Many radiographic patient positioning techniques compare images of the patient during treatment with digitally reconstructed radiographs (DRRs) derived from a prior CT study. The accuracy of the position measurement depends on the spatial resolution of the reference CT image, the quality of the positioning radiographs, and the accuracy of the comparison process. This study analyzes the dependence of one such positioning technique on CT slice thickness.

We used an automatic patient positioning algorithm that matches features in two orthogonal radiographs of the skull with features in two corresponding DRRs. Positioning precision was analyzed in laboratory tests using a CCD fluoroscope system to image a skull phantom, and in numerical simulations using test DRRs in place of the fluoroscopic images. The real and simulated images had a pixel pitch of 1.25 mm. The tests were made using reference CT studies of 1.5 and 3.0 mm slice spacing.

For 3.0 mm CT slices, the rms translational precision was 0.4 mm and the rms rotational precision was 0.8 - 0.9 degrees. For 1.5 mm CT slices, the translational precision was 0.2 mm and the rotational precision was 0.3 - 0.5 degrees. This indicates that CT spatial resolution in the slice direction is the dominant factor affecting the overall precision of this positioning process.