Valuation of brain tumours with MRS and PWI-DSC. Use of a Non Parametric Method in the post processing of PWI-DSC.

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INTRODUCTION

The purpose of this study was to evaluate the contribution of Magnetic Resonance Spectroscopy (MRS) and Perfusion Weighted Imaging (PWI) in the determination of the malignity grade in brain tumours. We compared Functool software (GE) with a new methodology of Automatic Hemodynamic Quantification with a Non Parametric method (AHQNP) in the post processing of Perfusion Weighted Imaging with Dynamic Susceptibility Contrast (PWI-DSC).

PATIENTS AND METHODS

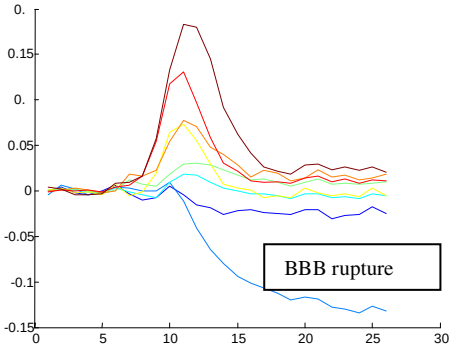
We included 37 patients diagnosed with single intra-axial brain tumours. In the histopathological verification, we found 14 patients with low-grade gliomas and 23 patients with malignant tumours (5 anaplastic gliomas, 11 glioblastomas and 7 solitary metastases). We carried out brain MRS and PWI-DSC (TE = 80, TR= 1700; gadolinium 0,2 mmol/kg; 1.5 T scanner (Signa GE)). The relative Cerebral Blood Volume (rCBV) was calculated with Functool, drawing a Region of Interest (ROI) in the periphery of the tumour in relation to the contra lateral hemispheric white matter. Also, we used AHQNP methodology in the post processing of PWI-DSC. This methodology is based on the vectorial quantification of the temporal series of contrast concentration. The selection of the Region of Interest (ROI) of each parametric map (CBV and MTT) was made automatically with the finality of to maximize the difference with a reference zone in the contra lateral hemisphere. We used an automatic algorithm of growing regions starting in the voxel of major difference (initial beam). This beam grows with the neighbour voxels only if the significance statistical difference with the reference zone is not higher than the deterioration umbral. Finally we get the ROI of major volume that presents a statistical difference with respect to the reference. In this ROI we calculated the rCBV related to the reference zone.

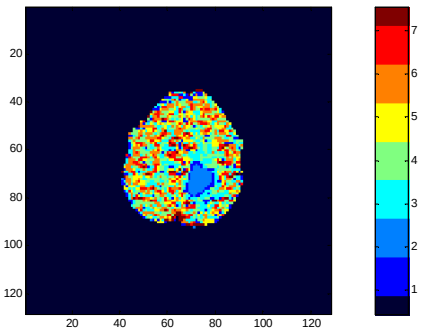
RESULTS

In MRS we found significant differences in Choline/Creatine ratios in relation to the tumour type with the highest values in high-grade gliomas and metastases. Our results showed that Ch/Cr ratios higher than 1.60 can predict malignancy with 90% of sensitivity and 83% of specificity. We did not find significance differences in the perilesional rCBV and relative cerebral blood flow (rCBF) for each type of tumour. The mean rCBV was 1.17 (SD: 0.55) for benign tumours, 1.32 (SD: 1.25) for anaplastic gliomas, 0.81 (SD:0.49) for glioblastomas and 0.43 (SD:0.15) for metastases. PWI-DSC post processing with functool showed 68% of sensibility and 75% of specificity in the prediction of malignancy; whereas, for AHQNP, we found 90% of sensibility and 75% of specificity.

CONCLUSION:

We conclude that, individually considered, MRS is superior to PWI-DSC post processing results with any of both used tools; however, the new methodology of processing with non parametrical models increase the sensibility with respect to functool. Our findings showed a tendency of low rCBV in glioblastomas and metastasis that could be explained by the rupture of the Blood Brain Barrier (BBB); however, the high rCBV in anaplastic gliomas agree with the increase of vascularity and angiogenesis.





Representative Concentrations Curves