Spatial and statistical correlation of diffusion and perfusion MR imaging markers in musculoskeletal neoplasms

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ABSTRACT

The aim of this study is to investigate the correlation of diffusion and perfusion Magnetic Resonance Imaging (MRI) markers, in patients with malignant soft tissue tumors. Additionally, the spatial agreement of hallmarks of malignancy as indicated by diffusion weighted (DWI) and dynamic contrast enhanced (DCE) imaging techniques respectively.

Quantification of both DWI and DCE derived parameters was succeeded via non-linear least squares for 25 patients of histologically proven soft tissue sarcoma scanned at a 1.5T scanner. DWI and DCE data were analyzed by an in house soft-ware implemented in Python 3.5. Voxel based parametric maps were extracted by the use of the Intra-Voxel Incoherent Motion (IVIM), the Extended Toft's (ETM) and the Gamma Capillary Transit time (GCTT) models. A graphical representation of the workflow used is depicted in Fig.1.

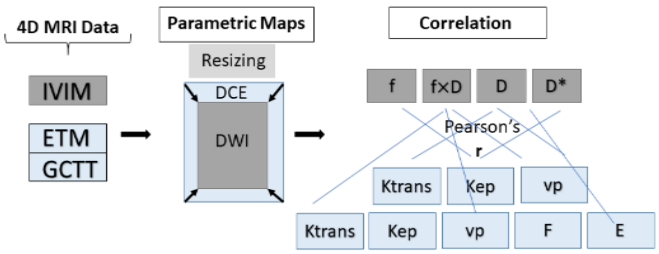

Fig.1 Graphical representation of correlation analysis

Good statistical correlation between micro-perfusion fraction (f-IVIM) and plasma volume (vp-GCTT) with Pearson's metric (r>0.5) was found. Driven from the results, no significant correlation between all other possible pairs of DCE and DWI derived parameters was observed. By appropriate thresholding (Fig.2) the indicators of malignancy from both imaging methods, the percentage of volume overlap between regions of high cellularity and high vascular permeability ranged from 6% to 30%.

In conclusion, the combination of DCE and DWI MRI can provide useful information on sites of aggressive characteristics for the guidance of the pre-operative biopsy and for overall treatment planning [1].

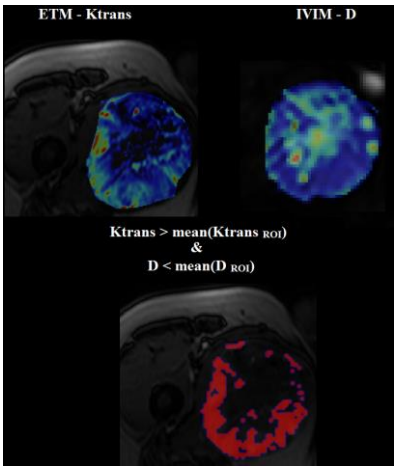

Fig.2 Graphical representation of the workflow used for finding high malignancy sites.

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REFERENCES

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