

TITLE: OPTIMUM CONCENTRATION OF BUPIVACAINE FOR BALANCED GENERAL/CAUDAL ANESTHESIA IN CHILDREN

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0.125% and 0.25% bupivacaine are equally effective for caudal analgesia in children when administered at the end of surgery.¹ We wished to determine the best concentration of bupivacaine for balanced general/caudal anesthesia in children.

Materials & Methods: Following IRB approval and written parental consent, 122 children ages 1 to 8 yr were randomized to receive caudal anesthesia with bupivacaine with 1:200,000 epinephrine in 1 of 6 concentrations (0.125, 0.15, 0.175, 0.2, 0.225, or 0.25%). Children were maintained at 1.5% inspired halothane for 10 to 12 min following caudal block before incision; following incision, a programmed reduction in inspired halothane (PRIH) resulted in an inspired halothane concentration of 0.5% 10 minutes after incision. Vital signs were recorded during PRIH. Children were scored for effectiveness of intraoperative caudal anesthesia (0=unable to follow PRIH; 1=halothane increased during or after PRIH; 2=PRIH followed, >20% increase in HR or BP; 3=PRIH followed, <20% increase in HR and BP). Time to awaken from anesthesia, discharge from PACU, first ambulation, and discharge from SDS were recorded. Modified Hannallah pain scores² were recorded in PACU and SDS, as well as supplemental analgesic requirements, incontinence, and complaints of leg weakness. Demographic data are presented as mean \pm SD. Results are presented as mean \pm SEM. Results were analyzed using analysis of variance, unpaired student's T tests, and χ^2 analysis. Results were considered

significant for $P < 0.05$ with appropriate Bonferroni correction for multiple comparisons.

Results: There was no difference in age (46 ± 24 mo), weight (16.3 ± 4.6 kg), pause before incision (12 ± 0.25 min), duration of surgery (20 ± 1 min), hemodynamic responses to incision and PRIH, end tidal halothane at peritoneal ligation ($.64 \pm .02\%$), awakening time (19 ± 1 min), time to discharge from PACU (30 ± 1 min), supplemental analgesic requirements in PACU (12/122) or SDS (48/122) or incontinence (15/109) for any of the concentrations. Children receiving 0.2% or greater were more likely to complain of leg weakness (39/67 ν 16/47, $P < 0.02$) but were less likely to require analgesics after discharge (27/69 ν 27/43, $P < 0.02$). Children receiving 0.175% had the earliest ambulation (129 ± 6 min, $P < 0.001$ ν 0.2%) and discharge from SDS (167 ± 8 min, $P < 0.0025$ ν 0.125 and 0.15%). Children receiving 0.125% and 0.15% had a higher incidence of 0 or 1 effectiveness scores (11/31 ν 16/91, $P = 0.08$ ν 0.175-0.25%, $P < 0.05$ ν 0.175% alone) and were also more likely to have pain scores > 1 on arrival in PACU (16/29 ν 23/88, $P < 0.005$). There were no other differences in pain scores.

Conclusions: Although all concentrations were effective for balanced general/caudal anesthesia, concentrations $< 0.175\%$ were associated with lower effectiveness scores, a longer time to discharge from SDS and higher initial pain scores. Concentrations $> 0.175\%$ were associated with a higher incidence of complaints of leg weakness and, in the case of 0.2%, a longer time until first ambulation. Concentrations less than 0.2% were associated with a higher requirement for supplemental analgesics following discharge; this suggests a shorter duration of analgesia for these concentrations, although this was not formally tested. We conclude that 0.175% bupivacaine appears to offer the best combination of effectiveness with minimal side effects for balanced general/caudal anesthesia in children.

References:

1. Wolf et al. *Anesthesiology* 1988; 69:102.
2. Hannallah et al. *Anesthesiology* 1987; 66:832

A1238

TITLE: ENOXIMONE: A NEW THERAPEUTIC CONCEPT IN RIGHT VENTRICULAR REPAIR IN PEDIATRIC SURGERY.

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The immediate postoperative period following tricuspid atresia or single ventricle surgical correction requires inotropic and/or vasodilator support to avoid hemodynamic instability and to improve the contractility of the systemic ventricle. Enoximone, a phosphodiesterase III inhibitor improves cardiac performance in adults with congestive heart failure in whom conventional therapy is unsuccessful or insufficient (1). Limited information regarding the use of this drug in the pediatric population is available.

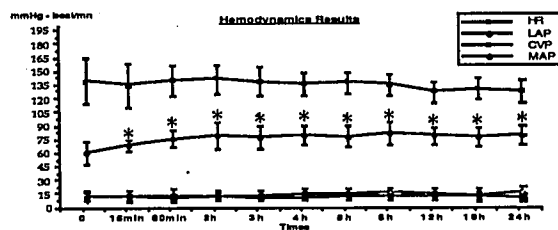
Fifteen consecutive pediatric post cardiac surgery patients (ASA III or IV), aged (51.0 ± 23.5 months) were studied. The trial was approved by the ethics committee. Informed written consent was obtained from all parents. Surgical repair (Fontan, or direct anastomosis between the vena cava and pulmonary bed) was performed to correct tricuspid atresia (TA) (10 cases) or unique ventricle (UV) (5 cases). Collected parameters were heart rate (HR), mean arterial pressure (MAP), mean pulmonary arterial pressure (MPAP), central venous pressure (CVP). Criteria for use of enoximone were 2 or more of the following at weaning from by pass: MAP less than or equal to 55 mmHg, left atrial pressure (LAP) equal or greater than 15 mmHg, MPAP greater than or equal to two thirds MAP, urine output less 0.5 ml-1, kg-1, h-1. Data were collected before and after enoximone IV at 15, 60 min, 2, 3, 4, 5, 6, 12, 18 and 24 hours. Enoximone was started immediately before weaning from by pass at 1 mg, kg-1 for 10 min followed by an infusion at 10 μ g, kg-1, min-1. Data are expressed as mean \pm SD

Statistical analysis was performed using ANOVA for repeated measures; $p < .05$: significant after Bonferroni correction.

Results are summarized in the graph: HR, CVP, LAP, remained unchanged, MAP, increased significantly from 15 min to the end of the study period; MPAP decreases at 15 min and remains stable throughout the postoperative period. We did not observe side effects such as ventricular dysrhythmias.

These results suggest that enoximone used as an "inodilator" is the agent of choice in pediatric cardiac patients. The absence of deleterious tachycardia is particularly noteworthy especially in patients with right ventricular repair. We suggest that the combination of catecholamines with enoximone has several advantages: it avoids beta receptor down regulation by the use of smaller amounts of adrenergic agents; it improves the inotropic action in children who have a calcium dependent hemodynamic status after cardiopulmonary bypass.

References: 1) *Am. J. Cardiol.*; 60; 42c-45c 1987



* $p < 0.05$ vs control