

AbstractID: 9136 Title: Target registration error analysis via kV imaging and conebeam CT in accelerated partial breast irradiation

Purpose: In accelerated partial breast irradiation (APBI), accurate localization of the lumpectomy cavity is important. We are investigating daily localization of the lumpectomy cavity in patients with implanted surgical clips by kV imaging followed by conebeam CT (CBCT). Initial data based on 2 patients are presented here. Target registration error (TRE) analysis was performed to assess the accuracy of available image-guidance techniques for target localization during APBI. **Materials and Methods:** APBI patients were positioned to the treatment isocenter initially by laser alignment to skin tattoos, followed by orthogonal kV radiographs to visualize bony anatomy and surgical clips and then by CBCT (once daily) to visualize both surgical clips and soft tissue architecture. Couch shifts were performed based on matching surgical clip position and lumpectomy cavity architecture (when visible) to the planned setup. The lumpectomy cavity position was assumed to be represented by the surgical clips. The TRE is defined as the residual setup error following isocenter alignment. Surface topology analysis on the serial CBCT datasets was performed post-treatment by co-registering the breast surfaces, as defined by CBCT, and then measuring the clip misalignment. **Results:** The average laser setup TREs (determined by kV imaging) for patients 1 (breast volume = 1335.5cc) and 2 (breast volume = 404.7cc) were 3.7mm and 6.1mm, respectively. The average kV imaging TREs (determined by CBCT, post-kV imaging shifts) for patients 1 and 2 were 4.9mm and 1.4mm, respectively. The average surface topology TREs for patients 1 and 2 were 4.9mm and 1.6mm, respectively. **Conclusions:** Even after kV imaging, TREs around 0.5cm were detected using CBCT in the larger breast volume. Therefore, CBCT may improve targeting in APBI for patients with large breast volumes. Surface alignment may be more suitable for patients with small breast volumes and is currently under further investigation.