Pupillometry in trauma: reducing variability associated with subjective assessment

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INTRODUCTION: Pupillary examination is a critical component in the neurologic evaluation of the traumatic brain injury (TBI) patient, yet is subject to considerable variablility. The dynamic infrared pupillometer objectively measures pupil size and pupil reactivity. The first study goal was to determine whether objective pupillometry could reduce variability associated with subjective examination. The second goal was to correlate pupillometry data with CT results.

METHODS: Part I: A convenience sample of non-consecutive trauma patients were examined by members of the trauma team for pupil size and reactivity (brisk, sluggish, or non-reactive). Pupil size and reactivity was then objectively assessed using a pupillometer. Three manual and pupillometer examinations were performed for each patient. Variability was then compared. Significance $p<0.05$. Part II: A convenience sample of trauma patients were examined with the pupillometer during the primary survey. Patients with confirmed or suspected TBI and underwent CT brain were included. Pupillometry data was compared to CT imaging results.

RESULTS: Part I: 101 patients examined. Mean SD for subjective assessments was 0.76mm; mean SD for objective measurements was 0.21, $p<0.001$. There was discordance in approximately 28% of subjective and objective assessment of pupillary reactivity. Part II: 168 patients included, 34 with positive CT. Mean Percent Change (maximum - minimum pupil size) for patients with positive CT was 19.7% and 28.2% for patients with negative CT, $p<0.001$.

CONCLUSIONS: Objective pupillometry is significantly more precise than subjective pupillary assessment. Pupillometry data correlated strongly with CT findings. Decreased percent change was correlated with positive intracranial findings.

Herpes virus entry mediator expression in critically ill trauma patients

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INTRODUCTION: Although overall trauma-related mortality has decreased, patients who develop trauma-induced immunosuppression—as characterized by lymphocyte dysfunction—often still succumb to sepsis and multisystem organ failure (MSOF). Understanding the contribution of these processes is critical to ameliorating these deaths. Herpes virus entry mediator (HVEM), a bidirectional secondary signal found on immune cells, either stimulates or inhibits T cell activation, depending on the ligand engaged. We hypothesized HVEM expression would be elevated in critically ill trauma patients requiring ICU admission.

METHODS: Thirty-seven moderately and severely injured patients requiring admission to the Trauma Intensive Care Unit (TICU) and 10 trauma patients with minor injuries were enrolled. Age, gender, APACHE II, and white cell count were obtained. Blood, collected within 36 hours of admission, was gated using FACS flow cytometry for granulocytes and monocytes and stained for lymphocytes (CD3+ and CD4+) and HVEM expression.

RESULTS: TICU patients were older (53.7 ± 3.3 vs 38.2 ± 4.3 years; $p=0.024$), with higher APACHE II (19.9 ± 1.57 vs 9.3 ± 0.56; $p=0.0004$). The groups were matched for gender (62% vs 70% male; $p=0.7$) and white cell count (12.8 ± 0.79 vs 11.9 ± 2.1; $p=0.63$). TICU patients had higher percentage and number of HVEM+ lymphocytes ($94\%\pm1.5$ vs $70\%\pm12$; $p<0.0005$ and 1.09 ± 0.1 vs 0.22 ± 0.06; $p=0.004$) and HVEM+ monocytes ($86\%\pm2.8$ vs $61\%\pm13$;$p=0.005$ and 0.75 ± 0.082 vs 0.24 ± 0.0046; $p=0.013$). Percentage and number of HVEM+ granulocytes was not significantly different ($54.5\%\pm4.5$ vs $39.1\%\pm11.8$; $p=0.19$ and 5.48 ± 0.57 vs 3.6 ± 1.4;$p=0.19$).

CONCLUSIONS: HVEM expression is significantly increased in physiologically-deranged trauma patients. As murine studies suggest, HVEM has a negative immunomodulatory role, we believe that HVEM may play a key role in the development of trauma-induced immune dysfunction.

Prestorage leukoreduction of aged blood reduces transforming growth factor β-1 and bone marrow hematopoietic suppression

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INTRODUCTION: We have previously shown that both transforming growth factor (TGF)β-1 and supernatant (SN) from blood stored for 14 days suppresses bone marrow (BM) function in rats. Leukoreduction of transfused blood has been associated with decreased mortality, infection, and immunomodulation in critically ill patients. We hypothesized that prestorage leukoreduction attenuates the suppression of BM function mediated by older stored blood.

METHODS: Blood from 6 Sprague-Dawley rats was pooled and separated into leukoreduced and non-leukoreduced components. After storage for 14 days with the preservative CPDA-1, SN from each group was incubated with fresh rat BM (n=6) and cultured for erythroid (CFU-E) and granulocyte-macrophage (CFU-GM) colony forming units. BM colony growth from both groups was compared to cultures with SN from blood stored for 1 day (D1). Supernatant from each group was analyzed for TGFβ-1 levels using ELISA.

RESULTS: Supernatant from leukoreduced aged blood (D14-LR) prevented suppression of BM CFU-E and CFU-GM growth and resulted in similar growth to that of D1 SN (Table). After 14 days of storage, there is a significant increase in TGFβ-1 in non-