

Intrathecal Morphine for Off-Pump Coronary Artery Bypass Patients

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ABSTRACT

Due to the fact that patients have increased mental alertness following off-pump coronary artery bypass (OPCAB), pain management in the immediate postoperative period is a major concern.

Thirty-two patients underwent OPCAB grafting, 20 received 5 mcg/kg morphine sulfate intrathecally. This group was compared with 12 patients who did not receive intrathecal morphine.

All patients were verbally evaluated for pain using the Wong-Baker Visual Analog Scale at eight, 12 and 24 hours. All the scores were highly statistically significant in favor of the intrathecal group. No significant complications were seen in this group of patients. It is concluded that intrathecal morphine at 5 mcg/kg is effective and safe in maintaining comfort for OPCAB patients in the immediate postoperative period.

INTRODUCTION

It is now recognized that patients who undergo coronary artery bypass (CAB) graft without the use of cardiopulmonary bypass (CPB) are post-operatively more alert than their counterparts. Within this particular group of patients, pain management has become a major concern.

As an alternative to parenteral pain medications, intrathecal morphine sulfate (ITMS) was introduced in 1980 to open heart patients [Mathews 1980]. The efficacy of this procedure has already been well established [Samiik 1981, Stoelting 1989]. ITMS produces intense and prolonged analgesia by acting on opioid receptors in the substantia gelatinosa of the posterior horn [Stoelting 1989]. The technique, however,

has not gained popularity due to the fear of bleeding complications in a patient who is fully heparinized for CPB [Kirklin 1983]; a situation theoretically not seen in patients who undergo CPB grafting without the use of CPB. This study investigates the safety and efficacy of intrathecal morphine in the off-pump coronary artery bypass (OPCAB) patients.

MATERIALS AND METHODS

For this study, 32 patients who underwent OPCAB grafting were selected. Patients on IV heparin preoperatively, recent use of thrombolytic therapy, platelet count <100,000/mm³, history of abnormal bleeding or unexplained elevated prothrombin time were excluded. Twenty patients received intrathecal morphine and were compared to 12 patients without intrathecal morphine. All patients received careful instruction on the procedure used to rate pain and the use of patient controlled analgesia (PCA). Instruction was given by a designated nurse from the Department of Cardiac Rehabilitation. Intensity of postoperative pain scores was assessed using the Wong-Baker Faces Rating Scale (McCaffery M, Beebe A: Pain Clinical Manual of Nursing Care, Mosby, 1989) (Figure 1, ©). Patients were asked by an independent observer to rate their level of comfort at eight, 12 and 24 hours post-operatively.

After informed consent was received, the patients were given a choice whether or not to receive the ITMS. All patients were pre-medicated with intravenous midazolam (versed), 50 to 70 mcg/kg before the insertion of a pulmonary artery catheter, arterial line and two large bore venous lines. The patients were then placed in a sitting position and the subarachnoid space was entered between lumbar spaces three to four or lumbar spaces four to five with a 25 gauge needle. Once clear fluid was obtained, morphine sulfate 5 mcg/kg was injected in the subarachnoid space. Patients were then allowed a brief visit with the immediate family prior to being moved to the operating room.

The intraoperative anesthetic technique was the same for all patients. Following preoxygenation, induction was done with etomidate 0.2 mg/kg and cisatracurium (Nim-

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Figure 1. Wong-Baker faces rating scale (from McCaffery M., Beebe A: Pain Clinical Manual of Nursing Care, Mosby, 1989)

bex) at 0.25 mg/kg or succinylcholine 1.5 mg/kg. Fentanyl was also used, with a total dose range of 10 to 20 mcg/kg given either at the time of induction and/or at the time of sternotomy. All fentanyl was given at or before sternotomy. Anesthesia was maintained with isoflurane 1 to 1.5 % in 100% oxygen. Midazolam (versed) 50 to 70 mcg/kg total dose was administered at induction, before endoscopic vein harvesting and before sternotomy.

Table 1. Demographic Characteristics

Sex	ITMS	Without ITMS
Male	16	9
Female	4	3
Age (yrs)	(49-87) 64.4	(45-80) 64.1

Table 2. Postoperative Complications

Complication	ITMS	Without ITMS
Pruritus	1 (20) 5%	0 (12)
Nausea	6 (20) 30%	4 (12) 20%
Spinal Headaches	1 (20) 5%	0 (12)

Table 3. Extubation Time

Groups	With ITMS*	Without ITMS
N	20	12
Mean	7.38	5.05
Std. deviation	3.36	1.86

*ITMS: intrathecal morphine

**t-test (two-tailed)

p < 0.05

All patients received nitroglycerin and dobutamine infusions, titrated to systolic blood pressure, pulmonary artery pressures and cardiac output. Inhaled isoflurane was used to treat hypertension in addition to nitroglycerin. Cardiazem infusion was administered if the radial artery was being used. All patients were monitored by transesophageal echocardiogram (TEE) for regional wall motion abnormalities. Heated circuit, fluid warmer and Bair Hugger were used to warm the patients, maintaining a core temperature of 36C° or above during surgery.

Endoscopic vein and radial artery harvesting were completed prior to midsternotomy, at which time heparinization was initiated to maintain ACT's between 300 and 400 seconds. The internal thoracic arteries were harvested and the remainder of the procedure was continued in the routine fashion.

After completion of bypasses and flow measurements, heparin was reversed one to one and patients were transferred to the cardiac surgery unit.

Patients were managed by the surgical cardiac unit nurse according to protocols, which had been previously established. "Patient Controlled Analgesia" (PCA) with meperidine used liberally at the discretion of the nurse caring for the patients.

Criteria for extubation were hemodynamically stable, normothermia, follow commands, and communicating with meaningful gestures/nodding, adequate weaning parameters, adequate urine output, and minimal chest tube drainage.

Student's t-test (two-tailed) was used to test the difference between means in the two groups.

RESULTS

Demographic and clinical characteristics are presented in Table 1 (©). Postoperative complications are listed in

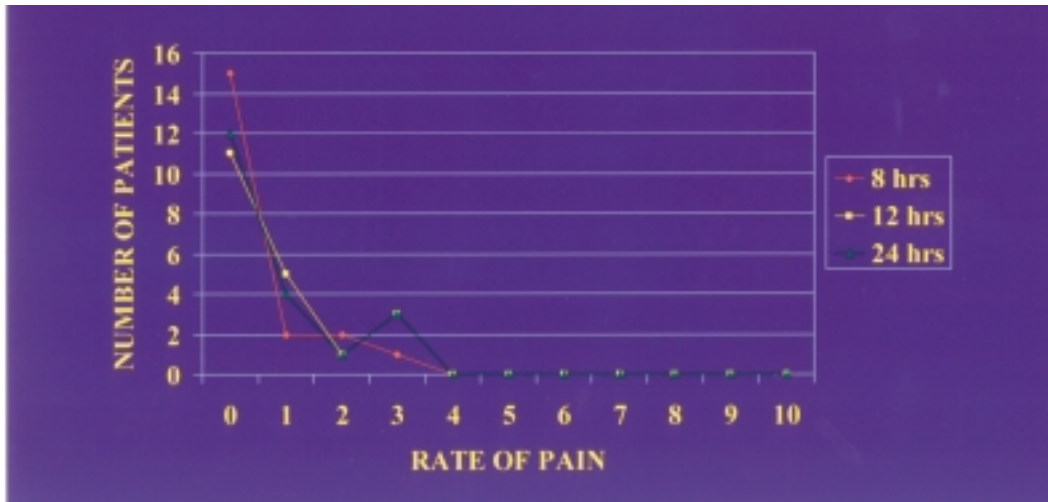


Figure 2. Postoperative pain scores in patients with Intrathecal morphine.

Table 2 (⊙). Of the patients who experienced nausea, all were treated with trimethobenzamide hydrochloride (Tigan) without major consequences. One patient, however, experienced mild pruritus, which responded to diphenhydramine HCL (Benadryl). One patient on the intrathecal group experienced headache during the first and second postoperative days. None of the patients developed urinary retention as defined by the need for recatheterization. There also was no evidence of subdural hematomas. Extubation time for the intrathecal group varied from one hour to 15.4 hours with a mean of 7.2. Extubation times for the group without ITMS fell between 1.5 hours and 7.5 hours with a mean of 5.5 hours. The difference between the two groups was 1.7 hours with a $p < 0.05$, Table 3 (⊙). Assessment of postoperative pain is

shown in Figure 2 (⊙) and Figure 3 (⊙) with the statistical analysis in Table 4 (⊙). All the scores at eight, 12, and 24 hours are highly statistically significant.

DISCUSSION

It has been established that proper postoperative analgesia affects the outcome of patients undergoing CAB grafting [Kehlet 1989] by decreasing incidence of myocardial ischemia [Chaney 1996, Manpano 1992]. Despite the liberal use of intravenous analgesia in the study, the level of comfort reported by the patients at intervals of 8, 12, and 24 hours were significantly higher in the intrathecal group.

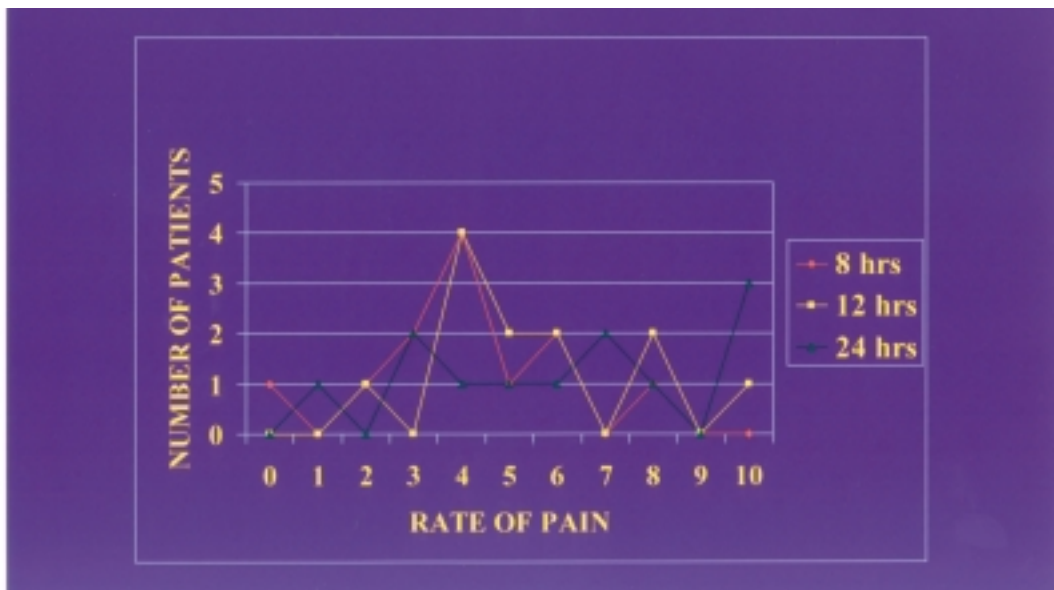


Figure 3. Postoperative pain scores in patients without Intrathecal morphine.

Table 4. Postoperative Pain Scores

Groups	Treatment	No.	Mean (pain scale)	SD	P**
8 hrs Post-op	ITMS*	20	0.450	0.887	
	Without	12	4.083	2.065	<.001
12 hrs Post-op	ITMS	20	0.800	1.105	
	Without	12	4.667	2.270	<.001
24 hrs Post-op	ITMS	20	0.750	1.090	
	Without	12	6.167	2.911	<.001

*ITMS: intrathecal morphine

**t-test (two tailed) is used for statistical analysis

Pain is difficult to measure, highly subjective and can be affected by various factors [Revill 1976]. The fact that the patients knew ahead of time the reason for the intrathecal block may have influenced their pain scores. Yet the differences were striking for the two groups.

Because of the economic forces driving the need for early extubation, the significantly longer extubation times for the intrathecal group is a concern, contrary to what other authors have reported [Ashok 1997]. This discrepancy is perhaps due to the liberal use of intravenous opioids by the nurses instead of the patients themselves. Perhaps intrathecal morphine as described here, will provide enough analgesia to keep the patient comfortable, without additional intravenous opioid that may prolong extubation times. Previously reported delayed respiratory depression [Taylor 1996] as well as other hemodynamic changes related to the release of histamine were not observed in this group of patients.

In conclusion, intrathecal morphine at a dose of 5 mcg/kg is effective and safe in controlling pain in patients undergoing OPCAB grafting. Further studies

should include a placebo group and better control of IV opioids.

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