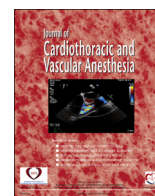


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Original Article

Lower Dose of Sufentanil Does Not Enhance Fast Track Significantly—A Randomized Study



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Objective: Adjustment in the doses of opioids has been a focus of interest for achieving better fast-track conditions in cardiac anesthesia, but relatively sparse information exists on the potential effect of psychologic and behavioral factors, such as stress, anxiety, and type of personality, on anesthesia requirements and patient turnover in the cardiac recovery unit (CRU); to the authors' knowledge, this particular focus has not been systematically investigated. In this randomized study, the authors tested the hypothesis that low-dose sufentanil, compared with a standard dose, can improve fast-track parameters and the overall quality of recovery. Opioid requirements related to personality type, pain sensitivity, and preoperative stress and anxiety also were assessed.

Design: A randomized, prospective study.

Participants: The study comprised 60 patients scheduled for elective coronary artery bypass grafting with or without aortic valve replacement.

Setting: A university hospital.

Interventions: Patients were randomly assigned to receive either a standard dose (bolus 0.5 $\mu\text{g}/\text{kg}$) or low dose (bolus 0.25 $\mu\text{g}/\text{kg}$) of sufentanil combined with propofol.

Measurements and Main Results: The primary outcome variables were ventilation time and eligible time to discharge from the CRU. The secondary objective was to evaluate the relationship between opioid requirements and personality type, pain sensitivity, and preoperative stress and anxiety. The groups were comparable in selected demographics and perioperative parameters. There was no difference between groups in ventilation time (low dose: 191 [163–257] v standard dose: 205 [139–279] min; $p = 0.405$); eligible CRU discharge time (10.3 ± 5.0 v 10.3 ± 4.2 h; $p = 0.978$); or administration of postoperative morphine (25 [11–34] v 27 [10–39] g; $p = 0.790$). There was no difference between groups in total sufentanil administration and various preoperative psychologic and behavioral test levels nor in the time to reach bispectral index < 50 during induction, except that personality type A demonstrated a longer induction time of 10 (8–12) minutes versus 6 (4–8) minutes in low-score patients.

Conclusion: A lower dose of sufentanil, compared with a standard dose, does not enhance fast-track conditions significantly.

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Key Words: sufentanil; fast-track; cardiac recovery; psychologic; behavioral pattern

THE PURSUIT OF a more efficient use of resources and earlier patient mobilization have led to an ongoing effort to identify relevant factors to achieve these objectives. Due to cost and an inadequate number of beds in intensive care units

(ICUs), length of stay (LOS) in the ICU is one of the main factors limiting operating room utilization in cardiac surgery. The requisite for a faster ICU turnover has led to interest for fast-track protocols that lead to an earlier discharge from the ICU.^{1–4}

Early extubation usually is considered one of the main steps in fast-track pathways,^{5,6} and different protocols have been proposed to achieve this.^{3,4,7–10} However, the effect of optimal extubation time on LOS after cardiac surgery still is debated,^{7,9}

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and the question of applicability, quality, and safety of these protocols still is open.^{3,4} A newer study raised the question as to whether the method of anesthesia or the characteristics of the recovery unit were decisive factors in fast-track protocols.¹¹ Furthermore, a major obstacle is that LOS is not a fully objective measure and may be contaminated by local policies and logistics. A more objective measure may increase the comparability and validity of reports.¹²

Most studies have evaluated the effect of different anesthetic regimens. Standard cardiac anesthesia consists of a moderate- to high-opioid dose combined with a lower dose of hypnotics. Depth of anesthesia is investigated less often, and thus a more objective perioperative monitoring parameter may facilitate a fast-track course for the patient.

Another area with relatively sparse information is the effect of psychologic and behavioral factors on anesthesia and patient turnover in the ICU. Anxious patients respond differently to anesthesia than do nonanxious patients and might require larger induction doses of anesthetics.^{13–15} Concern about the success of the surgery, characteristics of the surgery, and the underlying illness and fear of anesthesia, possible complications, and duration of hospital stay highly influence the level of preoperative anxiety¹⁶ as do sociodemographic characteristics such as age, sex, partnership, and educational training;¹⁷ personality characteristics;¹⁸ psychologic or psychiatric comorbidity¹⁹; and social support.²⁰ Stress and type of personality are other factors with a potential influence on anesthesia and postoperative care, but the potential effect on anesthesia requirements has not been investigated systematically.

The bispectral index (BIS) is a measure of the level of consciousness derived from a proprietary algorithmic analysis of the electroencephalogram during general anesthesia. A BIS value between 40 and 60 indicates an appropriate level for general anesthesia, although not proven to measure the level of consciousness. The reliability of BIS has been questioned, but there seems to be a general assumption that the use of BIS monitoring may help the anesthesiologist reduce the patient's risk of awareness,²¹ although results of the latter are conflicting.²²

The aim of this study was to evaluate the effects of standard- and low-dose of sufentanil on a fast-track protocol and how psychologic and behavioral factors may affect fast-track parameters. The primary fast-track parameters were ventilation time and eligible time to discharge from the recovery unit. Secondary aims were to evaluate the relationship between opioid requirements and personality type, pain sensitivity, and preoperative stress and anxiety and to assess the quality of recovery, with the hypothesis that low-dose sufentanil can improve fast-track parameters and the quality of recovery.

Material and Methods

Patients, Inclusion, and Exclusion

The study was randomized following the consort statement, performed in accordance with the Declaration of Helsinki, and

registered at ClinicalTrials.gov (NCT02756598) and EudraCT (2013-000017-21). The study was approved by the Central Region Committees on Health Research Ethics (1-10-72-207-13), and written, informed consent was obtained from all patients. Patients scheduled for elective coronary artery bypass grafting, valve surgery, or combination surgery were eligible for inclusion. Exclusion criteria were patients requiring special induction, expected longer ventilation time, participants in other projects, known allergy to the involved medication, and pregnancy.

All included patients were hospitalized 1 day before surgery. Participants were randomly assigned to receive either 1 of the 2 sufentanil regimens using a sealed envelope technique. The anesthesiologist was informed of the randomization 30 minutes before surgery, after which time all personnel were nonblinded to actual treatment. Patients were approached the morning of hospitalization, and after agreeing to participate in the study, a series of questionnaires (direct electronic registration) were answered by the patient alone or with help from a nurse from the research department.

The questionnaire series included a pain sensitivity test (17 questions of anticipated pain),²³ perceived stress test (10 questions with 5 levels),²⁴ combined personality and anxiety test (10 questions and 5 levels),^{25,26} the Amsterdam anxiety test,²⁷ and a modified type A personality test.^{28,29}

Patients continued regular medical treatment until the morning of surgery, except platelet inhibitors, which were paused 5 days before surgery. Premedication consisting of 5 to 10 mg of diazepam and 2 g of acetaminophen (slow release) was administered 1 to 2 hours before surgery.

Patients in the standard-dose group received primary bolus doses of sufentanil 1 µg/kg and supplemental bolus doses of 0.5 µg/kg with stipulated propofol of 0.03 mg/kg/min. Patients in the low-dose group received bolus doses of 0.5 µg/kg and 0.25 µg/kg with propofol of 0.06 mg/kg/min. Both groups received rocuronium, 0.6 mg/kg, to facilitate tracheal intubation.

Hemodynamic Monitoring and Anesthesia Protocol

Upon patient arrival in the operating room, monitoring with continuous 5-lead electrocardiogram, peripheral oxygen saturation, and arterial measurement of blood pressure was established. Anesthesia was initiated with a sufentanil bolus dose and propofol infusion with a predefined rate, according to the randomization group. Each extra sufentanil dose was given with at least a 2-minute interval in order to achieve a depth of anesthesia of BIS < 50. Changes in propofol infusion and the administration of bolus doses were performed at the discretion of the attending anesthesiologist. A stopwatch was used to measure time to reach BIS < 50.

A central venous catheter and a sheath for a thermistor-tipped, flow-directed pulmonary artery catheter (744 HF75; Edwards Lifesciences, Irvine, CA) and a Vigilance monitor (VGS-2; Edwards Lifesciences) were inserted after induction of anesthesia. Arterial and pulmonary blood pressures and central venous pressure were collected with the continuous

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