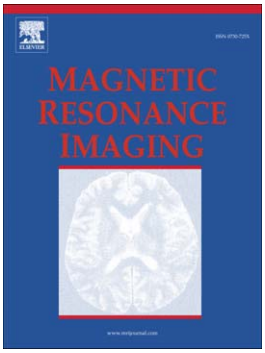

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Abstract

Objective: An extension of single- and multi-channel blind deconvolution is presented to improve the estimation of the arterial input function (AIF) in quantitative dynamic contrast enhanced magnetic resonance imaging (DCE-MRI).

Methods: The Lucy-Richardson expectation-maximization algorithm is used to obtain estimates of the AIF and the tissue residue function (TRF). In the first part of the algorithm, nonparametric estimates of the AIF and TRF are obtained. In the second part, the decaying part of the AIF is approximated by three decaying exponential functions with the same delay, giving an almost noise free semi-parametric AIF. Simultaneously, the TRF is approximated using the adiabatic approximation of the Johnson-Wilson (aaJW) pharmacokinetic model.

Results: In simulations and tests on real data, use of this AIF gave perfusion values close to those obtained with the corresponding previously published nonparametric AIF, and are more noise robust.

Conclusion: When used subsequently in voxelwise perfusion analysis, these semi-parametric AIFs should give more correct perfusion analysis maps less