motor Activity	Assisted Ventilation	↓HR	↑BP	Optimal Conditions Surgeon	Anesthetist
FB	28%	88%	12%	0	80%	48%
FI	16%	40%*	4%	0	80%	84%*
KB	4%	4%	0	28%	96%	96%
KI	4%	4%	0	8%*	96%	96%

* I drug group significantly different from B group (P<0.05)

Table 3: PRE- AND POSTOPERATIVE TRIEGER SCORES+

Group	Baseline	30 min	60 min	90 min	120 min
FB	5 ± 2	18 ± 3	12 ± 2	9 ± 2	6 ± 1
FI	4 ± 1	12 ± 2*	8 ± 1*	5 ± 1	NA
KB	5 ± 1	29 ± 3	19 ± 3	15 ± 2	10 ± 2
KI	4 ± 1	21 ± 3*	11 ± 2*	6 ± 1*	NA

+ Number of dots missed (mean ± SEM)
* I drug group significantly different from B group (P<0.05)