

TITLE: PLASMA GLUCOSE CONCENTRATIONS IN ANESTHETIZED CHILDREN DURING THE ADMINISTRATION OF LACTATED RINGER'S AND 5% DEXTROSE IN LACTATED RINGER'S

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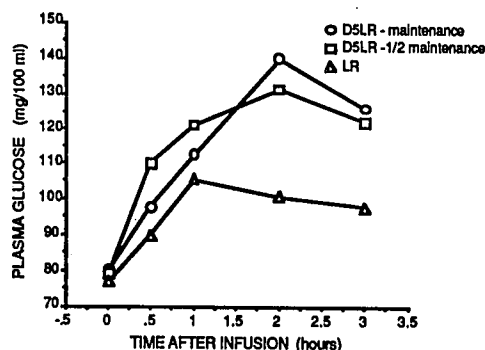
Introduction. Concern over hyperglycemia and hypoglycemia has resulted in a controversy regarding the choice of iv fluids for pediatric anesthesia patients. The present study examines the plasma glucose concentrations during anesthesia and surgery in children that received either no sugar intravenously, or 5% Dextrose in Lactated Ringer's (D5LR) administered at 1/2 or the full maintenance fluid rate.

Methods. The protocol for this study was approved by our human studies committee and written informed parental consent was obtained. Thirty ASA Class I and II children, ages 2 mo. - 6.8 yr (mean \pm SD = 2.2 ± 2.0 yr), were studied. Mean fasting time prior to anesthesia was 10.0 ± 3.9 h. Children were premedicated with rectal methohexital and anesthetized with halothane, N_2O , and O_2 . Muscle relaxants were given as needed. Two 22 gauge iv catheter (one for fluid administration, and the other for blood sampling) were inserted into each child after anesthesia was established. Blood samples were obtained intraoperatively before fluid therapy commenced and at 0.5, 1, 2, and 3 h. Intravenous fluids were administered to replace the fluid deficit incurred during fasting, the maintenance fluid requirements during surgery, and the fluid loss resulting from the surgical procedure. Patients were divided into 3 groups according to the fluids use to replace maintenance fluid requirements: Group I (D5LR at the maintenance rate); Group II (D5LR at 1/2 the maintenance fluid rate plus Lactated Ringer's at 1/2 the maintenance fluid rate); Group III (Lactated Ringer's at the maintenance fluid rate). Additional fluid requirements in all groups were replaced with Lactated Ringer's.

Plasma was analyzed for glucose. ANOVA and the Student's t-test were used to analyze the data. Significance was defined as $P < 0.05$.

Results. Plasma glucose concentrations ranged from 51-194 mg-dl⁻¹. During anesthesia, plasma glucose concentrations increased significantly in all groups. Glucose concentrations between the groups did not differ significantly until 2 h ($P < 0.05$). At this time, higher concentrations were measured in the D5LR groups compared to the LR group (Figure).

Conclusions. Plasma glucose concentrations were within the normal range when D5LR was administered to children at a rate equal to the maintenance fluid rate or to 1/2 of this rate during anesthesia and surgery. These glucose values were higher than the concentrations measured in patients who received only Lactated Ringer's. This suggests that D5LR administered at these rates may be useful in pediatric patients at risk for intraoperative hypoglycemia.



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TITLE: IMPAIRED CALCIUM MOBILIZATION IN CHILDREN UNDERGOING CARDIOPULMONARY BYPASS

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INTRODUCTION: The maintenance of normal blood ionized calcium (Cai) is a necessary requirement for the preservation of myocardial function. Cardiopulmonary bypass (CPB) in children often necessitates pump primes larger than the blood volume and can be associated with large drops in Cai. Because the Cai-PTH axis has been assumed to be immature in children, $CaCl_2$ has been routinely added during CPB. Thus, we evaluated the integrity of the Cai-PTH axis in children before, during and after CPB.

METHODS: After IRB approval and with the informed consent of parents, we studied 13 patients (5 male, 8 female) age 3 d to 6 y undergoing repair of congenital heart disease. Blood samples were drawn: 1) after induction, 2) 3 min after heparin, 3) on CPB, cooling with rectal temp. approx. $32^\circ C$, 4) cooling to rectal temp. of $23^\circ C$, 5) rewarming with rectal temp $29^\circ C$, 6) prior to separation from CPB (rectal temp $35^\circ C$, and 7) following CPB and chest closure. Samples were analyzed immediately for Cai. Samples were analyzed later PTH. Data are reported as mean \pm SEM.

RESULTS: All patients demonstrated significant decreases in Cai with the initiation of CPB. The PTH response to this large decrease in Cai was rapid and

sustained during cooling. Despite the PTH level more than doubling during CPB, Cai did not return to normal by the end of CPB without adding $CaCl_2$.

DISCUSSION: Although infants and young children have been described as having an immature Cai-PTH axis, our data suggest that they respond more briskly than adults to ionized hypocalcemia. Nonetheless, despite this brisk, sustained PTH response, Cai remained 30% below normal values at the end of CPB suggesting impaired calcium mobilization as the cause for the hypocalcemia. We, therefore, recommend Ca supplementation in children prior to separation from CPB.

