

TITLE: RESPIRATORY DEPRESSION FROM HIGH DOSE FENTANYL IN MAN

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Introduction

Among the claimed advantages of moderate to high dose fentanyl as the principle anesthetic agent for coronary artery bypass graft (CABG) surgery is its general lack of post-operative respiratory depression.^(1,2) We reviewed our experience with this technique compared to a standard halothane technique in regard to requirement for post-operative mechanical ventilation.

Materials and Methods

The charts of 24 consecutive patients undergoing CABG surgery with fentanyl anesthesia during the last six months of 1979 were reviewed. Retrospective review of patients charts conformed to the standards of our human studies committee. A group of 24 patients who received halothane during the same time period was randomly chosen and reviewed; this group was comparable to the fentanyl group in regard to pre-operative cardiopulmonary function, incidence of hypertension, surgeon, time of day, duration and temperature of cardiopulmonary bypass, pre-operative medications, age, and size. Post-operatively, all patients were placed on mechanical ventilation in the ICU, as is our routine. Times at which our standard criteria for reversal of muscle relaxant, T-piece trial (TPT), and extubation (Table I) were met were tabulated and compared by unpaired Students T-test with $p < .05$ considered significant. Patients who failed the T-piece trial were returned to mechanical ventilation for the duration of the first post-operative night.

Results

The mean (\pm S.E.) total dose of fentanyl given was 60.0 ± 6.26 μ g/kg (range 9-105 μ g/kg). Other drugs given to both the halothane and fentanyl groups were similar. This included pre-operative morphine and scopolamine as well as intraoperative diazepam, nitrous oxide, pancuronium, and scopolamine. Twenty-one of 24 patients in the fentanyl group and 19 of 24 patients in the halothane group met criteria for reversal of relaxant and went on to TPT [at 3.4 ± 0.7 and 4.0 ± 0.5 hrs post-op respectively (mean \pm S.E.) N.S.]. All 19 patients who received halothane, but only 8 of 20 patients who received fentanyl, successfully completed the T-piece trial, were normocarbic, and were extubated. Although the patients who failed the TPT were cardiovascularly stable, awake, and strong, their mean (\pm S.E.) pH and PaCO₂ was 7.27 ± 0.02 and

57.5 ± 2.1 torr respectively. For this reason, they were returned to mechanical ventilation. The mean (\pm S.E.) dose of fentanyl in those patients who were successfully extubated was 39.9 ± 10.5 μ g/kg compared to 77.4 ± 7.1 μ g/kg in those who were hypercarbic and not extubated ($p < .005$). Mean (\pm S.E.) dose of diazepam was the same in those fentanyl patients who were successfully extubated and those who were not (19.0 ± 4.9 and 22.5 ± 6.1 mg respectively). While the "successful" fentanyl patients were extubated at about the same time post-operatively as the halothane patients (mean \pm S.E.: 6.6 ± 0.6 hrs for fentanyl and 5.7 ± 0.5 hrs for halothane), the "unsuccessful" fentanyl patients were not extubated until 21.0 ± 1.11 hrs.

Discussion

We found that anesthesia with high dose fentanyl prolongs the time until extubation, contrary to what has previously been reported for CABG patients.^(1,2) The average total dose of fentanyl in our patients was lower or in the same range as that reported by others.^(1,2) Unsuccessful early extubation was characteristic of the patients receiving the highest doses of fentanyl.

We conclude that moderate to high dose fentanyl anesthesia supplemented with other intravenous agents does prolong the need for post-op mechanical ventilation.

References

1. Lunn JK, Stanley TH, Eisele J, et al: High Dose Fentanyl Anesthesia for Coronary Artery Surgery. *Anesth Analg* 58: 390-395, 1979.
2. Stanley TH, Philbin DM, Coggins CH: Fentanyl-Oxygen Anaesthesia for Coronary Artery Surgery. *Canad Anaesth Soc J* 26:168-171, 1979.

TABLE I

Criteria for Reversal of Muscle Relaxant and Scopolamine

1. Cardiovascular stability
2. Chest tube drainage < 100 cc/hr and diminishing
3. Normothermia

Criteria for T-piece Trial

1. All of above
2. $\frac{1}{2}$ V.C. $\times 30 \geq \dot{V}_E$ for PaCO₂ of 40
3. Awake and cooperative

Criteria for Extubation

1. All of above
2. Respiratory rate < 30 After 1 hour on T-piece
3. pH > 7.35 ; PaCO₂ < 45