AbstractID: 7882 Title: Clinical implementation of a kilovoltage imager for setup error verification in radiotherapy

Kilovoltage radiography for setup error verification in radiotherapy overcomes the problems related to poor image contrast, small field of view and non-negligible patient dose encountered with megavoltage EPID. A new kilovoltage EPID is now available in our clinic for routine use. The system is mounted on an Elekta SL-20 linear accelerator and consists of a retractable X-ray tube and flat panel mounted on a robotic arm. Many issues and choices are related to this clinical implementation: optimal exposure technique, dose versus image quality, kV and MV source coincidence, mechanical stability, etc. The replacement of the MV imager with the kV system for setup verification is possible if both systems are matched geometrically and if the kV system is efficient and convenient to use. The goal of this work is to characterize the mechanical positioning accuracy and stability of the kV imaging system as function of gantry angle and under extension and retraction of the robotic arm. The kV system sag is measured by tracking the projection of a ball bearing placed at the isocenter for the full range of gantry angles. A look up table incorporating these measurements enables remapping of the kV images to match the movements of the MV source. Preliminary tests suggest that it is possible to calibrate the source alignment to ±1 mm. The agreement observed between MV and kV systems enables the implementation of kilovoltage radiography for setup error verification, margin evaluation and study of involuntary organ motions under fluoroscopy.

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