Continuous Post-operative Infusion of a Local Anesthetic After Open-Heart Surgery

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INTRODUCTION

The use of large doses of opioid analgesics to treat pain after cardiac surgery can prolong the time to tracheal extubation and interfere with recovery of bowel and bladder function. Therefore, we investigated the efficacy and safety of a continuous infusion of bupivacaine, 0.25 or 0.5%, when administered at the median sternotomy site by an elastomeric infusion pump at 4 ml/hr for 48 hr after cardiac surgery.

METHODS

In this prospective, randomized double-blind, placebo-controlled clinical trial, 36 consenting patients undergoing open-heart surgery with a standardized general anesthetic technique had an indwelling 5 inch Soaker™ Catheter placed at the median sternotomy incision site at the end of surgery. The patients were randomly assigned to receive either: (1) normal saline (Control), (2) 0.25% bupivacaine or (3) 0.5% bupivacaine at a constant rate of 4 ml/hr for 48 hr. Patients evaluated their chest pain using 10 cm visual analog scales (VAS), with 0=no pain to 10=worst pain imaginable. In addition, a record was maintained of the post-operative opioid requirements, as well as opioid-related side effects. Patient satisfaction with their pain management was assessed on a 100-point scale, with 1=highly dissatisfied to 100=highly satisfied. Serum bupivacaine concentrations were measured at 24 and 48 hr.

RESULTS

Compared to the Control group, there was a statistically significant reduction in VAS pain scores and in the total amount of opioid analgesic medication in the 0.5% bupivacaine group. Patient satisfaction with their pain management was also improved in the 0.5% bupivacaine (vs. Control) group. There were no differences between the 0.25% bupivacaine and Control groups. The duration of the ICU (30 ±10 hr vs. 34 ± 12 hr) and hospital stays (4.2 ± 0.8 vs. 5.7 ± 2.1 d) stays were reduced in the 0.5% bupivacaine (vs. Control) group. Mean (± SD) serum bupivacaine levels at 48 hr in the groups receiving 0.25% and 0.5% were 0.5 ± 0.5 and 1.3 ± 0.7 $\mu g/ml^{-1}$, respectively.

CONCLUSION

A continuous infusion of 0.5% bupivacaine at 4ml/hr is a safe and effective method of decreasing pain and the need for opioid analgesic medication after cardiac surgery. Patients in the 0.5% bupivacaine group were able to ambulate earlier, leading to a reduced length of hospital stay.

Demographic Characteristics, Opioid Usage, Post-operative Recovery Times and Patient Satisfaction Scores

	Control (Saline)	Bupivacaine 0.25%	Bupivacaine 0.50%
Age (yr)	61 ± 8 ± 11		58 ± 14
ICU stay (hr)	34 ± 12 ± 15		30 ± 10
Hospital stay (day)	5.7 ± 2.1	5 ± 1	4.2 ± 0.8*
Opioid usage [morphine (mg	)]	27 ± 6.6 .5 ± 8.8 26	10 ± 2 *†
Ambulation			
Serum bupivacaine level at 2	4 hr (µg/m l) 0	0.5 ± 0.2	0.8 ± 0.6
Serum bupivacaine level at 48 hr (µg/ml)	0	0.5 ± 0.5	1.3 ± 0.7 †
Urinary catheter removal (day)	2 ± 1	2 ± 1	1 ± 0.5*
Return to normal diet (day)	2 ± 0.7	1 ± 0.6	1 ± 0.4*
Patient satisfaction with pain management (0-100)	69 ± 9	79 ± 11*	94 ± 4*†

Values are means ± SD, medians (with inter-quartile ranges), numbers
**P<0.05, bupivacaine versus control group*
†P<0.05, bupivacaine 0.5% versus 0.25% group

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