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ORIGINAL ARTICLE

Elevated mean platelet volume is associated with poor short-term outcomes in hepatitis B virus-related acute-on-chronic liver failure patients

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Summary

Background and aim: It has been shown that mean platelet volume (MPV) can be used as a prognostic biomarker in some chronic diseases. The aim of the present study is to investigate the possible association between MPV and clinical outcome and prognosis in patients with HBV-related acute-on-chronic liver failure (HBV-ACLF) within 4 weeks.

Methods: This study included 64 patients with HBV-ACLF, 19 chronic hepatitis B (CHB) patients, 27 patients with hepatitis B-related cirrhosis (CR, Child-Pugh A/B), 51 healthy subjects (healthy controls [HC]). The complete blood counts and biochemical examination of blood were obtained after 12 h of fasting. In the ACLF group, the relationships between the prognosis and the MPV were analyzed.

Results: At baseline, a statistically significant increase in MPV was shown in patients with ACLF (median 9.5, range 7.1—14.1) compared with HC (8.0, 7.2—11.9, $P < 0.001$), CR (8.4, 5.9—11.1, $P < 0.001$) and CHB (8.3, 7.3—12.0, $P < 0.001$). The MPV value was positively correlated with model of end-stage liver disease (MELD) score and international normalized ratio (INR). The MPV level was significantly increased in nonsurvivors than survivors. High MPV level showed a

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significantly lower survival rate ($P = 0.001$). Multivariate logistic regression analysis showed that only MPV level was independent factor predicting poor short-term outcomes.
Conclusion: MPV values at presentation were higher among nonsurvivors than survivors, and this parameter was well correlated with liver function parameters and may be used as a predictor for 4-week mortality rate in patients with HBV-ACLF.

Introduction

Acute-on-chronic liver failure (ACLF) is an increasingly recognized distinct disease entity encompassing an acute deterioration of liver function in patients with chronic liver disease [1]. Associated with a precipitating event, it results in significantly higher risk of short-term death in patients who hospitalized for an acute complication of hepatic disease [2,3]. The exact pathogenesis of the development of ACLF remains to be inconclusive, however, host response to injury, infection as well as inflammation may be useful in describing the pathophysiology and clinical categories [1,4,5].

In China, hepatitis B virus-related acute-on-chronic liver failure (HBV-ACLF) accounts for more than 80% of all ACLF owing to a high prevalence of HBV infection and a high carriage rate of HBV [6—8]. As a result of acute and severe impairment or loss of liver function in patients with chronic liver disease [9], HBV-ACLF exhibits relatively high mortality rate and liver transplantation is the most promising treatment [10,11]. However, the shortage of donor livers, considerable cost and ethical issues limit the application of liver transplantation in most patients at present [11]. So new potential biomarkers which might prompt and accurate prediction of outcome and then appropriate medical decision-making could be beneficial for these patients.

The mean platelet volume (MPV) reflects the size of platelets measured as part of a platelet index during a routine automatic whole blood count [12,13]. In general, larger platelets are more metabolically and enzymatically more active than those smaller size [12,13]. Consequently, MPV is used as a marker of platelet activation and function [14]. The importance of MPV has been emphasized as an inflammation marker in some chronic inflammatory disorders, such as ankylosing spondylitis, rheumatoid arthritis, and chronic obstructive pulmonary disease exacerbation [15,16]. Increase MPV is also associated with increased risk of myocardial infarction (MI), independent of known cardiovascular risk factors [17]. Evidence is accumulating that MPV level increase in chronic viral hepatitis [18—20]. In a study [21], MPV level was also found to be significantly higher in patients with inactive HBV infection. And it is consistent with Ekiz's conclusions [18]. They revealed that a significant relationship was found between fibrosis scores and MPV level, and it was claimed that MPV might be a marker in the determination of liver fibrosis scores. Ceylan showed that MPV determined the histological activity index (HAI) score, the indicator of the degree of inflammation in patients with chronic hepatitis B [20]. To our best knowledge, there are no studies of MPV in hepatitis B virus-related acute-on-chronic liver failure patients. On the basis of this background, in the present study, we investigated the relationship between MPV with hepatitis B virus-related acute-on-chronic liver failure and evaluated the usability of the MPV as a potential prognostic marker.

Material and methods

Patients

Sixty-four patients with HBV-ACLF, 19 chronic hepatitis B (CHB) patients, 27 patients with hepatitis B-related cirrhosis (CR, Child-Pugh A/B), 51 healthy subjects (healthy controls, HC) were enrolled in this study. All patients were admitted to the Department of Hepatology, The Third Central Clinical College of Tianjin Medical University from April 2010 to January 2014. A blood sample was collected at admission to examine liver function, renal function, a blood coagulation test, complete blood counts, and biochemical screening. Patients with HBV-ACLF meet the criteria for ACLF issued by the Asian Pacific Association for the Study of the Liver (APASL) [2]: a history of chronic hepatitis with the presence of serum HBsAg $\geq$ 6 months, recent development of severe jaundice with total bilirubin (TBIL) $\geq 85\,\mu mol/L$ plus increasing international normalized ratio (INR) ≥ 1.5 or decreasing prothrombin activity (PTA) $\leq 40\%$, complicated within 4 weeks by ascites and/or encephalopathy. CHB is defined as HBV carrier with a clinical course of hepatitis B infection for over 6 months and with symptoms or signs of hepatitis and abnormal hepatic function or with histological changes [22]. The exclusion criteria were as follows: infection with other hepatitis viruses, autoimmune diseases, alcoholic liver disease, drug-induced liver injury, coexistent hepatocellular carcinoma, any other serious medical illness or patients who had received any immunotherapy at least the preceding 6 months. Patients with cardiac diseases, endocrinological disorders, haematological disease, cancer were also excluded. None of enrolled subjects had received anticoagulant medications, nonsteroidal anti-inflammatory drugs, or contraceptives. Written informed consent was obtained from each participant or their family member if with hepatic encephalopathy before initiation of the study. The study was carried out according to the Declaration of Helsinki and the guidelines of the International Conference on Harmonization for Good Clinical Practice.

All patients with HBV-ACLF received standard medical treatment protocols, including Entecavir as their antiviral treatment, intravenous infusion albumin and plasma, the application of antibiotic agents, appropriate nutrition