

AbstractID: 8493 Title: Method for Determining Apparent Diffusion Coefficient (ADC) Values for Cerebral Lesions from Diffusion Weighted Magnetic Resonance Imaging (DWMRI) Examinations

Purpose: This work involves analyzing Apparent Diffusion Coefficient (ADC) values for cerebral lesions from Diffusion Weighted Magnetic Resonance Imaging (DWMRI) examinations. The methodology presented permits transferring lesion geometry from treatment plan images to sequential DWMRI images for intensity measurement and subsequent ADC determination. Uncertainty in ADC calculation was correlated with image intensity.

Method and Materials: DWMRI images were taken for several patients at specific intervals during treatment. Location of lesions were defined by the treatment plan contours and transferred to DWMRI images by use of a geometric algorithm. ADC values were calculated by a least squares line fit to DW intensities at varied b-values. ADC values for the entire volume of each lesion were calculated by a weighted sum of individual DWMRI slice values. Initially, the weighting was based on the individual slice volume compared to the total volume as determined by the number of lesion voxels in each slice.

Results: Greater uncertainty in ADC values were obtained for baseline b-values ($b=0$) where the average image intensity was lower. The baseline intensity values were included in the weighting factor for determining the whole volume ADC value, with lower weighting given to individual slices with higher uncertainty.

Conclusion: ADC values were determined for cerebral lesions outlined on treatment plan contours and transferred to DWMRI images. Corrections for variation between images and size of individual slice geometries allowed for the calculation of ADC value for whole lesion volumes. Low intensity in the baseline scans was correlated with greater uncertainty in resulting ADC values. For average intensities less than 1000, the uncertainty was more than 10% of the absolute ADC value. When the average intensity was higher than 4000, the ADC uncertainty was less than 5%.

Conflict of Interest (only if applicable):