Stereotactic localization accuracy was measured for pin-point and spherical targets in a custom-designed anthropomorphic head phantom. The Brown-Roberts-Wells (BRW) CT/MRI base ring and localizers were rigidly fixed to the phantom prior to imaging with computed tomography (CT) or magnetic resonance imaging (MRI) according to radiosurgery protocols. Plastic balls and rods displaced water at various locations within the phantom when filled. These served as targets for localization to obtain multiple sets of BRW stereotactic target coordinates using CT axial and T1 weighted MRI in three orthogonal image planes: axial, sagittal, coronal.

The BRW arc system was subsequently fitted on the base ring, the probe tip was touched to the location of a target by adjusting the arc angle and insertion depth and then locked into position. The position of the probe tip for each target in turn was subsequently transferred to the BRW phantom base to obtain a set of stereotactic coordinates. Because the BRW base ring remained attached to the phantom for all studies, this latter set of coordinates could be compared with image-derived coordinates.

The average vector distance to agreement of CT and MRI derived coordinates with the phantom base measurements were 1.41±0.90 mm and 1.37±0.38 mm, respectively. Submillimeter agreement was acheived in each of the BRW anterior-posterior, lateral and vertical coordinates for both imaging modalities. The vector distance to agreement between the two imaging modalities was 1.42±0.55 mm.

Our data supports using MRI directly for radiosurgery target localization if the appropriate checks and techniques are used.