Title: **The relation of acid base status to ionized calcium during pediatric liver transplant.**

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It has been shown that severe ionic hypocalcemia as a result of chelation by citrate occurs in liver recipients following massive transfusion of blood products (1). Since the quantity of ionic calcium depends on acid base balance, a study was designed to define such influence during hepatic transplantation in children.

The intraoperative charts of 30 consecutive pediatric transplants were reviewed. ECG, systemic blood pressure, central venous pressure, and cardiac output were monitored. The following variables were assesed every 45m during all stages of surgery: arterial blood gases and acid base status, ionized calcium (Ca^{2+}), potassium (K^+), and volume replacement. Data were evaluated by Student's t test for paired samples and linear regression analysis.

Patients were aged 8.6 yr ± 5.08 (mean±sd) and were given 2.24±10.3 blood volumes of red blood cells and fresh frozen plasma. Ca^{2+} progressively decreased from 1.15 mM/L ±0.09 (initial= in) to 1.04±1.15 during anhepatic(a-h) stage (t=2.2, p<0.03) and further decline to a minimum(min) of 0.9±1.44 (t=7.7, p<0.001). Ca^{2+}(in-min) was inversely related to pH(in), r=0.4, p<0.02. K^+ increased from 4.04 meq/l±0.95 (in) to a maximum of 4.8±6.07 (t=3.8, p<0.001). Significant negative correlations were found between: K^+(in) vs pH(in): r=0.42, p<0.02; K^+(a-h) vs pH (a-h): r=0.51, p<0.01 and Ca^{2+}(a-h) vs K^+ (a-h): r=0.42, p<0.02. The initial base excess (BE) in each patient was significantly correlated to pH (r=0.71, p<0.001). Quantitative displacement of this curve was observed during anhepatic stage (fig.1). BE(in) decreased from -1.42±22.2 to BE(a-h) - 2.96±3.95, t=-2.04, p<0.05.

This retrospective analysis supports consistent degrees of physico-chemical interaction between acid base parameters. and Ca^{2+}, suggesting an etiology more complex than ionized hypocalcemia as the only contributing factor associated with cardiovascular depression during liver transplantation.

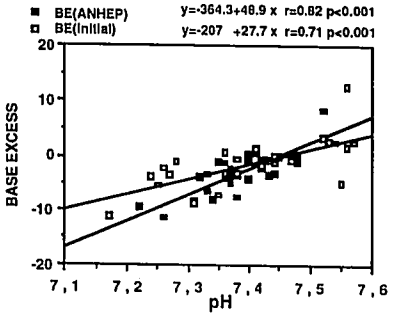

Fig.1: Quantitative displacement of acid base equilibrium during pediatric liver transplant.
Reference: Anesthesiology. 65:457-461,1986.

TITLE: THE RELATIONSHIP OF BLOOD SUGAR AND OXYGEN CONSUMPTION HERALDS GRAFT DYSFUNCTION AFTER LIVER TRANSPLANTATION

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The immediate neohepatic assessement of liver allograft function is considered important in determining the outcome after liver replacement. An early discrimination of good or poor graft function may initiate immediate treatment of complications which can occur already in the course of liver transplantation. For example, the indicative role of perioperative changes of blood glucose, as a rough indicator, has been appreciated earlier (1).The goal of the present study was to test the hypothesis whether the quotient of blood glucose levels (BG) and total body oxygen consumption (VO_2), as a metabolic index, is a sensitive indicator of early graft dysfunction.

A review of 500 consecutive records of measurements in liver graft recipients resulted in two groups of patients refering to outcome. Group 1 consists of survivors with no obvious difficulties related to graft function. Group 2 are early deaths within 30 days. Mean values of 6 measurements were taken for blood sugar, blood gas analysis and calculation of oxygen consumption according the Fick`s principle. All measurements during the procedure were analyzed by ANOVA and TUKEY's method for multiple comparisons. A p-value < 0.05 was considered statistically significant.

The table illustrates the variables that were statistically different between the groups. The metabolic index was lower (1.44 ± 0.15) in survivors compared to nonsurvivors (2.20 ± 0.20) whereas, by focusing the blood sugar levels, there was a significant difference only before and during crossclamping of the liver.

The principle finding of this study was the predictability of neohepatic recovery based on routinely measured parameters and logical indices during liver transplantation. The "metabolic index" after reperfusion of the graft shows a distinct correlation to immediate outcome. Nevertheless, survival is influenced by many factors besides initial graft function but, the onset of the metabolic function during the neohepatic recovery state plays an important role for survival and discriminates about 70% of liver graft dysfunction in our collective.

Table. Values of Glucose (G) and Index in survivors (S) and nonsurvivors (NS).

	control	anhepatic	neohepatic
G (S) mg%	97 ± 12*	175 ± 13*	278 ± 35
G (NS)mg%	156 ± 35	240 ± 38	335 ± 54
Index (S)	0.73 ± 0.18	1.39 ± 0.18*	1.45 ±0.15*
Index (NS)	1.11 ± 0.38	2.38 ± 0.46	2.65 ± 0.52

References:
1. Anesth & Analg 68:182-5,1989