

Title: SUFENTANIL ANESTHESIA FOR AORTOCORONARY BYPASS SURGERY: 30 $\mu\text{g}/\text{kg}$ vs 15 $\mu\text{g}/\text{kg}$

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INTRODUCTION. Sufentanil (S) is a new narcotic analgesia 5-10 times more potent than fentanyl (F) but with a similar duration of action. Because of its greater potency and higher therapeutic index, S may have advantages over F in anesthesia for cardiac surgery, particularly in terms of preventing hypertension and tachycardia. However, despite doses of S 15 $\mu\text{g}/\text{kg}$, 40% of 40 patients became hypertensive during sternotomy in a recent study.¹ Others have reported a 10-30% incidence of intraoperative hypertension after S doses of 11-20 $\mu\text{g}/\text{kg}$. Our study compared the cardiovascular effects, anesthetic conditions, and postoperative requirements for mechanical ventilation after S doses of 30 $\mu\text{g}/\text{kg}$ (Group I) and 15 $\mu\text{g}/\text{kg}$ (Group II).

METHODS. After institutional approval, 12 male patients (41-59 yr) with good ventricular function (LVEDP < 15 mmHg, EF > 0.5) gave their informed consent and were divided into two groups of 6. Three patients in Group I and two patients in Group II were being treated for hypertension, and all patients were taking beta-blocking drugs up to the time of surgery. Patients were premedicated with their usual dose of propranolol (20-120 mg), diazepam (0.15 mg/kg po), morphine (0.1 mg/kg im) and scopolamine (0.3 mg/70 kg im). Radial artery and Swan-Ganz catheters were inserted under local anesthesia in order to measure systolic (SBP), mean arterial (MAP), pulmonary arterial (PA) and capillary wedge (PCWP), and central venous (CVP) pressures. Heart rate (HR), cardiac index (CI) and systemic vascular resistance (SVR) were determined. After pancuronium (1-2 mg iv) and 3 min of breathing 100% O₂, S was administered by constant infusion for 20 min to a total dose of 30 $\mu\text{g}/\text{kg}$ (Group I) or 15 $\mu\text{g}/\text{kg}$ (Group II). Pancuronium (0.1 mg/kg iv) was given in 1-2 mg increments. Measurements were taken at the following times: Control while breathing 100% O₂; after 1/8, 1/4, 1/2, and the full dose of S; 2 and 5 min after intubation; 2 and 5 min after sternotomy; during aortic manipulation; and during electrocauterization of the pericardium after cardiopulmonary bypass (CPB). Sufentanil concentrations in plasma were determined in duplicate by RIA. Nitroglycerin (pre-CPB) and nitroprusside or enflurane (during and after CPB) were administered for elevations of SBP by > 20% of control. Results are expressed as the mean \pm SEM. Data from Group I and II were analyzed by one-way analysis of variance. P < .05 was considered to be statistically significant.

RESULTS. Induction of anesthesia was rapid with unconsciousness occurring at 2.1 ± 0.2 min in Group I and 2.7 ± 0.3 min in Group II. There were no significant changes in MAP, SVR, CVP or PCWP. Increases in HR ($58 \pm 4 \rightarrow 73 \pm 5$ bpm, P < .05) and CI ($2.3 \pm .1 \rightarrow 3.1 \pm 0.2$ l/m/M₂, P < .01) followed pancuronium administration only in Group I. With sternal spread, 1 patient in Group I and 4 patients in Group II became hypertensive (Table). During surgery there were no significant changes in HR, CVP, PCWP, or CI. The MAP increased significantly ($84 \pm 4 \rightarrow 104 \pm 3$, P < .01) in Group II and was related to an increase in SVR ($1242 \pm 104 \rightarrow 2014 \pm 372$). Patients were extubated 1 ± 1 HR (Group I) and 15 ± 2 HR (Group II) after surgery. One patient in Group I was extubated at noon, 6 hr later than usual. Two patients in Group II were extubated the day of surgery. No patient recalled intraoperative events.

DISCUSSION. Despite the continuation of beta-blocking drugs until the time of surgery, there was a high incidence (4 of 6 patients) of hypertension following sternotomy. S 30 $\mu\text{g}/\text{kg}$ provided a rapid induction of anesthesia with minimal cardiovascular effects, decreased the incidence of intraoperative hypertension, and was not associated with prolonged respiratory depression. This higher dose of S (equivalent to F dose of 150-300 $\mu\text{g}/\text{kg}$) may be necessary to provide satisfactory conditions for patients during aortocoronary bypass surgery.

REFERENCES. 1. Sebel SP, Bovill JC: Cardiovascular effects of sufentanil anesthesia. *Anesth Analg* 61:115-119, 1982.
2. deLange S, Boscoe MJ, Stanley TH, et al: Comparison of sufentanil-O₂ and fentanyl-O₂ for coronary artery surgery. *Anesthesiology* 56:112-118, 1982.

Number of patients with
SBP > 20% of control

Dose	S admin Induction	Intub	Sternal Spread	CPB	Post- CPB
Group I 30 $\mu\text{g}/\text{kg}$ N=6	1	1	1	1	1
Group II 15 $\mu\text{g}/\text{kg}$ N=6	1	1	4	2	2