AbstractID: 8518 Title: Applications of the Levenberg-Marquardt Nonlinear Least Square Fitting to Obtain the Optimum Arterial Input Function for DSC-MRI

Purpose: To develop an advanced non-linear curve fitting (NLCF) algorithm for analyzing dynamic susceptibility contrast MRI data of the human brain.

Materials and Methods: Relative cerebral blood flow (rCBF) was assessed using dynamic susceptibility-contrast MRI at 1.5 T. A simultaneous dual FLASH pulse sequence and Gd-DTPA (0.2 mmol/kg) were used for 20 volunteers, with measurement of rCBF in white matter (WM) and in gray matter (GM). The acquired data was deconvolved with arterial input functions (AIF) using singular value decomposition (SVD). The truncated Taylor expansions of the cost function at the current iteration of the measured signal were employed to derive the Levenberg-Marquardt equation in the optimization.

Results: From each of the recalculated parameters, a perfusion-weighted image was outlined by use of the modified non-linear curve fitting algorithm. The results were an improved estimation of rCBF for the volunteers. The average GM/WM rCBF ratios were 1.90 ± 0.09 ($n = 20$), using deconvolution with AIF and SVD.

Conclusion: The present study demonstrated an improvement of the kinetic parameters from the dynamic contrast-enhanced (DCE) T2*-weighted magnetic resonance imaging data with the use of contrast agents.