Impact of Alcohol Status on Peritoneal Cytokine Expression Following Damage Control Laparotomy in Trauma Patients

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Introduction:

Trauma patients requiring damage control laparotomy are at high risk for systemic inflammatory dysregulation. The peritoneal cavity plays a central role in this process, as the accumulation of cytokine-rich ascitic fluid has been shown to modulate immune signaling at both local and systemic levels. Acute alcohol intoxication is present in almost half of trauma patients, and while alcohol is known to alter immune function, its impact on peritoneal cytokine levels following traumatic injury remains poorly understood. This study aimed to elucidate the impact of alcohol on peritoneal fluid cytokine profiles of trauma patients. We hypothesized that alcohol-positive patients would exhibit altered peritoneal cytokine expression compared to alcohol-negative patients.

Methods:

Peritoneal fluid samples were collected intraoperatively during the initial exploratory laparotomy from adult trauma patients at a Level 1 Trauma Center. Select cytokine concentrations were measured using Milliplex assays. Patients were compared by alcohol status as positive (EtOH ≥15 mg/dL) or negative (EtOH <15 mg/dL). Numerical variables, such as cytokine levels and age, were compared using Wilcoxon rank-sum tests, while categorical demographic and clinical variables were compared using chi-squared or Fisher's exact tests, as appropriate. To address potential confounding, a secondary analysis was performed using propensity score matching (PSM) on age, BMI, ISS, sex, race, mechanism of injury, smoking, and shock.

Results:

A total of 35 trauma patients were included in the full cohort (10 alcohol-positive and 25 alcohol-negative). There were no significant differences in demographic or clinical characteristics ($p>0.05$). Patients were mostly male (83%) and African American (54%), with a median age of 33 years and a median Injury Severity Score of 27. Median peritoneal concentrations of IFN-γ, IL-1β, IL-4, IL-6, IL-8, IL-10, IL-17A, VEGF, MCP-1, and FGF-2 did not differ significantly between alcohol-positive and alcohol-negative patients. The highest median cytokine levels were observed for IL-8 (6655 pg/mL), MCP-1 (5680 pg/mL), and IL-6 (5569 pg/mL). After PSM, 16 matched patients were analyzed (8 per group). Baseline characteristics were well balanced, but cytokine comparisons again revealed no statistically significant differences across groups.

Conclusion:

Detectable blood alcohol levels were not associated with significant differences in peritoneal cytokine expression in trauma patients undergoing damage control laparotomy. Results were consistent across both unadjusted and propensity score–matched analyses, suggesting that the

intense local inflammatory response to trauma and surgical manipulation may overshadow potential immunomodulatory effects of alcohol.