AbstractID: 7571 Title: Localization of Acoustic Neuroma Using CT/MRI Fusion for Gamma Knife Stereotactic Radiosurgery

This study investigates the magnitude and source of errors in spatial localization of Gamma Knife stereotactic radiosurgery (GKSRS) targets when imaged using CT and MRI. Specifically, the intracanalicular acoustic neuroma was simulated using two cylindrical phantoms to verify the accuracy of image fusion. The first phantom consisted of bovine bones and water gel. Holes were drilled into the bones, and vitamin E or 0.5% Magnevist was injected for MRI imaging. The bone was then filled and surrounded with tissue-equivalent water gel (Fig. 1a). The second phantom consisted of polystyrene, and was also drilled for imaging and measurement of localization accuracy (Fig. 1b). The phantoms were inserted into the MR frame for both imaging modalities to minimize possible re-positioning errors between imaging procedures. High-Z contrast liquid was injected into the MRI frame for visualization on CT. Table 1 shows coordinates of each hole from CT and MRI, and discrepancies between coordinates. The polystyrene phantom exhibited significant shifts only in the Z-direction, while the bone phantom exhibited significant shifts in all three directions. To verify these results, 1 mm^3 TLDs were inserted into the holes and irradiated using either MRI or CT coordinates. TLD results, shown in Fig. 2, verify the imaging results and indicate CT coordinates are optimal for target localization. These CT/MRI shifts were caused by differences in magnetic susceptibility between the bone and tissue-equivalent media. In conclusion, these measurements support the practice of mapping MRI localization into CT coordinates for GKSRS of acoustic neuroma.