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 Title : DEXTROSE HYDRATION IN CESAREAN SECTION PATIENTS
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Introduction. Prehydration with intravenous fluids containing 5% dextrose to prevent hypotension, in patients undergoing cesarean section with regional anesthesia, causes acute maternal hyperglycemia. As in diabetes mellitus, hyperglycemia may stimulate fetal insulin production, thereby causing neonatal hypoglycemia. This prospective study determines the effect of dextrose on maternal blood pressure and neonatal serum glucose and bilirubin.

Methods. The study was approved by the Committee on Studies Involving Man. Informed consent was obtained from otherwise normal term parturients who were to undergo elective cesarean section after an overnight fast of 8-12 hours. Subjects, randomly assigned to one of two groups, received 150 cc of 5% dextrose in water (D5W) plus either normal saline (NS) 1000 cc (Group A) or 5% dextrose in normal saline (D5NS) 1000 cc (Group B) for hydration prior to epidural administration of 18-22 cc of 0.5% bupivacaine. Following hydration, NS (Group A) or D5NS (Group B) was infused as necessary to maintain a normal blood pressure. Patients with systolic blood pressures below 100 torr received intravenous ephedrine. Maternal serum glucose was determined initially and both glucose and venous pH were determined at delivery. After sampling umbilical arterial and venous blood at delivery for lactate, glucose, pH, pCO₂ and pO₂ measurements, neonatal capillary glucose samples were obtained at 1 and 2 hours.

Results. Statistical analysis was carried out either by an unpaired two-tailed t test or a chi-square test for two independent samples. The patients and their babies were comparable. All values are given as mean \pm SEM. Mean fluid received was 1851 \pm 91 cc (Group A) or 1825 \pm 64 cc (Group B). Mean systolic blood pressures (112 \pm 2.5 torr in Group A and 113 \pm 3.3 in Group B) dropped momentarily to 104 \pm 4.1 (Group A) and 95 \pm 3.8 (Group B, p .1). Expected mean maternal serum glucose at delivery in Group B (refer to table) was significantly higher than in Group A, as were umbilical venous and arterial glucose values. Serum glucose in Group B newborns dropped precipitously; the slope by regression analysis was $-.34$ ($r = .82$, $p < .001$); the Group A slope was $-.0025$. Both cord lactate means were higher in Group B and (although not statistically significant, $p < .1$) arterial pH fell and pCO₂ rose as well.

Physiologic jaundice occurred more frequently in Group B infants (Mann Whitney $u = 17$, $p < .02$) where median bilirubin was 9 compared to normal in Group A.

Discussion. D5NS failed to prevent hypotension, in fact increased its incidence (Mann Whitney $u = 12$, $p < .02$), perhaps by causing osmotic diuresis. Hypotension, placental insufficiency and/or increased glucose metabolism in a normally oxygen poor environment caused lactic acid accumulation in this group. Maternal dextrose administration led to neonatal hypoglycemia, probably the result of hyperinsulinism and limited capacity for gluconeogenesis and glycogen mobilization; and hyperbilirubinemia, the result of hypoglycemia limiting glucuronic acid supply and acidosis which limits the rate of conjugation. In conclusion, maternal dextrose administration may cause hypotension, fetal acidosis, and neonatal hypoglycemia and hyperbilirubinemia. We suspect Group B babies face increased risk of morbidity should placental function be compromised. We recommend limited maternal dextrose administration, maintaining a normal serum glucose level. Patients laboring without anesthesia may tolerate more, but those undergoing elective cesarean section should receive no more than five grams of dextrose per hour.

Sample	Group	Glucose	pH
Umbilical vein	A	69 \pm 2.2(10)	7.30 \pm .01(10)
	B	204 \pm 13(12)*	7.28 \pm .01(14)
Umbilical artery	A	63 \pm 4.3(10)	7.25 \pm 02(10)
	B	205 \pm 18(11)*	7.19 \pm .02(11)
Maternal vein initial	A	77 \pm 2.6(10)	
	B	75 \pm 3.6(12)	
Maternal vein at delivery	A	77 \pm 2.6(10)	7.35 \pm .01(10)
	B	236 \pm 18(12)*	7.36 \pm .01(10)
Newborn at 1 hour	A	61 \pm 5.0(10)	
	B	53 \pm 7.2(11)	
Newborn at 2 hours	A	62 \pm 5.6(10)	
	B	32 \pm 5.3(9)*	

Sample	Group	pCO ₂ (mmHg)	pO ₂ (mmHg)	Lactate (μ mol/l)
Umbilical vein	A	38 \pm 1.9(9)	35 \pm 1.0(10)	1.42 \pm .095(7)
	B	39 \pm 1.8(12)	30 \pm 2.6(12)	2.40 \pm .212(10) [†]
Umbilical artery	A	47 \pm 2.5(8)	19 \pm 2.9(8)	1.78 \pm .257(6)
	B	54 \pm 3.2(9)	17 \pm 1.5(10)	2.63 \pm .260(9) [‡]

Group A received normal saline; group B received 5% dextrose in normal saline. Values are mean \pm SEM. Numbers in parentheses are numbers of observations.

* $p < .001$ + $p < .01$ † $p < .05$ (unpaired 2-tailed t-test between group A and group B for significance).