

VOLUMETRIC-MODULATED ARC THERAPY IN DIFFERENTIATED THYROID CANCER: A COMPARISON WITH INTENSITY-MODULATED RADIOTHERAPY

Chan, Wing-lok¹; Ng, Choryi S¹; Law, Martin²; Lee, Victor Ho-fun³; Wan, Koon-yat¹; Leung, To-wai¹
¹Department of Clinical Oncology, Queen Mary Hospital, Hong Kong, Hong Kong; ²Department of Radiology, Queen Mary Hospital, Hong Kong, Hong Kong; ³Department of Clinical Oncology, The University of Hong Kong, Hong Kong, Hong Kong

Background/Purpose: Adjuvant radiotherapy is indicated in differentiated thyroid cancer patients with high risk of local recurrence, either macroscopic residual disease or extensive nodal involvement. While intensity-modulated radiotherapy (IMRT) is the standard, this study compared the performance of dual-arc volumetric-modulated arc radiotherapy (VMAT) with fixed 9-field IMRT.

Methods: Planning computer tomography data from 15 patients with differentiated thyroid cancer were selected. Dose prescriptions were 66Gy to the gross residual tumor, and 60Gy to bilateral cervical lymph nodes from level II down to level VII, all delivered in 33 fractions. Plans for 9-field IMRT and VMAT for all 15 patients were optimised and compared. The MU and delivery time were measured for treatment efficiency.

Results: All 30 plans reached clinical treatment requirement in target coverage. The conformity index (IMRT vs. VMAT, PTV66: 0.77 ± 0.06 vs. 0.73 ± 0.07 , $p=0.16$; PTV60: 0.78 ± 0.03 vs. 0.80 ± 0.03 , $p=0.11$) and homogeneity index (IMRT vs. VMAT, PTV66: 3.07 ± 0.61 vs. 3.30 ± 0.63 , $p=0.35$; PTV60: 6.52 ± 1.77 vs. 6.67 ± 1.21 , $p=0.79$) were comparable. For OARs, the mean dose to parotids was significantly increased by 4.8Gy (14.4%, $p=0.014$) in VMAT. The maximum dose of spinal cord (D1%), brain stem (D1%), median dose of esophagus and the integral dose to lung (V5/ V10/ V20/ V30) were not different between the two methods. Compared to IMRT, the mean MU and delivery time of VMAT were reduced by 71.6% (IMRT: 1860.53 ± 209.06 vs. RA: 528.27 ± 73.74 , $p=0.0004$) and 63.1% (IMRT: 7.63 ± 0.56 minutes vs. RA: 2.81 ± 1.29 minutes, $p=0.004$) respectively.

Discussion & Conclusion: For adjuvant radiotherapy for thyroid cancer with target covering level II lymph nodes, IMRT is preferred for better parotid sparing. Otherwise, VMAT could be an accurate and efficient alternative.