

AbstractID: 1244 Title: Combining KV and MV images to improve on-board CT reconstruction efficiency

Technologies with gantry-based KV and MV imaging are now available for image-guided radiation therapy to improve treatment localization accuracy. With the new KV on-board imaging device installed in the accelerator orthogonal to existing MV portal imaging device, image acquisition efficiency could be practically improved by combining KV/MV projections for CT reconstruction. We are investigating image detail variations between cone-beam images reconstructed using KV only, MV only, and both KV and MV projections. Methods based on the multi-level scheme algebraic-reconstruction technique (MLS-ART) and accelerated MLS-ART are used to reconstruct cone-beam CT images involving either full only, partial only, or combination of both full and partial projections. Varian CL21EX with both an aSi500 portal imager and a KV on-board imaging device is used for the study. Preliminary study indicated that use of combination of MV and KV projections will reduce image acquisition time by at least 40%. The use of MLS-ART methods further reduced acquisition time by minimizing the number of projections required to generate reasonable image quality of localization cone-beam CT images with as few as 20 KV and 20 MV projections within 90° of gantry rotation. With the ability of limited projection reconstruction and gated image acquisition, 4-D CT reconstruction will be possible. Information between KV and MV projections is supplemental and could be used to enhance target localization. Adaptive cone-beam CT images reconstructed using combination of full KV projections and partial MV projections show great promise for target localization/treatment verification. Clinical cases with different anatomical sites will be presented.