Changes of serum amino acid profile in guinea pigs with bile duct ligation

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Background: Liver plays a critical role in detoxification, synthesis and metabolism. Previous studies indicate that blood amino acid changes in severe liver disease. Glycine, a precursor of glutathione, exerts protective effects against free radical-induced liver injury. This study aimed to establish a method measuring serum amino acids concentrations with liquid chromatography-tandem mass spectrometry (LC-MS/MS) and to examine the effects of bile duct ligation on serum liver function tests and amino acids concentrations. We further investigated whether treatment of glycine, alanine, serine or tyrosine would protect against bile duct ligation-induced damage. Methods: Aliquots of serum were added into iced methanol containing internal standard. The supernatant was injected to LC-MS/MS (API2000) for analysis. The chromatographic separation was performed on a C18 column, 2.1 mm x 50 mm, 3.5 μm with mobile phase acetonitrile. Results: The mean recovery was 104%, 108%, 91%, 94%, 107% and 99% for tryptophan, phenylalanine, valine, leucine, isoleucine and tyrosine, respectively. The imprecision (CV%) was less than 7% for all amino acids. Serum alanine aminotransferase (ALT) and aspartate aminotransferase (AST) significantly increased at day-14 post ligation. Serum leucine and isoleucine levels were significantly decreased (P<0.05) at 14-day post ligation, compared with the sham group (182.6±7.1 vs. 238.2±18.1 μM and 185.2±6.9 vs. 234.9±15.5 μM for leucine and isoleucine, respectively). However, there were no significant changes in serum aromatic amino acids (AAAs) with 14 days of ligation. Branched-chain amino acids (BCAAs)/AAAs ratio was also decreased in ligated group (2.5±0.1 vs. 3.3±0.1 μM, p<0.05). The treatment of glycine, but not other amino acids, decreased the serum ALT and AST activities and restored the BCAAs concentrations and BCAAs/AAAs ratio. Conclusion: We established a method for the measurement of serum amino acids using LC-MS/MS. The results indicate that glycine protects against bile duct ligation-induced liver damage with the BCAAs profile reverted to normal.