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Quantitative analysis of microcirculation changes of hepatic ischemia reperfusion injury in rabbits with liver cirrhosis by contrast-enhanced ultrasound**Haiyuan Li**

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Objective: To investigate hepatic microcirculation perfusion before and after hepatic ischemia reperfusion injury (IRI) in rabbits with liver cirrhosis by the quantitative analysis of contrast-enhanced ultrasound (CEUS).

Methods: Forty-five New Zealand rabbits with liver cirrhosis were randomly divided into sham operation group (group A) and ischemia reperfusion injury group (group B and group C). CEUS examination, aspartate aminotransferase (AST), alanine aminotransferase (ALT) and histopathological examination were performed before and after reperfusion of 0h, 1h, 6h, 24h and 48h, respectively. SonoLiver software was used to perform the quantitative analysis of CEUS. And the time intensity curve (TIC) was used to measure peak intensity (IMAX), rise time (RT), peak time (TTP), respectively.

Results: There were no significant differences in TIC parameters (IMAX, RT and TTP) in the group A at each time point ($P > 0.05$). IMAX in groups B and C at 0h, 1h, 6h, 24h, 48h of reperfusion had no significant change compared with the blocking ($P > 0.05$). In groups B and C, RT, TTP increased significantly at 0h, 1h, 6h of reperfusion compared with before reperfusion ($P < 0.05$), however, the parameters of RT and TTP had no changes at 24h of reperfusion had no obvious change than before reperfusion, no significant difference ($P > 0.05$), 48h of reperfusion compared with before reperfusion decreased, with statistical difference ($P < 0.05$). Pearson correlation analysis showed that RT and TTP were positively correlated with ALT and AST ($P < 0.001$). In groups B and C, the pathological changes at 0h of reperfusion showed edema of liver cells, liver sinusoidal space narrowing, gathered a large number of red blood cells in liver sinusoids and central vein blocking lumen, micro thrombosis. With the prolongation of reperfusion, the pathology revealed that red blood cell aggregation in hepatic sinusoids and the portal area, caused by occlusion of the lumen of the portal area, microcirculation, there is a small amount of neutrophils at 1h of reperfusion. The pathological analysis revealed that edema was found in liver cells increases in ballooning, and saw extensive infiltration of neutrophils when at 6h of reperfusion. Hepatocyte atrophy, necrosis and hepatic sinus collapse were found at 24h of reperfusion.

Conclusion: The quantitative analysis of contrast-enhanced ultrasound is a noninvasive, objective and accurate method to evaluate the changes of hepatic IRI microcirculation.

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