AbstractID: 5679 Title: Factor of Ten Dose Reduction in CT Perfusion Imaging

Purpose: To reduce by a factor of ten the patient dose in contrast enhanced CT Neuro Perfusion protocols while maintaining SNR and physiologic information relative to standard full dose CT Neuro Perfusion protocols.

Method and Materials: Our group's newly developed undersampling algorithm for contrast enhanced MRI, HighlY constrained back Projection (HYPR), is applied to a contrast enhanced CT Neuro Perfusion protocol. By using temporally redundant information in the time series, a reduction in the number of required projection angles for each time frame is possible. The time series data is acquired using interleaved and equally spaced projections. A composite image consisting of projection information from either the entire time series or a limited number of time frames is first constructed by the standard filtered back projection technique. Next, a HYPR time frame is reconstructed by multiplying the composite image by backprojections for each projection angle in the time frame after normalizing them by the corresponding projection from the composite image.

Results: HYPR time frames with similar SNR to fully sampled images and containing equivalent physiologic information for the creation of perfusion parameter maps have been obtained. The simulated reduction in the number of projection angles for the studies completed would result in a reduction in dose by a factor of 10. Computed parametric maps of CBV, CBF, and MTT are qualitatively similar to that of full dose maps, and arterial and venous input functions show excellent agreement with full dose input functions.

Conclusion: The application of HighlY constrained back Projection (HYPR) to contrast enhanced CT Neuro Perfusion protocols allows a potential reduction by an order of magnitude to the delivered patient dose while maintaining SNR and physiologic information in the form of CBV, CBF, and MTT maps and arterial, venous and tissue input functions.