AbstractID: 13265 Title: Dependence of Signal-to-Noise Ratio Variance on ROI Size in Phased-Array Coil Measurements

Purpose: The goal of this project was to determine the dependence of SNR variance measured with the phased array coil on ROI size.

Method and Materials: A doped water-filled soccer ball and GE spherical phantom were scanned using an 8-channel phased array coil and volume coil. SNR was calculated using two different techniques; the single acquisition method and the difference method. The dependence of the estimated standard error in the mean was calculated to assess SNR measurement variability as a function of radius. Observations were made on multiple days to characterize the impact of systematic variation on SNR calculations. Comparisons were made to simulated images containing homogenous signal and noise.

Results: Simulation data demonstrated that standard error of mean SNR decreases as ROI size increases, which is expected if signal and noise are homogenous throughout an image. However, this result did not hold true for phased-array coils. Our data suggests that there is an optimal ROI size, dependent on phantom and SNR method, above which there is no decrease in SNR variance. Data from a 32-channel phased array coil implied a lower optimal radius as compared to the 8-channel coil, which is most likely the result of strong signal increases near array elements. This observation was true of both SNR calculation methods. Although small relative to daily SNR variance over a period of days (< 1/10th total variance), ROI size contributed some variation to SNR beyond systematic variations. This contribution is likely to be larger for phased arrays with high numbers of channels.

Conclusion: Considering that signal and noise are not homogenous across an image, our data suggests there is an optimal ROI size for determining mean SNR when utilizing phased-array coils.