Elevated Inflammation and Decreased Platelet Activity is Associated with Poor Outcomes After Traumatic Brain Injury

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Introduction

Inflammatory processes contributing to injury after traumatic brain injury (TBI) are unclear. We hypothesize that changes in systemic cytokine/chemokine (CC) levels are associated with clinical outcomes after TBI. We examined levels of CCs and their relationship with patient outcomes. As exploratory analysis we present a correlation-network model to characterize CC interactions after TBI.
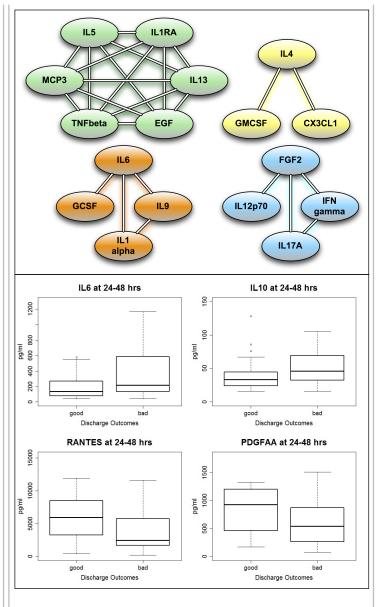
Methods

Serum from acute TBI subjects were collected within 24hrs(T1) and 24-48hrs(T2). CC levels were measured using a multiplex 41-plex-kit. Based on the modified Rankin scale (mRS), good outcomes were defined as (mRS<4) and poor outcome (mRS>=4). Differences in CC concentrations between groups were compared using the Mann-Whitney U test. Pearson's correlation coefficient (Pcc) were computed for all CC pairs and hierarchical clustering algorithms were used to group correlated cytokines.

Results

76 acute TBI subjects were included. In the mRS=4 group, Interleukin-6(IL6) and Interleukin-10(IL10) were elevated at both time points, indicating activation of immune reaction and modulation. Simultaneously, PDGFAA, PDGF-AA/BB, and RANTES were lower in the mRS=4 group at both time points.

Cluster analysis identified two inter-correlated CC clusters. Cluster A consisted of IL13, EGF, IL5, IL1RA, MCP3 and TNFß. Cluster B was a smaller cluster consisting of IL9, IL8, IL1a and IL6. Clusters A and B were 'disconnected' in the

Conclusions

Poor outcomes after TBI were associated with elevated levels of IL6 and IL10 and lower levels of PDGF and RANTES within 0-48 hrs after injury. Subjects with poor outcomes had interconnection of CC clusters indicating activation of inflammatory pathways.

Learning Objectives

1) Recognize the complex inflammatory reaction the body undergoes in response to traumatic brain injury.
2) Understand the correlation of IL6 and IL10 to poor outcomes.
3) Describe the association of inflammatory pathway activation with poor outcomes in traumatic brain injury.

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