World Academy of Science, Engineering and Technology
International Journal of Medical and Health Sciences
Vol:8, No:07, 2014

Open Fields' Dosimetric Verification for a Commercially-Used 3D Treatment Planning System

Authors : Nashaat A. Deiab, Aida Radwan, Mohamed Elnagdy, Mohamed S. Yahiya, Rasha Moustafa

Abstract : This study is to evaluate and investigate the dosimetric performance of our institution's 3D treatment planning system, Elekta PrecisePLAN, for open 6MV fields including square, rectangular, variation in SSD, centrally blocked, missing tissue, square MLC and MLC shaped fields guided by the recommended QA tests prescribed in AAPM TG53, NCS report 15 test packages, IAEA TRS 430 and ESTRO booklet no.7. The study was performed for Elekta Precise linear accelerator designed for clinical range of 4, 6 and 15 MV photon beams with asymmetric jaws and fully integrated multileaf collimator that enables high conformance to target with sharp field edges. Seven different tests were done applied on solid water equivalent phantom along with 2D array dose detection system, the calculated doses using 3D treatment planning system PrecisePLAN, compared with measured doses to make sure that the dose calculations are accurate for open fields including square, rectangular, variation in SSD, centrally blocked, missing tissue, square MLC and MLC shaped fields. The QA results showed dosimetric accuracy of the TPS for open fields within the specified tolerance limits. However large square (25cm x 25cm) and rectangular fields (20cm x 5cm) some points were out of tolerance in penumbra region (11.38 % and 10.9 %, respectively). For the test of SSD variation, the large field resulted from SSD 125 cm for 10cm x 10cm filed the results recorded an error of 0.2% at the central axis and 1.01% in penumbra. The results yielded differences within the accepted tolerance level as recommended. Large fields showed variations in penumbra. These differences between dose values predicted by the TPS and the measured values at the same point may result from limitations of the dose calculation, uncertainties in the measurement procedure, or fluctuations in the output of the accelerator.

Keywords : quality assurance, dose calculation, 3D treatment planning system, photon beam
Conference Title : ICMPBB 2014 : International Conference on Medical Physics, Biophysics and Biotechnology
Conference Location : Stockholm, Sweden
Conference Dates : July 14-15, 2014