

TITLE: SERUM CONCENTRATIONS OF SUFENTANIL AND FENTANYL IN THE POST-OPERATIVE COURSE IN CARDIAC SURGERY PATIENTS

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INTRODUCTION. Sufentanil (S) has been previously reported to have a shorter elimination half-life ($T_{1/2}$) than fentanyl (F) in patients undergoing cardiac surgery. Because of this shorter half-life, greater potency and higher therapeutic index, S has been proposed as a better anesthetic for cardiac surgery than F. Since these two drugs have not been compared with each other pharmacokinetically in the post-operative period we conducted this study.

METHODS. Forty patients (EF \geq 4 ASA III) were randomly selected after giving written informed consent to receive either F 100 ug/kg or S 25 ug/kg as the main component of anesthesia for cardiac surgery. All patients were continued on beta-blockers and/or calcium antagonists up to the time of surgery. Oral lorazepam 0.05 mg/kg was given preoperatively. A radial artery cannula, two large bore IV's and a Swan Ganz catheter were inserted under local anesthesia. Induction was accomplished with metocurine/pancuronium combination 2:1 followed by S 15 ug/kg or F 50 ug/kg. Before skin incision an additional 10 ug/kg of S or 50 ug/kg of F were administered. No further doses of narcotic were given. Inhalational agents were added if the MAP exceeded 20% above control. The patients were closely observed in the SICU up to 4 hours after extubation. Elapsed time from induction to awakening and the subsequent progression through decreasing rates of IMV to extubation were recorded together with complete hemodynamic profiles. Blood was drawn from the arterial cannula and serum concentrations of S or F were analyzed by gas-liquid chromatography and checked by radioimmunoassay. Coefficient of variation was 12%. After each decrease of 2 breaths in the IMV rate, patients were assessed for ability to breath spontaneously. Serum concentrations of both drugs were fit by a non-linear least squares (NONLIN) program to a bi-exponential equation. The administration of vasoactive or inotropic drugs, and episodes of hypertension or tachycardia were compared using the Student two-tailed t-test ($p < 0.05$).

RESULTS. The NONLIN fit of the data was good as evidenced by the low average percent deviation of the observed versus calculated serum concentrations (S=12.31%, F=11.28%). The $T_{1/2}$ of both drugs was longer than previously reported in non-cardiac surgery patients. The average $T_{1/2}$ of our patients was F 612 \pm 178 min and S 595 \pm 125 min compared to 219 min and 148 min.¹ Both F and S gave similar intraoperative hemodynamic results; however, higher cardiac output, less use of vasoactive drugs, and a lower SVR were found in the S patients post-operatively (Fig. 1 and 2). At each assay point there was approximately a four-fold difference in serum concentration between the two drugs, predictable from the administered doses. F patients were successfully extubated at a mean of 1.5 ng/ml and the S patient at 0.6 ng/ml. Time of extubation from induction was 1550 min in F patients and 1350 min in S patients (Fig. 3) through IMV to a period of spontaneous breathing on a T-piece.

CONCLUSIONS. Hemodynamically, S patients had a smoother post-operative course with less hypertension and use of vasoactive and inotropic drugs. Though S patients should have a more rapid recovery time than F patients, the $T_{1/2}$'s and times to extubation were not significantly different in this study.

REFERENCE

1. Rosow, CE: Sufentanil citrate: A new opioid analgesic for use in anesthesia. Pharmacotherapy 4(1); 11-19, 1984.

