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Does magnetic resonance spectroscopy identify patients with minimal hepatic encephalopathy?

Czy spektroskopia rezonansu magnetycznego identyfikuje pacjentów z minimalną encefalopatią wątrobową?

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Abstract

Background and purpose: The results of a few studies suggest that magnetic resonance spectroscopy of the brain could allow detection of minimal hepatic encephalopathy. The goal of this study was to assess the ability of magnetic resonance spectroscopy to differentiate between cirrhotic patients with and without minimal hepatic encephalopathy.
Material and methods: Localized magnetic resonance spectroscopy was performed in the basal ganglia, occipital gray matter and frontal white matter in 46 patients with liver cirrhosis without overt encephalopathy and in 45 controls. Neurological and neuropsychological examination was performed in each participant.
Results: The patients with liver cirrhosis had a decreased ratio of myoinositol to creatine in occipital gray matter and frontal white matter (mean: 0.17 ± 0.05 vs. 0.20 ± 0.04, $p = 0.01$ and 0.15 ± 0.05 vs. 0.19 ± 0.04, $p < 0.01$, respectively) and a decreased ratio of choline to creatine in occipital gray matter (mean: 0.32 ± 0.07 vs. 0.36 ± 0.08, $p = 0.03$). Minimal hepatic encephalopathy was diagnosed in 7 patients. Metabo-

Streszczenie

Wstęp i cel pracy: Wyniki pojedynczych badań sugerują, że spektroskopia rezonansu magnetycznego mózgu może być pomocna w wykrywaniu minimalnej encefalopatii wątrobowej. Celem tego badania była ocena przydatności spektroskopii rezonansu magnetycznego w odróżnianiu pacjentów z marskością wątroby z minimalną encefalopatią wątrobową od pacjentów bez tej encefalopatii.
Materiał i metody: Badanie spektroskopii rezonansu magnetycznego mózgu przeprowadzono u 46 pacjentów z marskością wątroby bez jawnej encefalopatii i u 45 osób z grupy kontrolnej. Rejestracji widm dokonano z trzech obszarów mózgu: zwojów podstawy, istoty szarej płata potylicznego i istoty białej płata czołowego. U wszystkich badanych osób przeprowadzono badanie neurologiczne i neuropsychologiczne.
Wyniki: U pacjentów z marskością wątroby stwierdzono obniżenie stosunku mioinozytolu do kreatyny w zakresie płata potylicznego i czołowego (średnie odpowiednio $0{,}17 \pm 0{,}05$ *vs* $0{,}20 \pm 0{,}04$, $p = 0{,}01$ oraz $0{,}15 \pm 0{,}05$ *vs* $0{,}19 \pm 0{,}04$, $p < 0{,}01$) oraz zmniejszenie stosunku choliny do kreatyny

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lite ratios did not differ significantly between patients with and without minimal hepatic encephalopathy. Metabolite ratios did not differ significantly between patients with Child-Pugh A and those with Child-Pugh B.

Conclusions: Magnetic resonance spectroscopy does not allow accurate diagnosis of minimal hepatic encephalopathy. A similar profile of metabolites in the brain is observed in cirrhotic patients without cognitive impairment.

Key words: magnetic resonance spectroscopy, minimal hepatic encephalopathy, liver cirrhosis, neuropsychological assessment.

w płacie potylicznym (średnia: 0,32 ± 0,07 *vs* 0,36 ± 0,08, $p = 0{,}03$) w porównaniu z grupą kontrolną. Minimalną encefalopatię wątrobową rozpoznano u 7 pacjentów. Stosunek metabolitów nie różnił się istotnie u pacjentów z minimalną encefalopatią wątrobową i bez niej. Nie stwierdzono także różnicy w stężeniu metabolitów u pacjentów z niewydolnością wątroby zakwalifikowanych do kategorii A w skali Child-Pugh w porównaniu z pacjentami zakwalifikowanymi do kategorii B.

Wnioski: Spektroskopia rezonansu magnetycznego nie pozwala na dokładne rozpoznanie minimalnej encefalopatii wątrobowej. Podobny profil metabolitów w mózgu obserwuje się u pacjentów z marskością wątroby bez zaburzeń poznawczych.

Słowa kluczowe: spektroskopia rezonansu magnetycznego, minimalna encefalopatia wątrobowa, marskość wątroby, ocena neuropsychologiczna.

Introduction

Proton magnetic resonance spectroscopy (MRS) allows *in vivo* measurement of different metabolites in the brain. MRS studies showed a decrease in the ratio of choline (Cho) to creatine (Cr) and myoinositol (Ins) to Cr and an increase in the ratio of glutamine/glutamate (Glx) to Cr in brains of patients with hepatic encephalopathy [1,2].

Minimal hepatic encephalopathy (MHE) is a subtle cognitive impairment commonly seen in patients with liver cirrhosis [3,4]. Identification of patients with MHE could be clinically important, because this group of patients has increased risk of overt encephalopathy and death [5,6]. Moreover, patients with MHE have reduced quality of life and deterioration in daily functioning including driving abilities [7]. The diagnosis of MHE is mainly based on performance of psychometric and/or neurophysiological tests. The results of neuropsychological and some neurophysiological tests could be, however, influenced by different factors including age, education, mood, degree of patient cooperation, etc. Taking into account these limitations, new methods allowing more objective identification of patients who are at risk of encephalopathy are needed.

Several studies have shown that patients with MHE have a decreased ratio of Ins/Cr and Cho/Cr and an increased ratio of Glx/Cr compared to controls [8-13]. Moreover, it was suggested that MRS allows accurate diagnosis of MHE [11,14]. In one study, MRS was able to differentiate patients with MHE from healthy controls with 100% accuracy when Ins depletion in the frontal and occipital lobe was used as a discriminating factor [11]. It should be noted that these studies compared patients with MHE only with healthy subjects. Therefore, it remains unclear whether MRS is able to differentiate patients with MHE from patients with liver cirrhosis without cognitive impairment.

The goal of our study was to assess the ability of MRS to differentiate between patients with liver cirrhosis with and without MHE.

Material and methods

The patients participating in this study were recruited from the patients with liver cirrhosis admitted from October 2008 to March 2011 to the outpatient clinic in the Department of Gastroenterology, Hepatology and Infectious Diseases, University Hospital in Krakow. The diagnosis of cirrhosis was based on clinical and biochemical data, results of ultrasound examination of the abdomen and, in selected cases, liver biopsy.

The exclusion criteria were: (1) overt hepatic encephalopathy or history of encephalopathy in the past; (2) history of psychiatric or neurological disorders; (3) history of recent use of drugs affecting psychometric performance (for example benzodiazepines, psychotropic drugs, etc.); (4) presence of structural changes on magnetic resonance imaging (MRI) which could interfere with results of spectroscopy or results of psychometric tests; (5) known central nervous system diseases, diabetes mellitus, severe cardiac and renal diseases; (6) active alcohol and drug abuse.