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Improving the classification of brain tumors in mice with perturbation enhanced (PE)-MRSI

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Classifiers based on pattern recognition analysis of MRS(I) data are becoming important tools for the non-invasive diagnosis of human brain tumors [1,2]. Here we investigate the potential interest of perturbation-enhanced MRSI (PE-MRSI), in this case acute hyperglycemia, during moderate brain hypothermia [3,4], for improving the discrimination between mouse brain MRS patterns of glioblastoma multiforme (GBM), low grade oligodendroglioma (ODG2), and non-tumor brain parenchyma (NT). Six GBM-bearing mice and two ODG2-bearing mice were scanned at 7 Tesla by PRESS-MRSI with 12 and 136 ms echo-time, during euglycemia (Eug) and also during induced acute hyperglycemia (Hyp), generating altogether four datasets per animal (echo time + glycemic condition): 12Eug, 136Eug, 12Hyp, and 136Hyp. For classifier development, using in-house built software *SpectraClassifier 2.0* [5,6], all spectral vectors (spv) selected were unit length normalized (UL2) and used either as training set (76 GBM spv, four mice; 70 ODG2 spv, 2 mice; 54 NT spv, 6 mice) or as independent test set (2 mice, 61 GBM spv and 17 NT spv). All Fisher's LDA classifiers obtained had very good descriptive performance when extracting at least 10 features from the training sets as evaluated by Bootstrapping: correctly classified cases ≥ 99 %. Evaluation of predictive performance with the independent test set clearly revealed that 12Hyp MRSI-based classifiers with at least 5 features provided the best robustness: balanced error rate (BER) for spv prediction < 0.9 %. This highlights the potential interest of perturbation-enhanced MRSI protocols for improving the non-invasive characterization of brain tumors at a preclinical level.

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References

1. De Edelenyi FS, Rubin C, Estève F, Grand S, Décorps M, Lefournier V, Le Bas J-F, Rémy C: **A new approach for analyzing proton magnetic resonance spectroscopic images of brain tumors: nosologic images.** *Nat Med* 2000, **6**:1287-1289.
2. Tate AR, Underwood J, Acosta DM, Julià-Sapé M, Majós C, Moreno-Torres A, Howe FA, van der Graaf M, Lefournier V, Murphy MM, Loosemore A, Ladroue C, Wesseling P, Luc Bosson J, Cabañas ME, Simonetti AW, Gajewicz W, Calvar J, Capdevila A, Wilkins PR, Bell BA, Rémy C, Heerschap A, Watson D, Griffiths JR, Arús C: **Development of a decision support system for diagnosis and grading of brain tumours using in vivo magnetic resonance single voxel spectra.** *NMR Biomed* 2006, **19**:411-434.
3. Simões RV, García-Martín ML, Cerdán S, Arús C: **Perturbation of mouse glioma MRS pattern by induced acute hyperglycemia.** *NMR Biomed* 2008, **21**:251-264.
4. Simões RV, Delgado-Goñi T, Lope-Piedrafita S, Arús C: **1H-MRSI pattern perturbation in a mouse glioma: the effects of acute hyperglycemia and moderate hypothermia.** *NMR Biomed* 2010, **23**:23-33.
5. Ortega-Martorell S, Olier I, Juliá-Sapè M, Arús C: **SpectraClassifier 1.0: a user friendly, automated MRS-based classifier-development system.** *BMC Bioinformatics* 2010, **11**:106.
6. **SpectraClassifier (SC).** [http://gabrmn.uab.es/SC].

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