Hepatic encephalopathy (HE) is a severe complication of chronic liver disease which drastically affects patient lives. Its underlying mechanisms are still unknown and energy metabolism studies are of key interest. Here, we combined H-MRS and 18F-FDG PET in a rat model of HE, combined with a correlation analysis to identify metabolites of interest. We confirmed the metabolic changes already demonstrated by H-MRS (2016). Metab. Brain Dis. 31, 1303–1314 (2016).

Results

Discussion

Conclusion

References

Acknowledgements

**Methods**

Hepatic encephalopathy (HE) is a severe complication of chronic liver disease and leads to metabolic dysfunction and cognitive impairment, which are often acknowledged.

**Materials and methods**

**Clinical study**

**PET**

**H-MRS**

**Discussion**

**Conclusion**

**References**

**Acknowledgements**

**Supplementary information**

**Figure 1** Experimental protocol for 1H-MRS experiments in adult male Wistar rats. 1H MRS (time course 24h) for disease progression and at week 7 post surgery, associated with a significant 2-fold increase in brain glutamine and a 1.2-fold decrease in brain osmolytes.

**Figure 2** PET experiments on BDL and SHAM rats.

**Figure 3** Representative 1H-MR spectra acquired in BDL rats in hippocampus and cerebellum at week 0 and week 6 post surgery. For each region, visual inspection in the representative spectrum of 1H-MRS reveals a decrease in the metabolite concentration of Gln and tCho, and an increase in the metabolite concentrations of Glc and Tau. An analysis of variance (ANOVA) followed by a post hoc test (Bonferroni correction) was used to determine if the difference of metabolite concentrations is significant between the two groups. The metabolite concentration of Gln is significantly lower in the BDL group compared to the SHAM group at week 6 (p<0.0001).

**Figure 4** Representative 18F-FDG PET images in the hippocampus and cerebellum at week 0 and week 6 post surgery for disease progression and at week 7 post surgery. The PET images show a decrease in glucose uptake in the BDL group compared to the SHAM group at week 6. The decrease in glucose uptake is associated with a significant 2-fold increase in brain glutamine and a 1.2-fold decrease in brain osmolytes.

**Figure 5** PET images on BDL and SHAM rats. A, Representative 18F-FDG PET images in the hippocampus and cerebellum at week 0 and week 6 post surgery. For each region, visual inspection in the representative spectrum of 1H-MRS reveals a decrease in the metabolite concentration of Gln and tCho, and an increase in the metabolite concentrations of Glc and Tau. An analysis of variance (ANOVA) followed by a post hoc test (Bonferroni correction) was used to determine if the difference of metabolite concentrations is significant between the two groups. The metabolite concentration of Gln is significantly lower in the BDL group compared to the SHAM group at week 6 (p<0.0001).

**Figure 6** Representative 18F-FDG PET images in the hippocampus and cerebellum at week 0 and week 6 post surgery for disease progression and at week 7 post surgery. The PET images show a decrease in glucose uptake in the BDL group compared to the SHAM group at week 6. The decrease in glucose uptake is associated with a significant 2-fold increase in brain glutamine and a 1.2-fold decrease in brain osmolytes.

**Figure 7** Representative 1H-MR spectra acquired in BDL rats in hippocampus and cerebellum at week 0 and week 6 post surgery. For each region, visual inspection in the representative spectrum of 1H-MRS reveals a decrease in the metabolite concentration of Gln and tCho, and an increase in the metabolite concentrations of Glc and Tau. An analysis of variance (ANOVA) followed by a post hoc test (Bonferroni correction) was used to determine if the difference of metabolite concentrations is significant between the two groups. The metabolite concentration of Gln is significantly lower in the BDL group compared to the SHAM group at week 6 (p<0.0001).

**Figure 8** Representative 18F-FDG PET images in the hippocampus and cerebellum at week 0 and week 6 post surgery for disease progression and at week 7 post surgery. The PET images show a decrease in glucose uptake in the BDL group compared to the SHAM group at week 6. The decrease in glucose uptake is associated with a significant 2-fold increase in brain glutamine and a 1.2-fold decrease in brain osmolytes.