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APP/PS1转基因AD小鼠磁共振波谱及行为学的对照观察

Contrast between magnetic resonance spectroscopy and changes of behavior in APP/PS1 transgenic mice

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中文摘要:

目的 探讨氢质子磁共振波谱($^1\text{H-MRS}$)成像对APP/PS1转基因AD小鼠代谢变化的显示及其早期诊断价值。方法 35只APP/PS1AD小鼠(实验组)和20只同源野生型小鼠(对照组)在6、9月龄时接受Morris水迷宫测试及 $^1\text{H-MRS}$ 成像。 $^1\text{H-MRS}$ 测量小鼠大脑海马区N-乙酰天门冬氨酸(NAA)、肌醇(mI)和肌酐(Cr)的峰下面积,计算NAA/Cr和mI/Cr比值并进行两样本均数t检验。结果 与对照组比较,实验组小鼠6月龄时mI/Cr比值明显升高($t=2.904, P<0.05$),NAA/Cr比值明显降低($t=-7.535, P<0.05$)。免疫组化检查显示海马区出现A β 沉积斑块,周围包裹活化的胶质细胞;而行为学差异在9月龄时才有统计学意义($P<0.05$),表现为小鼠学习和记忆方面的损害。结论 $^1\text{H-MRS}$ 是早期评价AD的高敏感性、高特异性的方法,mI、NAA的变化早于行为学改变。

英文摘要:

Objective To explore the value of $^1\text{H-MR}$ spectroscopy ($^1\text{H-MRS}$) in displaying changes of metabolites and in the diagnosis of AD in early stage in APP/PS1 double transgenic Alzheimer's disease (AD) mice. **Methods** Study of behavior and $^1\text{H-MRS}$ was performed in 35 APP/PS1 AD mice (study group) and 20 homologous wild type mice (control group) at 6 and 9 months of age. Behavioral detection test learning and memory capacity of mice were assessed through Morris water maze. For $^1\text{H-MRS}$, sub-peak areas of N-acetyl aspartate (NAA), myo-inositol (mI) and creatinine (Cr) in the cerebral cortex and hippocampus were measured, and the NAA/Cr and mI/Cr ratios were calculated and compared with the two-sample *t*-test. **Results** Compared with the control group, the mI/Cr ratio of the 6-month-old AD mice significantly increased ($t=2.904, P<0.05$), and the NAA/Cr ratio significantly decreased ($t=-7.535, P<0.05$). Immunohistochemistry of the hippocampus demonstrated the appearance of A β plaque deposition and the activated astrocyte surrounded the plaque. However, there were significant differences in behavioral detection at 9 months of age ($P<0.05$), indicating damage in learning and memory of AD mice. **Conclusion** $^1\text{H-MRS}$ is a method for early assessment of AD with high sensitivity and specificity, and change of mI and NAA happen prior to behavior in APP/PS1 double transgenic AD mice.

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