

Analysis and Comparison of the Dose Distribution of RTP and Experimental Measurement during IMRT for a Moving Organ

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IMRT quality assurance (QA) is performed to confirm the intensity modulated radiation beams, which are determined by inverse planning using the computed optimization procedure before the patient is irradiated by IMRT. IMRT QA does not consider the motion of a moving organ whilst performing IMRT. Therefore, the purpose of this study was to improve the efficiency of treatment by not only accurately determining the dosimetry with respect to a moving organ, but to correct the tumor and normal structure on the radiation treatment planning (RTP) when a moving organ was treated. A moving phantom system (moving device, cork, and acryl phantom) was designed to simulate the motion of a moving organ. The diaphragmatic motions of 5 patients were analyzed by fluoroscopy to acquire the motion of an internal organ. The CT scan images were obtained simultaneously during the operation of the moving phantom system such as diaphragm motion (static state, 10, 15, and 20 mm). The phantom system was irradiated using the sliding window method, after Gafchromic EBT films had been inserted within the space (40, 50, and 60 mm depth) of the phantom. The results, in which the dose distribution of the films were compared with those from planning, showed a decrease in dose on the PTV region with increasing motion of the moving phantom. The difference of planning and measurement are maximum 39.6-43.2% at 20 mm movement and minimum 0.1-3.4% at static state. The dose on the penumbra region increased with increasing the motion of the moving phantom. Overall, the efficiency of radiotherapy would be improved if radiotherapy QA considers the motion of an internal organ and the PTV, CTV, and OAR are corrected accordingly before a patient is treated with the planning data.

Keywords : IMRT, IMRT QA, Moving Phantom System