

AbstractID: 10348 Title: Daily verification of isocenter alignment for a new image guided radiotherapy system, MHI-TM2000

Purpose: The purposes of this study were to propose a fast verification functionality of isocenter alignment of MHI-TM2000 and to evaluate the accuracy of isocenter alignment for long-term period. **Method and Materials:** The verification of isocenter alignment was performed employing lasers, kV X-ray imaging unit, and MV X-ray beam unit. First, a cubic water-equivalent phantom (100x100x100 mm) having a small steel ball at the center was placed on the couch so that the steel ball was aligned to the isocenter using lasers. For each of two orthogonal kV X-ray images acquired by the corresponding imagers, the steel ball was segmented using a threshold value based on image histogram, and then its centroid was computed. The displacement between the center of the kV X-ray image and the centroid denotes a positioning error by lasers. After the positioning error was corrected by the couch movement, electronic portal imaging device (EPID) images were acquired at gantry angles of 270, 0, 90, 180 degrees, respectively. The centroid of the steel ball was computed in the same manner. The displacement between the center of the EPID image and the centroid of the ball represents the beam-axis deviation from the isocenter (beam-axis error). **Results:** Daily verification of the laser positioning error and the beam-axis error were performed from April 2008 to December 2008. The root mean square errors were 0.62 mm for laser positioning and less than 0.40 mm for beam-axis at each gantry angle. The verification time was within three minutes. **Conclusion:** We addressed a fast verification functionality of isocenter alignment of MHI-TM2000. Verification result for long-term period have proved that the proposed method achieves significant acceleration of daily quality assurance and that MHI-TM2000 provides isocenter alignment with high accuracy. **Conflict of Interest:** Research sponsored in part by Mitsubishi Heavy Industries, Ltd.