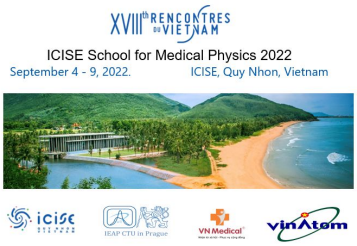

Contribution ID: **47** Type: **not specified**

Comparison of skin doses of FF and FFF beams in planning the use of VMAT radiotherapy for radiation therapy of patients with head and neck cancer

Wednesday 7 September 2022 16:00 (15 minutes)

Purpose:
Currently, at the Department of Radiotherapy and Radiosurgery, Cancer Institute, 108 Military Central Hospital, head and neck (H&N) cancer patients are treated with the Volumetric Modulated Arc Therapy (VMAT) plan by using photon beam 6 MV flattening filter FF on TrueBeam STx and Eclipse v13.6 software. The study aims to compare and evaluate the dose distribution, especially skin dose, in the VMAT plan for H&N cancer patients using photon beams at 6 MV FF and 6 MV Flattening Filter Free (FFF).
Objects and methods:
The CT-Simulation data of 31 treated H&N cancer patients was used to re-plan VMAT on Eclipse v13.6 software with 2 photon beams at 6 MV FF and 6 MV FFF of TrueBeam STx. The VMAT plans were quantitatively compared in terms of dose coverage for the treatment volume PTV, Quality of Coverage (Q), Conformity Index (CI), and Homogeneity Index (HI), the dose on organs at risk (OARs), and skin dose, as well as Monitor Unit (MU) number and Beam on Time (BoT).
Result:
The dose distribution of the VMAT plans using two beams of 6 MV each was compared. The dose evaluation indicators obtained from plans using 6 MV FFF photon beams give values close to the ideal values than the 6 MV FF photon beam plans. In terms of physical characteristics, the plans to use the FFF photon beam for the average number of MU are about 17.39% higher than the plans to use FF photon beams. However, the BoT of the FFF photon beam (1400MU/mins) is reduced by 49.34% compared to the FF photon beam (600MU/mins).
For the tolerance dose to OARs, FF photon beams give tolerated dose values at some OARs using a 6 MV FF photon beam for lower dose values than 6 MV FFF photon beams at the spinal cord (0.76%) and right inner ear (0.24%). However, the 6 MV-FFF photon beam has a lower dose value than the 6 MV-FF photon beam in most of the remaining OARs, such as 0.36% in the brainstem, 5.68% in the chiasm, 12.18% in the left len, 14.77% in the right len, 1.01% in the left inner ear, 3.07% in the left optic nerve, 2.79% in the right optic nerve, 1.15% in the left parotid gland, 0.87% in the right parotid gland, and 4.44% of the body mean dose.
The skin dose on the VMAT plan using the 6 MV FFF beam was lower than the 6 MV FF beam observed at different skin thicknesses from 1 mm to 4 mm as well as different dose levels from 5 Gy to 60 Gy.
Conclusion:
The study compared the planning of head and neck cancer patients by the VMAT technique using two photon beams at 6 MV, which gave similar results. When using the FFF beam, it will reduce the dose on the patient's skin and reduce the beam on time during the treatment of the patient.
Keywords: FFF, FF, skin dose, head and neck cancer.

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Session Classification: Student presentations - Session 3