Purpose: To develop a local search clustering algorithm for analyzing the dynamic contrasted enhanced (DCE)-MRI data for determining the vascular permeability. The clustered signal will have better contrast-to-noise ratio (CNR) and thus can improve the analysis.

Methods: In DCE-MRI, data often suffer from low CNR. The CNR is particularly poor in central nervous system and could lead to spurious results. We propose a local search clustering algorithm that groups proximal voxels with similar uptake curves and T1 values. The algorithm starts with a seed voxel, and then grows outward to recruit new voxels into a cluster. Once a cluster is formed, all members of the current cluster form a 'seed collection' and the seed point of the cluster becomes the seed collection. The expansions and updates continue with the seed point/collection until the stopping criterion is met. To investigate the effectiveness of our clustering algorithm, we used a 64x64 2D Shepp-Logan phantom. Variations on the T1 values and permeability parameters were applied on different regions in the phantom. The time resolution was set to 30sec and 82 post-contrast data were created. After the DCE-MRI data were generated, Gaussian noise was applied to the images to investigate the effect of noise on the clustering algorithm. DCE analysis was performed on the clustered data and the results were compared against the result obtained from voxel-by-voxel analysis.

Results: The addition of noise degraded the results of DCE estimation. The clustering algorithm on average reduced the errors of the permeability parameters by more than 50% compared to the voxel-by-voxel analysis.

Conclusions: We developed a local search clustering algorithm to segment the concentration time curves of the DCE-MRI data. The proposed clustering algorithm enhances the apparent CNR within the clustered data and reduces the errors of the permeability parameters.