AbstractID: 6680 Title: Evaluation of Novalis ExacTrac Patient Positioning System and Application to Treatment of Lung and Liver Lesions.

The BrainLAB Novalis stereotactic radiosurgery system allows the treatment of extracranial lesions using the ExacTrac Patient Positioning System (EPPS). The EPPS tracks skin-affixed retro-reflective markers with a pair of infrared cameras. The 3-D positions of the markers provide sufficient information to determine the treatment plan isocenter and hence provide the ability to position the lesion at the isocenter of the treatment linear accelerator. We irradiated the lesions with 6-MV x rays that were collimated with the BrainLAB M3 µMLC. The Novalis unit was designed for stereotactic radiosurgery with an alignment tolerance of 0.75 mm. The EPPS positioning uncertainty was typically 0.5 to 1.5 mm.

The EPPS was applied to small lung metastases and liver lesions. Organ motion studies were conducted to ascertain the target position uncertainty on exhale breath hold. The measured uncertainties were incorporated into the system uncertainty to derive treatment field margins. CT scans were obtained during the course of treatment and registered to the original treatment plan CT data set by matching the skin-affixed markers in the respective scan sets. The lesion positions were calculated relative to the treatment plan dose distributions. Lesion displacements (+/- 4 mm) and ablations were verified during the time course of treatment. The tumor registration error (TRE) was theoretically calculated as a function of the placement and the number of fiducial markers, the localization error of the markers, and the position of the tumor relative to the markers, and iso-error contours were displayed on the images.

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