AbstractID: 12749 Title: A Comparative Study of Cobalt-60 based Tomotherapy versus 6 MV Linac-based Tomotherapy, IMRT, and 3DCRT for the Treatment Planning of Prostate and Head and Neck Cases

Purpose: Cobalt-60 (Co-60) based radiation therapy continues to play a significant role in a large number of countries due its simplicity and robustness. However, it has not been developed to accommodate modern techniques that provide intensity modulated radiation therapy (IMRT). In this paper we present the results of investigations of Co-60 based tomotherapy. Particularly, we generate clinical plans for prostate and head and neck (H&N) anatomical regions and compare them with the plans obtained with 6MV based linac tomotherapy, standard 6MV IMRT, and 3D conformal radiation therapy (3DCRT) techniques. **Method and Materials:** The tomotherapy plans were obtained by modeling a MIMiC binary multileaf collimator attached to a Theratron-780C Co-60 unit and a 6MV linear accelerator. The EGSnrc/BEAMnrc Monte Carlo code was used to model the treatment units with the MIMiC collimator while EGSnrc/DOSXYZnrc code was used for calculating dose on prostate and H&N CT datasets. All heterogeneities and patient contours were considered. An in-house inverse treatment planning program was then used to optimize all 2D tomotherapy plans. The IMRT and 3DCRT plans were generated in Eclipse treatment planning system based on our in-house IMRT and 3DCRT clinical protocols for prostate and H&N treatment. **Results:** A quantitative analysis of the dose distributions and dose area histograms (DAHs) showed that the Co-60 plans achieve the dose objectives for the targets and OARs. The dose distributions and DAHs for Co-60 tomotherapy plans for both cases are very similar to those obtained with 6MV based tomotherapy and IMRT, and are much more conformal compared to 3DCRT plans. **Conclusion:** Our investigations confirm that Co-60 tomotherapy is indeed capable of providing state-of-the-art conformal dose delivery and could be used for the treatment of targets in both small and larger separation anatomical regions.