AbstractID: 14159 Title: The impact of imaging frequency on intrafraction setup corrections in frameless image guided stereotactic radiosurgery

Purpose: The BrainLAB Novalis™ system allows for the delivery of image guided frameless stereotactic radiosurgery (SRS). At our institution, we use the Novalis Body ExacTrac™ to image the patient and make appropriate setup corrections prior to each treatment arc. Due to mechanical limitations, some arcs cannot be imaged - potentially decreasing treatment accuracy. The goal of this work is to assess the impact of our inability to image these arcs using setup correction data.

Method and Materials: Thirty patients treated with intra-cranial, frameless SRS at our institution were randomly selected for analysis. Patients' had 1-5 isocenters and were treated using 4-24 dynamic-conformal arcs (DCAs). A total of 264 DCAs were delivered with 166 imaged. Setup correction data based on these images were acquired and differential corrections taken over intervals of either one or two DCAs (corresponding to time intervals of approximately 2.5 or 5 minutes) were obtained. Data were also separated based on treatment isocenter to gain a time series representation of the observed setup corrections.

Results: Distributions of one and two arc interval corrections were compared using a two-sample Kolmogorov-Smirnov test and found to be similar (5% significance level) with mean values (± SD) for lateral, longitudinal, and vertical offsets of 0.2±1.1mm, -0.1±1.4mm, -0.1±1.2mm (one arc), and 0.1±0.9mm , 0.1±1.2mm , -0.2±1.2mm (two arc) respectively. The distribution of 3D vector displacements for all setup corrections indicated the mean 3D offset after a 2.5-5 minute interval to be 1.6±0.1mm (± SE). No clear trend in mean 3D vector displacements over the course of treatment was evident.

Conclusion: Failure to image a DCA on the Novalis system is likely to have little impact on the overall setup accuracy when the time interval between corrections does not exceed 5 minutes. Our data suggests this fact is independent of the total treatment length.