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Evaluation on the Functions of Setup Error Correction in the On-Board Imager(OBI) System

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On-Board Imager (OBI) System which is attached to the both sides of the linear accelerator (LINAC) is considered as a proper tool to deliver the Image Guided Radiation Therapy (IGRT). In this study, the accuracy of the setup error correction using the OBI system is evaluated. The evaluated OBI system was the part of the Clinac iX (Varian, USA) and the accuracy of the setup error correction was analyzed using the phantom provided by Varian for the quality assurance (QA) of the OBI system. The phantom is shaped as a cube with five embedded radiopaque markers. The simulation image of the phantom was acquired in the Acuity (Varian, USA) and test plan was made for the analysis of the setup error correction. In the treatment room, the phantom was located with different positions compared with the one in a test plan with a combined random shift variation in the direction of longitudinal, vertical, and lateral of couch. Additionally, the couch rotational variation was also considered. The shift variation was limited to the value of 2 cm in each direction and 2 degree was the maximum value in the rotational variation. The operation for the setup error correction in the OBI system was performed by the dosimetrist and therapist who do not know the real variation of the phantom setup location in the treatment room for the blind test. The total number of tests for the shift variations was 20 and five cases were analyzed for the couch rotational variation. The average of absolute correction errors in the case of shift variations only were 0.70 mm (longitudinal), 0.70 mm (lateral) and 0.85 mm (vertical). When the rotation was also varied combined with the shift variations, the average values were 2.8 mm (longitudinal), 3.2 mm (lateral), 2.6 mm (vertical) and 0.4 degree. The function of setup error correction in the OBI system of Clinac iX showed the verification of the accuracy in the cases of shift variations but could not be evaluated as a proper accuracy in the correction of the rotational variations.

Keywords : IGRT(Image Guided Radiation Therapy), OBI(On-Board Imager), Setup Error