type of the breast cancer. Prospective studies with larger series are necessary regarding the correlation between the primary tumor histopathology and the ADC values of the metastasis.

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**Combining Diffusion Kurtosis Imaging, Dynamic Susceptibility Contrast-Enhanced Perfusion MR and Short Echo time Chemical Shift Imaging in the grading of gliomas.**

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**Purpose/Introduction:** To assess the diagnostic accuracy of diffusion kurtosis imaging (DKI), dynamic susceptibility-weighted imaging (DSC) and short echo time chemical shift imaging (CSI) in the grading of gliomas, as separate techniques and in a multimodal approach in order to determine the best discriminative parameter(s).

**Subjects and Methods:** 35 patients with cerebral gliomas prior to any treatment (12F/23M; age range: 22-78, median age: 55) underwent DKI, DSC and CSI imaging at a 3T MR scanner. Scanning and data analysis was done according to previously described protocols (1-4). Diffusion parameters - mean diffusivity (MD), fractional anisotropy (FA), mean kurtosis (MK) -, perfusion parameters – mean relative regional cerebral blood volume (mean rrCBV) – and CSI ratio markers as defined in (5)- were compared in the solid part of 22 high grade gliomas (HGG) and 14 low grade gliomas (LGG) (Mann-Whitey-U, $p<0.05$ significance, Bonferroni corrected). Sensitivity, specificity, diagnostic accuracy and optimal thresholds were determined from a receiver operating curve analysis.

**Results:** MK, meanrrCBV, Lips/Cho and Lips/Cre were significantly higher in HGG compared to LGG. FA, MD and normalizedCho/NAA and normalizedCho/Cre did not significantly differ between glioma grades. Highest sensitivity, specificity and diagnostic accuracy to discriminate between HGG and LGG was found for meanrrCBV and MK (79%, 92%, 84% and 80%, 92%, 85% respectively ). Optimal thresholds for MK and meanrrCBV to differentiate HGG from LGG were 0.50 and 1.78 respectively. Combining MK, meanrrCBV and Lips/Cho ratio to determine tumor grade demonstrated a sensitivity of 85%, a specificity of 93% and diagnostic accuracy of 88%.

**Discussion/Conclusion:** Combining the parameters mean kurtosis, meanrrCBV and Lips/Cho to determine the grade of gliomas, yields a diagnostic accuracy up to almost 90%. The best performing parameters in single use were found to be mean kurtosis and meanrrCBV.

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**Artificial neural networks and $^1$H in vivo MRS in classification of posterior fossa tumors progression or recurrence**

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**Purpose/Introduction:** This work assesses the ability of artificial neural networks to classify $^1$H in vivo MRS spectra and to predict tumor recurrence/progression. The benefits of application of such a decision support system before pathological changes are manifested in MRI are invaluable.

**Subjects and Methods:** The 166 short TE spectra were acquired from 31 patients using the whole-body 2T MRI/MRS scanner. VOIs were located at the border between the tumor (or tumor bed) and the healthy tissue, and in the normal appearing tissue at the opposite cerebellar hemisphere. Multilayer perceptron (MLP) was chosen as a simple and reliable classifier. Number of variables was reduced by PCA and backward feature selection algorithm. The network structure and learning parameters were chosen by trial and error procedure. The classification accuracy was assessed with an independent test set.

**Results:** Network trained with principal components correctly classified 87.5% of tumor free, 100% of stable tumor and 80% of tumor progression/recurrence cases. Network trained with reduced number of original variables correctly classified 75% of tumor free, 75% of stable tumor and 60% of tumor progression/recurrence cases.

**Discussion/Conclusion:** As compared to the following studies [1,2,3,4] the accuracy of our PCA based MLP is high. On the other hand, the BFS algorithm was found to lead to poor classification, which is probably due to removal of too many of important variables. The main drawback of our study is a rather small number of cases, especially in the TPR group. Thus making far-reaching conclusions is risky at the moment. Nevertheless, it may be expected that such adaptive systems - like ANN - should be precise enough in learning of features of samples that are unique in a population. We strongly believe that, when trained with a large number of samples, ANN can constitute the core of fast working and reliable DSS.

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**Usefulness of MR spectroscopy in differentiation between recurrent/residual brain glioma and post-therapeutic changes**

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**Purpose/Introduction:** Differentiation between glial tumor recurrence and radiation and/or chemotherapy induced effects is a serious clinical as well as radiological problem, because structural magnetic resonance imaging (MRI) is not specific enough, and tends to have similar visual appearance.
Magnetic resonance spectroscopy (MRS) is widely used for metabolic characterization of the brain parenchyma. Our purpose was to determine the efficiency of standard brain metabolites measurements: choline (Cho), creatine (Cr), lipid and lactate (LL), myo-inositol (MI), N-acetylaspartate (NAA) in