Cardiothoracic Anesthesia, Respiration and Airway

Intrathecal sufentanil-morphine shortens the duration of intubation and improves analgesia in fast-track cardiac surgery

[L'administration intrathécale combinée de sufentanil-morphine réduit la durée de l'intubation et améliore l'analgésie lors d'une intervention cardiaque "fast-track"]

Dominique A. Bettex MD,* Daniel Schmidlin MD,* Pierre-Guy Chassot MD,† Edith R. Schmid MD*

Purpose: To compare the effect of combined intrathecal morphine and sufentanil with low-dose *iv* sufentanil during propofol anesthesia for fast-track cardiac surgery.

Methods: Twenty-four consecutive patients with normal cardiopulmonary function who were scheduled for elective cardiac surgery were randomized to receive either a continuous *iv* infusion of sufentanil 0.9 to 1.8 $\mu g \cdot kg^{-1} \cdot min^{-1}$ (13 patients), or a single lumbar intrathecal dose of sufentanil 50 μg and morphine 500 μg (11 patients). We prospectively studied perioperative analgesia, time to extubation and early postoperative maximal inspiratory capacity in the two groups. In the intensive care unit, the medical and nursing staff were blinded to the analgesic technique.

Results: Intrathecal sufentanil morphine allowed a shorter duration of intubation (104 ± 56.5 min *vs* 213 ± 104 min; $P = 0.01$), reduced the need for postoperative analgesia with nicomorphine (equipotent to morphine) (0.7 ± 0.4 $mg \cdot hr^{-1}$ *vs* 1.2 ± 0.4 $mg \cdot hr^{-1}$; $P = 0.008$) and improved postoperative maximal inspiratory capacity (53.4 ± 16.1 *vs* 38.4 ± 12.5% of the norm; $P = 0.05$).

Conclusion: In low-risk patients undergoing coronary artery bypass graft or valve surgery, combined intrathecal sufentanil and morphine with a target-controlled infusion of propofol satisfies the goals of fast-track cardiac surgery.

But : *Comparaison de l'effet de l'administration intrathécale combinée de morphine et de sufentanil avec l'administration iv de sufentanil lors d'une anesthésie à base de propofol pour la chirurgie cardiaque "fast-track".*

Méthode : *Vingt-quatre patients consécutifs ayant une fonction cardiopulmonaire dans les limites de la normale ont été admis en vue d'une intervention cardiaque programmée et ont été randomisés en deux groupes distincts : l'un recevant une perfusion iv continue de 0,9 à 1,8 $\mu g \cdot kg^{-1} \cdot min^{-1}$ de sufentanil (13 patients) et l'autre une dose unique intrathécale de 50 μg de sufentanil et 500 μg de morphine (11 patients). Nous avons étudié prospectivement l'analgésie périopératoire, le délai d'extubation et la capacité inspiratoire maximale postopératoire dans ces deux groupes de patients. Aux soins intensifs, le personnel soignant médical et paramédical ignoraient la technique analgésique utilisée.*

Résultats : *L'administration intrathécale de sufentanil et de morphine a permis une extubation plus rapide (104 ± 56,5 min vs 213 ± 104 min ; $P = 0,01$), une réduction des besoins analgésiques en nicomorphine (puissance équivalente à la morphine) (0,7 ± 0,4 $mg \cdot h^{-1}$ vs 1,2 ± 0,4 $mg \cdot h^{-1}$; $P = 0,008$) et une amélioration de la capacité inspiratoire maximale postopératoire (53,4 ± 16,1 vs 38,4 ± 12,5 % de la norme ; $P = 0,05$).*

Conclusion : *Chez les patients à bas risque opératoire programmés pour des pontages aortocoronariens ou un remplacement valvulaire simple, l'administration intrathécale de morphine et sufentanil en dose unique satisfait les critères de chirurgie cardiaque "fast-track".*

FAST-TRACK cardiac surgery entails early postoperative extubation with intense control of pain and rapid transfer to the ward and is mostly applied to patients who have well-preserved pulmonary and ventricular function.

From the Divisions of Cardiovascular Anesthesia, University Hospital of Zürich,* Zürich; and the University Hospital of Lausanne,† Lausanne, Switzerland.

Address correspondence to: Dr. Dominique A. Bettex, Division of Cardiovascular Anesthesia, USZ - Rämistrasse 100, CH – 8091 Zürich, Switzerland. Phone: +41 1 255 59 33; Fax: +41 255 45 61; E-mail: dominique.bettex@ifa.usz.ch

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Among the reported advantages are fewer respiratory complications, improved cardiac function and patient comfort, reduced intensive care unit (ICU) requirements and shorter ICU and hospital duration of stay.[1–2] The use of volatile anesthetics or *iv* propofol in combination with low-dose or short-acting opioids (fentanyl, alfentanil, remifentanil)[3–4] results in early extubation but requires supplemental analgesia in the early postoperative period with frequent patient discomfort or respiratory depression. The use of perioperative epidural anesthesia and analgesia allows intense postoperative analgesia, stress-response attenuation and thoracic cardiac sympathectomy with possible reduction of the risk of myocardial ischemia.[5] However, this technique can be associated with undesirable drug effects and increases the risk of epidural hematoma formation.

Intrathecal (IT) analgesia entails a lower risk of hematoma formation than epidural access.[6] IT morphine allows intense postoperative analgesia but does not cover the operative period and may cause prolonged ventilatory depression.[7] IT sufentanil provides intense and fast-onset analgesia[8] and, along with IT morphine, appears to be a suitable choice for fast-track cardiac surgery.[9]

The aim of this prospective randomized study was to assess the effect of intraoperative combined IT sufentanil and morphine in comparison to low-dose *iv* sufentanil in low-risk patients undergoing elective cardiac surgery. Both anesthetic techniques were combined with a target-controlled infusion of propofol.

Methods

Patient population and exclusion criteria

After approval of the Ethics Committee and written informed consent, patients with well-preserved ventricular function (ejection fraction 40%) and pulmonary function [forced expiratory volume in one second (FEV_1) and ratio of FEV_1 and forced vital capacity (Tiffenau ratio) > 80% of predictive values] who were scheduled for elective coronary artery bypass graft (CABG) surgery or valve surgery under cardiopulmonary bypass (CPB) participated in the study. Surgery was scheduled in the early morning because of the risk of delayed extubation with late admission into the ICU.[10] Normal coagulation tests (prothrombin time, partial thromboplastin time, thrombin time, fibrinogen, platelet count > 100,000 mL^{-1}) and no history of abnormal bleeding or known coagulation disorders were required. The following patients were excluded: patients with mainstem coronary artery stenosis, left ventricular ejection fraction < 40%, unstable angina or severe aortic or mitral stenosis; patients who required a reoperation, an emergency procedure or a combined operation (CABG and valve surgery, double valve replacement); patients with severe hemodynamic, pulmonary, metabolic or renal (dialysis) impairment; patients with neurologic or vertebral pathology; and patients receiving preoperative *iv* or subcutaneous heparin, coumadin derivatives, aspirin less than seven days before operation, or nonsteroidal anti-inflammatory drugs less than three days before operation. By previous agreement with the surgeons, the surgery would be delayed 24 hr if a bloody tap occurred. Bloody tap was defined as arterial blood (blood-gas analysis) suctioned or running freely through the spinal needle.

Anesthesia protocol

Preoperative medications, except angiotensin-converting enzyme inhibitors, diuretics and digoxin, were continued until the morning of surgery. One to two hours before induction of anesthesia, all patients received either oral flunitrazepam (1–2 mg) or midazolam (7.5–15 mg). Prior to arrival in the operating room, every patient was randomized using a classical table of random numbers (Geigy Scientific Tables) to receive either IT sufentanil and morphine (IT group) or *iv* sufentanil (*iv* group).

Routine monitoring was instituted initially with 5-lead electrocardiography (ECG), pulse oximetry (Spo_2) and radial artery pressure. Patients in the IT group were then turned on their sides, and after standard sterile preparation, a lumbar puncture at the L3–L4 or L2–L3 level was performed, with the use of a 25-gauge Quincke-tipped spinal needle (Sprotte Standard Needle, Pajunk, Germany). Every lumbar puncture was done by the same anesthesiologist, and no more than three attempts were allowed. Once clear cerebrospinal fluid was obtained, preservative-free sufentanil 50 μg and morphine 500 μg diluted in 6 mL of sodium chloride were injected into the IT space and the needle removed. The patients were brought into the dorsal decubitus position and anesthesia induced with a target-controlled infusion of propofol (TCI-propofol; beginning with a target dose of 1.5 $\mu g \cdot mL^{-1}$ and gradually increasing, according to patient hemodynamic response, to a maximal target dose of 3 $\mu g \cdot mL^{-1}$), pancuronium 0.1 $mg \cdot kg^{-1}$ and a bolus dose of *iv* sufentanil 0.5 $\mu g \cdot kg^{-1}$. The time between lumbar puncture and anesthesia induction was kept as short as possible, to avoid patient discomfort through the early appearance of pruritus, thoracic rigidity or respiratory depression secondary to IT sufentanil. Maintenance of anesthesia was ensured with TCI-propofol; no further *iv* opioids were given. Anesthesia in patients in the *iv* group was

induced with TCI-propofol (target dose, 1.5–3 $\mu g \cdot \cdot mL^{-1}$), pancuronium 0.1 $mg \cdot kg^{-1}$ and a bolus dose of *iv* sufentanil 1 $\mu g \cdot kg^{-1}$. Continuous infusion of sufentanil was then begun: 1.8 $\mu g \cdot kg^{-1} \cdot hr^{-1}$ until CPB, followed by 0.9 $\mu g \cdot kg^{-1} \cdot hr^{-1}$ until closure of the chest. The use of vasoactive substances as well as the occurrence of ECG changes, arrhythmia or hemodynamic variations of more than 20% of the awake values were observed by an independent anesthesiologist and recorded.

After endotracheal intubation and initiation of mechanical ventilation (Servo C, Siemens-Elema AB, Sweden), a three-lumen central venous catheter (Arrow-Howes 7F, Arrow International; Erding, Germany), a percutaneous sheath introducer set (8.5F, Arrow International) and a continuous cardiac output pulmonary catheter (Swan-Ganz CCO/VIP 7.5F, Baxter; Unterschleissheim, Germany) were inserted in the right internal jugular vein in both groups. Before aortic cannulation, bovine heparin 300 $IU \cdot kg^{-1}$ was administered intravenously and the CPB was started when a minimal activated clotting time (ACT) of 300 sec was reached (Medtronic Hemotec, Inc. Parker, CO, USA). During CPB, an ACT 500 sec was maintained. Following initiation of CPB, patients were cooled to a minimum rectal temperature of 32°C and were later rewarmed to 36°C before being taken off bypass. The use of vasoactive drugs was left to the discretion of the attending anesthesiologist. Heparinization was reversed with an initial 1:100 protamine *iv* dose (1 mg for 100 IU of heparin administered). An additional dose of 0.5 to 1 $mg \cdot kg^{-1}$ of protamine was given when the ACT remained above 140 sec.

Postoperative management

After surgery, patients were transferred to the ICU. The medical and nursing staff of the ICU were blinded to the anesthetic technique. A continuous infusion of propofol (0.5 to 1 $mg \cdot kg^{-1} \cdot hr^{-1}$) was maintained until normothermia, hemodynamic stability and minimal chest tube drainage (< 100 $mL \cdot hr^{-1}$) were attained. For acute pain control prior to extubation, the nursing staff administered an *iv* bolus of nicomorphine (increments of 2 mg) as required. Nicomorphine is known to be equipotent to morphine but should induce less adverse effects such as respiratory depression, pruritus, nausea and vomiting. Ibuprofen 400 mg was given rectally or orally three times a day. Forced air warming was used to maintain core temperature above 36°C and shivering was treated with *iv* meperidine (12.5–25 mg). The criteria for extubation included normal neurologic status, stable hemodynamics under minimal inotropic support (< 5 $\mu g \cdot kg^{-1} \cdot min^{-1}$ dopamine or dobutamine), adequate pulmonary function (spontaneous ventilation for a minimum of 30 min with a vital capacity > 12 $mL \cdot kg^{-1}$, respiratory rate between 10 and 20 min^{-1}, $PaCO_2$ < 50 mmHg, pH > 7.30 and PaO_2 > 75 mmHg on a FiO_2 < 40%) and minimal chest tube drainage (< 100 $mL \cdot hr^{-1}$). After extubation, the patients used a patient-controlled analgesia device with nicomorphine (*iv* bolus of 2 mg every eight minutes, maximum).

A two-hour sedation score using the Ramsay scale[11] and a four-hour analgesic score [visual analogue scale (VAS), 1–10] was recorded by the nurses in the ICU. Patients were questioned regarding the occurrence of pruritus, nausea and vomiting as well as intraoperative awareness. The times between ICU admission and extubation and between cessation of propofol infusion and extubation were recorded as well as the maximal inspiratory capacity on the first postoperative day (Coach 2 breathing exerciser, DHD Healthcare, New York, NY, USA). The latter value was normalized to the expected value considering the size and age of the patient[12] and compared with the preoperative value of FEV_1 and of Tiffenau ratio, both also normalized to the expected value.

ICU discharge criteria included patient orientation, hemodynamic stability without the use of *iv* vasoactive substances, SpO_2 > 90% with nasal O_2 at less than 4 $L \cdot min^{-1}$ and urine output > 0.5 $mL \cdot kg^{-1} \cdot hr^{-1}$. Chest tubes, pulmonary catheter and arterial lines were removed before transfer to the ward.

Statistics

The primary outcome measurements were duration of intubation, postoperative analgesia requirements and postoperative spirometry. Results are expressed as the mean ± SD (range), unless otherwise indicated. Operative and postoperative variables were compared by means of the Mann-Whitney U test for continuous variables and Fischer's exact test for nominal variables. $P < 0.05$ was considered significant.

Results

Eleven patients were randomized to the IT group and 13 patients were randomized to the *iv* group. The groups were similar in patient characteristics, preoperative risk scores (EuroSCORE[13]; Table I) and preoperative medications. Surgical data including type of procedure, duration of CPB and aortic cross-clamping, were also similar between groups (Table II).

Anesthesia, intraoperative analgesia and surgery

All lumbar punctures were performed without complication. The mean ± SD time from lumbar puncture to systemic heparinization in the IT group was 101 ± 27 min (range, 64–137 min). The mean ± SD time

between lumbar puncture and intubation was 12 ± 2.6 min (range, 8–17 min). Patients in the IT group received significantly more propofol (Table II). The use of vasoactive substances and the occurrence of ST segment changes, hypotension or arrhythmia during induction (Table II), were not significantly different between the two groups. The occurrence of hypertension during induction, defined as more than 20% augmentation of mean basal arterial pressure, was significantly more frequent in the IT group. The occurrence of hypotension during induction, defined as more than 20% reduction of mean basal arterial pressure was similar in both groups. The CPB and post-CPB periods were uneventful for all patients and intraoperative surgical complications did not occur. Two patients (one in each group) received dopamine (1–2.5 $\mu g \cdot kg^{-1} \cdot min^{-1}$), and one patient in the *iv* group received dobutamine (5 $\mu g \cdot kg^{-1} \cdot min^{-1}$) to facilitate separation from bypass (Table II).

TABLE I Patient characteristics and preoperative risk score (Euro Score)

	IT group (n = 11)	*iv group (n = 13)*	*P value*
Age	53.5 ± 11.4 (32–66)	57.2 ± 9.4 (37–71)	NS
Sex (M/F)	9/2	13/0	NS
Weight (kg)	76 ± 12 (53–97)	81.5 ± 13.5 (61–104)	NS
Height (cm)	173 ± 9.5 (152–182)	176 ± 8 (166–192)	NS
EF (%)	62 ± 11 (40–79)	62 ± 9 (49–81)	NS
EuroSCORE[13]	1.5 ± 1.5 (0–4)	1.8 ± 1.6 (0–6)	NS

Values are expressed as number of patients or mean ± SD (range). IT = intrathecal; EF = ejection fraction; NS = not significant.

Extubation, postoperative analgesia and complications

Postoperative risk scores (APACHE II;[14] Table III) and use of vasoactive drugs were similar in both groups. The trachea could not be extubated in seven patients (three in the IT group and four in the *iv* group) within the first six hours after operation: three because of hemodynamic instability or postoperative ST segment changes (one patient in the IT group fol-

TABLE II Surgical procedures and patient outcome

	IT group (n = 11)	*iv group (n = 13)*	*P value*
Coronary artery bypass graft	7	11	NS
Aortic valve replacement	3	1	NS
Mitral valve repair	1	1	NS
Aortic cross-clamp time (min)	63 ± 17 (35–79)	65.5 ± 21 (39–114)	NS
Cardiopulmonary bypass time (min)	111.5 ± 23 (69–143)	98.5 ± 29 (56–165)	NS
Total *iv* propofol ($mg \cdot kg^{-1}$)	20.1 ± 5.7 (11.3–28.4)	14.3 ± 7.5 (6.8–31.9)	0.045
Total *iv* sufentanil ($\mu g \cdot kg^{-1}$)	0.5 ± 0.2 (0.25–0.9)	7.6 ± 1.8 (4.2–9.9)	0.0001
Hypertension during induction*	5	0	0.03
Hypotension during induction†	1	4	NS
Segment changes during induction	0	0	NS
Off-bypass use of dopamine	1	1	NS
Off-bypass use of dobutamine	0	1	NS

Values are expressed as number of patients or mean ± SD (range). IT = intrathecal; NS = not significant.*Hypertension during induction of anesthesia was defined as more than 20% augmentation of mean basal arterial pressure. †Hypotension during induction of anesthesia was defined as more than 20% reduction of mean basal arterial pressure.

TABLE III Patient outcome in ICU

	IT group (n = 11)	*iv group (n = 13)*	*P value*
APACHE II[14]	11.7 ± 3.3 (6–17)	12 ± 3 (6–16)	NS
Time between ICU admission and time of adequate answer to simple command (min)	101 ± 121.5 (0–375)	142.5 ± 65 (35–210)	NS
Time between ICU admission and extubation (min)	231 ± 149.5 (80–540)	332 ± 115 (130–555)	0.05
Time between cessation of propofol and extubation (min)	104 ± 56.5 (10–180)	213 ± 104 (65–400)	0.01
Sedation score,[11] two hours	3.2 ± 1.2	2.1 ± 1	0.02
Sedation score, four hours	3.7 ± 0.9	3.3 ± 0.8	NS
Extubation time > six hours	4	3	NS

Values are expressed as number of patients or mean ± SD (range). IT = intrathecal; ICU = intensive care unit.

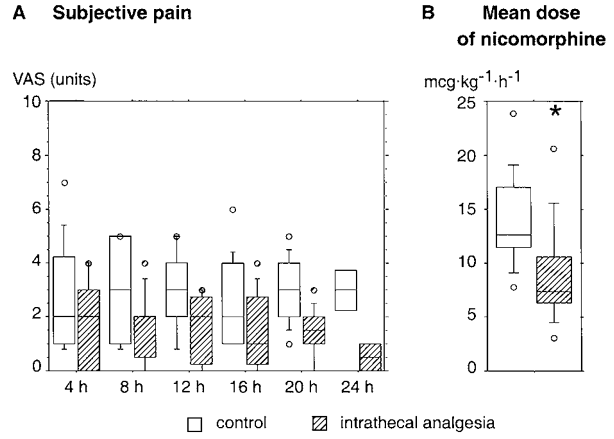

FIGURE 1 Postoperative visual analogue scale scores (A) and nicomorphine use (B) in the *iv* group (open boxes) and the intrathecal (IT) group (hatched boxes). Significantly different between groups. **P* = 0.008.

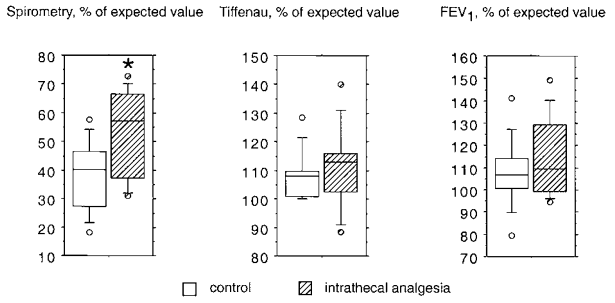

FIGURE 2 Postoperative maximal inspiratory capacity (spirometry), preoperative Tiffenau and FEV1 in percent of the predictive value in the *iv* group (open boxes) and the intrathecal (IT) group (hatched boxes). Significantly different between groups. **P* = 0.05.

lowing aortic valve replacement and one in each group following CABG surgery), one in the *iv* group because of hypothermia at ICU admission (34.4°C), one in the IT group because of mediastinal bleeding requiring rethoracotomy and two in the *iv* group because of delayed awakening and/or respiratory depression. The maximal duration of intubation was nine hours and 15 min. The sedation score was significantly lower in the *iv* group after two hours but was comparable between groups after four hours (Table III). The time from ICU admission to extubation and the time between cessation of sedation and extubation were significantly higher in the *iv* group (Table III). No patient required reintubation. The need for *iv* nicomorphine was significantly higher in the *iv* group even though the two groups' VAS scores were not significantly different (Figure 1). Five patients suffered from nausea or vomiting (three in the IT group and two in the *iv* group), and one patient complained of pruritus (IT group).

Despite comparable results in preoperative pulmonary function tests, patients in the IT group had a better maximal inspiratory capacity after operation (Figure 2). There was no perioperative myocardial infarction (defined as troponine, creatine kinase or creatine kinase-MB elevation or new Q-wave on the ECG). According to the routine in our institution, every patient stayed overnight in the ICU for monitoring purposes; ICU duration of stay was the same in both groups.

Discussion

Our data suggest that in low-risk patients undergoing CABG or valve surgery without contraindication to locoregional anesthesia, combined IT sufentanil and morphine with TCI-propofol allows a shorter postoperative duration of intubation, adequate analgesia and better maximal inspiratory capacity as compared with a standard *iv* anesthetic technique.[3]

Choice and advantages of the method used

Recent evidence suggests that fast-track cardiac surgery is not only safe but may improve patient outcome by decreasing the incidence of postoperative cardiopulmonary morbidity and may lower the cost of cardiac surgery.[1–3,9] The optimal anesthetic technique to reach this goal remains debatable. TCI-propofol offers stable hemodynamics with minimal negative inotropism and a rapid and controlled recovery; it is widely used for noncardiac as well as cardiac surgery.[15] Because of its previously demonstrated advantages for fast-track cardiac surgery,[3] we chose TCI- propofol for induction and maintenance of anesthesia.

Previous studies have shown that although IT morphine prior to cardiac surgery provides profound postoperative analgesia[16,17] it does not offer sufficient intraoperative analgesia because of its delayed peak of action. Concerns have been raised regarding the potential for ventilatory depression and delayed extubation when IT morphine is used as part of a fast-tracking program, especially with the concomitant use of *iv* analgesics and sedatives.[8,18,19] IT sufentanil is known to provide an intense and fast-onset analgesia.[8,9] We postulated that the combination of IT mor-

phine and sufentanil could avoid deleterious effects and increase patient comfort because of their different peaks of activity.[8,16,17]

In our study, the combination of IT morphine and sufentanil provided effective intraoperative analgesia. The trend toward hypertension during induction in the spinal group did not result in increased requirements for vasoactive substances because of its non-sustained nature. There was no need for *iv* opioids except shortly before intubation when IT sufentanil is not active.[9] The IT group required significantly more *iv* propofol, however, probably because they received less *iv* sufentanil, which has its own sedative effect.[20] The time to extubation was significantly shorter in the IT group despite a similar time between ICU admission and time of adequate answer to simple command. We attribute this to the larger amount of *iv* sufentanil and nicomorphine required in the *iv* group. None of the patients who remained intubated for more than six hours had respiratory problems related to IT opioids. Actually, only two of the seven patients with slightly prolonged intubation times required a longer intubation because of delayed awakening or respiratory depression; they both belonged to the *iv* group. The five other patients suffered from hemodynamic instability or bleeding complications, which were not likely related to anesthetic technique.

Postoperative comfort

IT morphine and sufentanil provided effective postoperative analgesia, as indicated by a significant decrease in the need for postoperative *iv* nicomorphine in the IT group for comparable VAS analgesia scores. The well-known side effects of IT opioids, besides ventilatory depression, are pruritus, nausea, vomiting and urinary retention. None of the patients experienced severe pruritus; the incidence of nausea and vomiting was similar in both groups, and no patient experienced urinary retention after removal of the urinary catheter or ventilatory depression after tracheal extubation. We used *iv* propofol for ICU sedation as it is known to facilitate the process of weaning patients from mechanical ventilation after cardiac surgery when compared with midazolam.[21] The low incidence of postoperative opioid-related nausea and vomiting could be attributed to the antiemetic effect of propofol.[22]

Risk of IT analgesia

Although extremely rare, subarachnoid and epidural hematomas have occurred in patients when a diagnostic or therapeutic lumbar puncture was followed by systemic heparinization.[23] None of the previous reports of the use of IT morphine for cardiac surgery have indicated the development of subarachnoid or epidural hematoma.[7,19,24] However, usual precautions should be followed to decrease this risk.[24] Our exclusion criteria with respect to this potential complication were particularly strict, and we were ready, in agreement with the surgeons, to delay surgery in case of a bloody tap (which did not occur). The minimal delay between lumbar puncture and heparinization was 64 min, which is close to the 70 min previously reported by Chaney *et al.*[7] This delay might have clinical relevance upon intradural hematoma formation but this remains unclear. We observed no clinical evidence of central neuraxial hematoma in any patient enrolled in our study, but our series is obviously too small to infer the safety of this method.

Study limitations

Limitations include a predominantly male population, a small sample size, and a nonuniform type of surgery. Female sex may impart additional operative risk in CABG surgery[25] and was an adverse risk factor for early extubation univariately in one study and multivariately in another.[26,27] Although sex-related differences in pain perception as well as response to pain have been described,[28] we are not aware of a sex-linked difference in the effect of spinal analgesia. The difficulty recruiting patients was predictable because patients taking aspirin were excluded. A recently adopted policy in our institution is to continue aspirin until the day of surgery, so this change forced us to stop the study. The type of cardiac surgery, with the exception of minimally invasive procedures, does not appear to have a significant influence on intubation time, suggesting that patients undergoing valve repair or replacement are not at increased risk for delayed extubation.[10]

The optimal dose of IT sufentanil and morphine has not been determined and should remain the subject of future studies. The beneficial effects on immediate postoperative ventilatory function documented in our study should be investigated in patients with poor preoperative ventilatory function before the use of IT sufentanil and morphine for fast-track cardiac surgery in this type of patient can be recommended.

Conclusion

In patients with well-preserved ventricular and respiratory function scheduled for fast-track cardiac surgery, the use of combined IT morphine and sufentanil provides superior postoperative analgesia and maximal inspiratory capacity when compared with *iv* sufentanil during TCI-propofol anesthesia.

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