

Title: CONTINUOUS EPIDURAL ANALGESIA WITH FENTANYL IN TRAUMA PATIENTS

Authors: DL Downs, M.D., and JH Eisele, Jr., M.D.

Affiliation: Department of Anesthesiology, University of California, Davis, Medical Center, 2315 Stockton Blvd., Sacramento, CA 95817

INTRODUCTION: Selective spinal analgesia with epidural fentanyl (F) has been shown effective for post-trauma pain⁽¹⁾, and not to cause any significant respiratory depression over 18 hours⁽²⁾. Unlike the more hydrophilic agent morphine, any respiratory depression seen with epidurally administered F would likely be from absorption into the systemic circulation.

We have used continuous infusion epidural F for prolonged analgesia in trauma patients with thoracic, abdominal, and extremity injuries. The analgesia obtained is superior to intermittent bolus epidural morphine, and we have not seen respiratory depression or marked sedation. The plasma kinetics of bolus epidural F and short-term epidural F infusion have been studied⁽²⁾. We would like to report our observations and the plasma kinetics for prolonged infusion epidural F in trauma patients.

METHODS: Patients were selected from pain management consultations in the surgical ICUs and from the O.R. schedule who were considered appropriate for epidural opioids. Epidural catheters were placed in the lumbar region between L₁ and L₅, and documentation of correct placement was performed with a local anesthetic solution containing epinephrine. A bolus of 1 mcg/kg of F was injected, followed by a continuous infusion of 1 mcg/kg/hr of F in a 10 mcg/cc concentration. A top-up bolus of one-half the initial bolus followed by increasing the infusion rate by 15% - 20% was done if needed as determined by the anesthesiologist. Supplemental parenteral narcotics were withheld during the infusion period. All patients were monitored in the ICU with an arterial catheter. ABGs and plasma F levels were obtained at time 0 then q 12 - 24 hours thereafter.

RESULTS: Ten patients (ages 13 to 71) were studied for an average of 60 hours (range 24-120 hrs.) By adjusting the infusion rate, satisfactory analgesia was obtained in all cases. Infusion rates were started at 1 mcg/kg/hr, and averaged 1.32 mcg/kg/hr with a maximum of 2.17 mcg/kg/hr. PCO₂ levels remained between 37 and 44 mm/Hg.

F was measured by R.I.A. in duplicate and averaged 2.18 ng/ml (range from 0.80 to 4.0 ng/ml). Each F concentration was matched with the corresponding infusion rate (see Figure) and all pairs (31) were correlated using the least squares method with a r value of 0.77 (p < .001). In five patients, the infusion rate was constant throughout the study. In these cases, the average relationship of epidural F infusion to serum F concentration was 0.44 indicating that infusing 1 mcg/kg/hr produces a serum F of 2.27 ng/ml.

In one patient with F infusion over 120 hours, the serum F dose from 1.98 to 2.47 ng/ml while the infusion rate increased from 1.02 to 1.35 mcg/kg/hr which provided satisfactory analgesia.

DISCUSSION: Satisfactory analgesia with minimal side effects was obtained with F epidural infusion up to 5 days in the ICU by adjusting the infusion rate over a narrow range. Serum F levels correlated well with F infusion and remained low, that is, close to the threshold analgesia concentration of 2 ng/ml⁽³⁾. In our experience, this technique was superior to bolus injections of either F or morphine for providing analgesia.

The infusion rates here employed provided a stable and safe serum F concentration over time. Although acute tolerance may be common, in our study only five patients required small increases in F infusion rate.

REF:

- 1). Mackersie RC et al: Continuous epidural fentanyl analgesia: ventilatory function improvement with routine use in treatment of blunt chest injury. *J Trauma* 1987;27(11):1207-1212.
- 2). B. Renand, et al: Continuous epidural fentanyl: ventilatory effects and plasma kinetics. *Anesthesiology* 1985;V63(3A).
- 3). Stanski D, Hug C: Alfentanil - A Kinetically Predictable Narcotic Analgesic. *Anesthesiology* 1982;57:435-437.

