Title: EFFECT OF DILUENT VOLUME ON ANALGESIA PRODUCED BY EPIDURAL FENTANYL

Authors: Arcario T, Vartikar J, Johnson MD, Lema NJ, Datta S, Ostheimer GM, Naulty JS

Affiliation: Department of Anesthesia, Brigham and Women's Hospital, Harvard Medical School, Boston, MA

Introduction. Epidural fentanyl given in 10 ml normal saline solution is capable of producing a rapid onset of analgesia with a duration of up to 4 hours following cesarean delivery. However, the effect of varying the volume of injectate on the onset, duration and quality of the analgesia produced by epidural fentanyl, or other epidural narcotics, is unknown. Therefore, we have performed a double blind, randomized, dose response study of varying volumes of diluent on a single dose of epidural fentanyl.

Methods. The protocol was approved by the hospital's Committee for the Protection of Human Subjects from Research Risks, and written informed consent was obtained. To date, we have studied 20 ASA class I patients scheduled for elective cesarean delivery under epidural anesthesia. After delivery, pain scores (10 cm visual analog pain scale), motor block sensory levels, vital signs, and the presence or absence of nausea, shivering, somnolence and pruritis were recorded. When the patient reported a pain score of 3 or greater, 50 μg of fentanyl dissolved in 1-25 ml normal saline was injected via the epidural catheter, and then the catheter cleared with 0.3 ml air. The amount of study drug injected was unknown to the anesthesiologists evaluating the patient's responses. After injection, the above parameters were recorded at frequent intervals until the patient complained of pain. The presence or absence of side effects and the amount of parenteral narcotic drugs administered for the first 24 hours postpartum were recorded. Data were analyzed for statistical significance using an analysis of variance, and exponential regression curves were calculated for best fit to the data.

Results. Fig. 1 shows the time to onset of complete analgesia (a pain score of 0) for the varying volumes of injectate. A superimposed exponential regression line. Total volume less than 10 ml were associated with a significantly longer onset time. Patients who received 1 or 2 ml total volume frequently never developed complete analgesia. Fig 2 shows the duration of complete analgesia, which was similarly related to the volume of injectate. Volumes of less than 5 ml were associated with significantly shorter durations than doses greater than 10 ml, and doses greater than 20 ml were associated with the longest durations.

Discussion. Our expectations were that increasing the volume of saline diluent would either have a minimal effect, or by decreasing the concentration gradient for diffusion from the epidural to the subarachnoid space would slow the onset and decrease the duration of analgesia produced by epidural fentanyl. Exactly the opposite phenomenon occurred. Increasing volumes of normal saline diluent (and hence a less concentrated fentanyl solution) produced significantly faster onset and longer durations of analgesia.

References.