

Changes in the brain more than 10 years after liver transplantation

V. Herynek¹, M. Dezortová¹, D. Wagnerová¹, I. Hejlová², and M. Hájek¹

¹MR-unit, Department of Diagnostic and Interventional Radiology, Institute for Clinical and Experimental Medicine, Prague, Czech Republic,

²Hepatogastroenterology Department, Institute for Clinical and Experimental Medicine, Prague, Czech Republic

Introduction

Presence of paramagnetic ions in the basal ganglia of patients with hepatic encephalopathy is manifested by hypointense signal on T2-weighted images, or hyperintense signal on T1-weighted ones. Based on increased manganese concentration in blood and animal experiments, manganese is hypothesized to be responsible for these relaxation time changes in the brain. Previous studies confirmed that the process of paramagnetic ion deposition is reversible by liver transplantation. In this study, we collected relaxation data of a unique group of patients that underwent liver transplantation more than 8 years ago to prove, whether the recovery in the basal ganglia is permanent.

Subjects and Methods

Studied groups: (A) a group of 11 patients with a liver disease indicated for liver transplantation (Child-Pugh score B or C), (B) 33 patients measured within two years after liver transplantation, (C) 37 patients measured 8 – 15 years after transplantation. Patients were examined using a 3T Trio imager (Siemens, Germany) equipped with a Tx/Rx head coil. T2 was obtained using a CPMG sequence with 32 echoes (echo-spacing TE=13.2 ms, repetition time TR=3000 ms), T1 using saturation recovery, repetition time varied from 100 up to 3200 ms, echo time TE=6.9 ms. In both measurements, a 5 mm thick tilted axial slice through the basal ganglia was chosen. Relaxation maps were calculated using three-parameter fit both for T1 and T2. Relaxation time values were then obtained from the basal ganglia (globus pallidus, putamen, and caudate nucleus) and the thalamus.

A group of 24 healthy volunteers was measured using the same protocol.

The protocol was approved by the ethics committee of the Ministry of Health, Czech Republic. Subjects were in detail informed about the examination.

Results/Discussion

Relaxation times of all patient groups and controls are summarized in the Table 1 (T1 values) and Table 2 (T2 values). It is presumed that surplus paramagnetic ions are predominantly deposited in the globus pallidus. Recovery of the relaxation times in this structure suggests that the excessive deposited ions are completely washed out. There is no recurrence observed even after long time period (up to 15 years). Similar behavior is also observed in the putamen (although we observed only a statistical trend in T2 increase, the T2 relaxation time did not reach normal values even after 15 years) and nucleus caudatus. Significant increase of the relaxation times was also observed in the thalamus. Interestingly, T2 values in the group C even exceed values found in controls, however, as we do not expect substantial deposition (and following elimination) of paramagnetic ions in this structure, this effect might be attributed to possible small lacunar infarction lesions detectable on T2-weighted images, which may occur in higher age. No changes were found between left and right hemispheres.

Conclusion

We confirmed previously published results, that paramagnetic ions deposited in the basal ganglia in patients with liver disease were shunted away shortly after transplantation. Moreover, we proved that there was no recurrence of paramagnetic ion deposition even after long time period (up to 15 years) after transplantation.

Table 1: T1 relaxation time values in the basal ganglia and thalamus.

T1 (ms)	globus pallidus	putamen	nucleus caudatus	thalamus
patients before Tx	693 ± 90*	942 ± 83*	1030 ± 79*	890 ± 46*
0-2 years after	871 ± 57 [#]	1050 ± 50 [#]	1135 ± 76 [#]	931 ± 37 [#]
8-15 years after	907 ± 44 [#]	1085 ± 46 [#]	1167 ± 73 [#]	961 ± 39 [#]
controls	881 ± 34	1066 ± 31	1148 ± 45	942 ± 38

Table 2: T2 relaxation time values in the basal ganglia and thalamus.

T2 (ms)	globus pallidus	putamen	nucleus caudatus	thalamus
patients before Tx	52.8 ± 3.0*	64.1 ± 7.3*	76.3 ± 6.5*	71.7 ± 4.2*
0-2 years after	55.7 ± 3.6	65.9 ± 4.3*	78.5 ± 3.5 [#]	75.5 ± 2.3 [#]
8-15 years after	56.7 ± 3.4 [#]	66.4 ± 4.4*	78.5 ± 4.2 [#]	77.6 ± 2.9* [#]
controls	55.5 ± 1.9	68.0 ± 4.0	79.1 ± 3.1	74.7 ± 2.3

* significantly differs from the control group, [#] significantly differs from the group of patients before liver transplantation

The study was supported by grant projects IGA MZ CR 10523-3 and MZ0IKEM2005.