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Assessment of hepatic lipid in steatoic liver rat models using ^1H -MRS on 3.0T

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作者	单位	E-mail
韩海伟	厦门大学附属第一医院放射科, 福建 厦门 361003	
韩成坤	厦门大学附属第一医院放射科, 福建 厦门 361003	
庄碧梅	厦门大学附属第一医院放射科, 福建 厦门 361003	
张惠杰	厦门大学附属第一医院内分泌糖尿病科, 福建 厦门 361003	
庄雄杰	厦门大学附属第一医院放射科, 福建 厦门 361003	zhuangxiongjievip@163.com

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中文摘要:

目的 探讨利用3.0T临床型MR仪行 ^1H -MRS测定非酒精性脂肪肝 (NAFLD) 大鼠模型肝内脂肪含量的可行性。方法 将75只SD大鼠随机分为高脂饲养实验组 ($n=50$) 与正常对照组 (25); 分别在第2、4、6、8、10周时行肝脏 ^1H -MRS扫描及组织病理学检查。将 ^1H -MRS原始数据导入LC model软件进行分析, 并对各代谢物浓度行T1、T2纠正; 将 ^1H -MRS结果与组织病理学结果加以对照, 将肝内饱和脂肪酸含量、总非饱和脂肪酸含量及组织病理学检测含量分别记为 Lip_{MRS1} 、 Lip_{MRS2} 和FI。结果 大鼠肝脏同一部位相同参数 (r_1) 及同一部位不同点 (r_2) ^1H -MRS测量结果 ($r_1=0.99$, $r_2=0.96$, P 均 <0.01) 呈高度正相关; Lip_{MRS1} 、FI呈高度正相关, 回归方程为: $\text{Log}Y=0.37+1.21\text{Log}X$ ($r=0.95$, $P<0.01$), NAFLD大鼠模型中 Lip_{MRS1} 及 Lip_{MRS2} 含量无明显相关性 ($r=-0.11$, $P=0.66$); *Bland & Altman*曲线分析显示 Lip_{MRS1} 与FI的一致性良好。结论 采用3.0T临床型MR仪行 ^1H -MRS可作为在体评价NAFLD大鼠模型肝内脂肪含量的无创的影像学方法; LC model软件能区分肝内脂肪组分并精确定量。

英文摘要:

Objective To investigate the feasibility of in vivo assessment of hepatic lipid content using clinical 3.0T ^1H -MRS in a nonalcoholic fatty liver disease (NAFLD) rat models. **Methods** Totally 75 healthy Sprague-Dawle rats were randomly divided into NAFLD group ($n=50$) and control group ($n=25$). ^1H -MRS of the liver was performed, and then rats were sacrificed for histopathological assessment of the liver after 2, 4, 6, 8, 10 weeks. The raw data of ^1H -MRS was exported to LC model software. The metabolite concentration of H_2O and Lipid was measured and corrected for T1 and T2 decay. ratio of $\text{Lip}/(\text{Lip}_{\text{corr}}+\text{H}_2\text{O}_{\text{corr}})\times 100\%$ was noted as Lip_{MRS1} , of unsaturated fatty acid (UFA)/(UFA+ H_2O) $\times 100\%$ was noted as Lip_{MRS2} , the lipid content estimated by histopathology was noted as FI. **Results** The reproducibility of ^1H -MRS was validated by showing that duplicate ^1H -MRS measurements on different occasions (r_1) and different sites (r_2) of the liver were highly correlated ($r_1=0.99$, $r_2=0.96$, all $P<0.01$). Lip_{MRS1} and FI were high positively correlated, and the regression equation was $\text{Log}Y=0.37+1.21\text{Log}X$ ($r=0.95$, $P<0.01$), while Lip_{MRS1} and Lip_{MRS2} had no correlation ($r=-0.11$, $P=0.66$). With *Bland-Altman* method plot, all data points of Lip_{MRS1} and FI were within the limits of agreement. **Conclusion** High quality and reproducible ^1H -MRS of NAFLD rat model can be achieved using clinical 3.0T MR scanner. The saturated fatty acid and the polyunsaturated fatty acid can be discriminated by LC model software. ^1H -MRS can be used as a noninvasive and in vivo method in assessing hepatic lipid content and composition for NAFLD rat models.

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