Dietary glutamine supplementation reduces cellular adhesion molecule expression and tissue myeloperoxidase activity in mice with gut-derived sepsis

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Abstract

Objectives

This study investigated the effects of glutamine (Gln) on plasma intracellular adhesion molecule-1 levels and leukocyte integrin (CD11a/CD18 and CD11b/CD18) expressions in gut-derived sepsis. Myeloperoxidase (MPO) activities in organs were also analyzed to identify the extent of tissue injury resulting from neutrophil infiltration.

Methods

Mice were randomly assigned to a normal group (NC), a control group, or a Gln group. The NC group was fed standard chow diet; the control group was fed a common semipurified diet; and the Gln group received a diet in which part of the casein was replaced by Gln, which provided 25% of total amino acid nitrogen. After 3 wk, sepsis was induced by cecal ligation and puncture (CLP) in the control and Gln groups. Mice in the experimental groups were killed at 0, 6, 12, and 24 h after CLP. Mice in the NC group were killed when CLP was performed. Blood and organ samples were collected for further analysis.

Results

Plasma intracellular adhesion molecule-1 levels were significantly lower in the Gln group than in the control group at 6, 12, and 24 h after CLP. Expressions of lymphocyte CD11a/CD18 were significantly higher, whereas polymorphonuclear lymphocyte expressions of CD11b/CD18 were lower in the Gln group than in the corresponding control group at 6 and 12 h after CLP. In comparisons of MPO activities in various organs, the Gln group had lower MPO activities at 6 and 12 h in the lung, at 6, 12, and 24 h in the liver, at 12 and 24 h in the kidneys, and at 12 h in the intestine than those in the control group.

Conclusions

Results of this study demonstrate that a Gln-supplemented enteral diet increased lymphocyte CD11a/CD18 expressions, whereas neutrophil CD11b/CD18 expressions, circulating intracellular adhesion molecule-1 levels, and MPO activities in various organs decreased with gut-derived sepsis. These findings suggest that, under septic conditions, Gln administration may enhance lymphocyte function, attenuate interactions between polymorphonuclear lymphocytes and endothelium, and thus may decrease neutrophil infiltration into tissues.