TITLE: THYROID FUNCTION ON ECMO
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Previous studies[1,2] have shown that critically ill patients have low levels of T3, T4, and TSH (the sick euthyroid syndrome, SES). This study examines thyroid hormone levels before, during, and after critically ill neonates were placed on extracorporeal membrane oxygenation (ECMO).

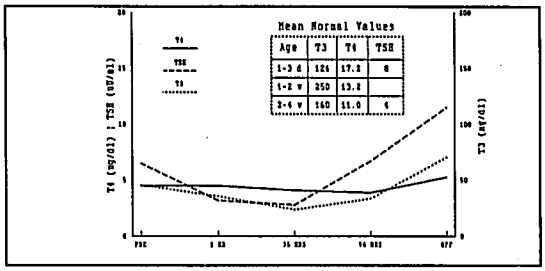
Twelve neonates (age: 1d-6m), who required ECMO for pulmonary failure, were studied. After informed consent and institutional approval, blood was obtained 1h before, and at 1, 36 and 96h on ECMO, as well as 2-24h after ECMO discontinuation. Blood to prime the ECMO circuit was also studied. T3, T4, and TSH levels were determined by RIA. Significant differences were determined by ANOVA.

Before starting ECMO, 11 of 12 neonates had low T3, T4, and low-normal TSH, consistent with the SES. ECMO prime blood had low levels of thyroid hormones (mean T3=37.6, T4=3.9, TSH=1.4). Hormone levels on ECMO reached a nadir at 36h. A rise in TSH occurred at 96h on ECMO. T3 and TSH were significantly elevated after ECMO discontinuation as compared to pre, 1h and 36h values ($p<.05$). T4 off ECMO levels were elevated compared to pre values ($p<.05$).

These data confirm that critically ill neonates requiring ECMO have the SES. Dilution with prime blood probably occurs, further decreasing thyroid levels. Despite the fact that ECMO temporarily corrects metabolic imbalances (hypoxemia, hypercarbia, acidosis) thyroid levels remain low. T3, T4 and TSH rise significantly, but do not return to normal, after completion of ECMO. The response may be due to alterations in blood flow when discontinuing ECMO and is similar to changes in normal neonates immediately after delivery.

Although no treatment is recommended for SES, some of our patients had values consistent with primary hypothyroidism (elevated TSH, low T3 and T4) raising the question of possible replacement therapy.

References: [1]AIM 98:946-957. [2]JPEDS 107:599-602



Neuropeptides: Plasma Levels in Endotoxic Shock

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Introduction: The autonomic nervous system and the endocrine system are well known to have critical roles in the pathophysiology of endotoxic shock. Several recent reports have underscored the importance of endogenous neuropeptides (NP) as modulators of the humoral response to stress; moreover, these NP are frequently associated with the sympatho-medullary system. We therefore decided to undertake a study of selected plasma NP responses to endotoxic shock in the pig, correlating cardiopulmonary response to sepsis with plasma NP levels.

Methods: Pathogen-free castrated male pigs (*Sus Scrofa*) had femoral artery and vein catheterization and were divided into an experimental (n=7) and control (n=3) group. Baseline hemodynamic and blood samples were obtained and ten minutes later, 0.3 mg/kg *E. Coli* endotoxin was administered intravenously to the experimental group. Both groups had repeated hemodynamic measurements and blood sampling at 15, 60 and 120 minutes post-endotoxin. Blood samples were extracted and assayed for vasoactive intestinal peptide (VIP) and neuropeptide-Y (NPY) via RIA as described by Yaksh, *et al* (1).

Significance of change from control values in plasma NP levels and hemodynamic parameters was calculated by a repeated-measures analysis of variance. Correlation coefficients were calculated for changes in plasma NP levels and hemodynamic parameters after endotoxin.

Results: Sixty minutes after the administration of endotoxin, mean arterial pressure (MAP) decreased to 46% of control values; heart rate (HR) increased to 125%. mean pulmonary artery pressure (MPAP) increased to 364% and cardiac index (CI) decreased to 65% of control values (all $p\leq.05$). Both VIP and NPY plasma levels increased (333% and 153%, respectively; $p\leq.05$) at 60 minutes post-endotoxin. Hemodynamically MPAP correlated with NPY levels at 60 minutes ($r=0.77$, $p\leq.05$), as did several other parameters.

Discussion: As postulated, the NP we measured significantly increased following endotoxin administration. NPY, a synergistic mediator of norepinephrine-mediated vasoconstriction (2) increased in plasma and was correlated with the hemodynamic changes seen after endotoxin administration.

References:

1. Yaksh TL, Michener SR, et al; Survey of Distribution of Substance-P, Vasoactive Intestinal Polypeptide, Cholecystokinin, Neurotensin, Met-Enkephalin, Bombesin and PHI in the Spinal Cord of Cat, Dog, Sloth and Monkey, *Peptides*, 9: 357-372, 1988.
2. Håkanson R, Wahlstedt C, Ekblad E, Edvinsson L, Sundler F; Neuropeptide Y: Coexistence with noradrenaline. Functional implications. *Progress in Brain Research*, 68: 279-287, 1986.