VALIDATION OF BONY ANATOMY BASED (2D-2D) IMAGE REGISTRATION

Purpose: Image-guided daily localization is becoming standard of care in radiation therapy. The purpose of this work is to validate the accuracy of bony landmarks based image-registration of the Acculoc software, Isoloc's (v7.0). This provides daily patient localization ability on linear accelerators which don't have on-board kV-imager for 2D-2D matching or cone-beam CT.

Methods and materials: The image-registration accuracy can be compromised by the image quality. In order to test the bony anatomy based image-registration accuracy, a blind study was conducted with two individuals; first person to off-set the anthropomorphic phantom and the second person for alignments. Anthropomorphic phantoms representing head-and-neck, thorax and pelvis were used in this study. All three phantoms were CT-scanned and treatment plans were generated using Pinnacle (v8.0). Orthogonal {anterior-posterior (AP) and right-lateral (RLAT)} setup beams were added for each isocenter and digitally reconstructed radiographs (DRRs) were generated for each beam. At the treatment machine, both AP and RLAT portal images were obtained using Portal-Vision software. Portal images and their respective DRRs were imported into the Isoloc software for the alignments. Several blind translational off-sets followed by the image-registration were made for each site. Furthermore, in order to simulate obese patients, the pelvic phantom was wrapped with around 10 cm bolus and checked the accuracy of the software to align the phantom based on bony landmarks.

Results: The image quality was acceptable for all three sites and we were able to align the head and neck phantom with ±2 mm accuracy in each direction. Accuracy for aligning thorax and pelvis phantoms were within ±3 mm.

Conclusion: 2D image-registration based on bony landmarks using Isoloc 7.0 software has been validated and the image-registration accuracy was found to be within ±3 mm.