

AbstractID: 10968 Title: Simultaneous estimation of perfusion and permeability parameters: validation study on animal model

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Purpose:

To demonstrate the feasibility of simultaneously obtaining permeability and perfusion parameters using one MR pulse sequence with one administration of contrast agent (CA).

Method and material:

A 3D dual-echo pulse sequence was used to simultaneously acquire T_1 -weighted and T_2^* -weighted images. Data were acquired from a stroke mouse model using the pulse sequence with six pre-contrast and eighty four post-contrast dynamic contrast-enhanced series. An analysis method was developed to estimate perfusion and permeability parameters. Shortening in T_1 by CA enhances signal intensity, while shortening in T_2^* reduces signal intensity. This competitive process by T_1 and T_2^* was taken into account in our analysis method. To minimize subjectivity and increase consistency, AIF was automatically estimated using fuzzy C-means clustered based techniques.

Result:

Three-dimensional pharmacokinetic parameter maps of volume transfer constant (K_{trans}), extracellular extravascular space (V_e) and reflux rate (K_{ep}), as well as perfusion parameter maps of the relative cerebral blood volume (rCBV), relative cerebral blood flow (rCBF) and relative mean transit time (rMTT) were successfully obtained.

Conclusion:

It is feasible to simultaneously estimate permeability and perfusion parameters using data acquired by one pulse sequence with only one administration of CA. This new technique should prove to be a useful tool for both animal and human DCE-MRI studies.