

Is ^{31}P MRS a useful tool for evaluating early acute hepatic radiation injury?

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Acute hepatic radiation injury could lead to necrosis of hepatocytes, fatty degeneration and hepatic fibrosis. At the present, the gold standard test is liver biopsy. However, this procedure is invasive, uncomfortable for the patients and sometimes results in serious complications. ^{31}P magnetic resonance spectroscopy (MRS) has been used to study liver metabolism in vivo for several years.

A research team led by Jian-Shan Mao from Zhejiang University investigated whether changes of ^{31}P MRS in the liver with early acute radiation injury were related to the liver damage score (LDS) and pathologic changes. They also determined the value of ^{31}P MRS in detecting early acute hepatic radiation injury, and identified the most valuable phosphorylated metabolite for detecting acute hepatic injury. Their study will be published on June 14, 2009 in the [World Journal of Gastroenterology](#).

In this study, 30 rabbits which received different radiation doses (ranging 5-20 Gy) were used to establish acute hepatic injury models. Blood biochemical tests, ^{31}P MRS and pathological examinations were carried out 24 h after irradiation. The degree of injury was evaluated according to LDS and pathology. Ten healthy rabbits served as controls. The MR examination was performed on a 1.5 T imager using a $^1\text{H}/^{31}\text{P}$ surface coil by the 2D chemical shift imaging technique. The relative quantities of phosphomonoesters (PME), phosphodiester (PDE), inorganic phosphate (Pi) and adenosine triphosphate (ATP) were measured.

They found that there were significant differences of ATP relative quantification among control group, mild injured group, moderate injured group, and severe injured group according to both LDS grading and pathological grading, respectively, and it decreased progressively with the increased degree of injury ($r = -0.723$, $P = 0.000$).

The relative quantification of PME and Pi decreased significantly in the severe injured group, and the difference between the control group and severe injured group was significant (P

These results indicate that ^{31}P MRS is a useful method to evaluate early acute hepatic radiation injury. The relative quantification of hepatic ATP levels, which can reflect the pathological severity of acute hepatic radiation injury, is correlated with LDS. This study may be particularly useful for allowing clinical detection of early acute hepatic injury with ^{31}P MRS in the future.

More information: Yu RS, Hao L, Dong F, Mao JS, Sun JZ, Chen Y, Lin M, Wang ZK, Ding WH. Biochemical metabolic changes assessed by ^{31}P [magnetic resonance spectroscopy](#) after radiation-induced hepatic injury in rabbits. *World J Gastroenterol* 2009; 15(22): 2723-2730
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