Dosimetric comparison between VMAT and 7 fields IMRT in preoperative hypofractionated radiotherapy for rectal cancer

Ehab Saad[1,2], Khaled Elshahat[2,3], Hussein Metwally[2,4]
[1] Department of Clinical Oncology, and nuclear medicine, Cairo University, Egypt
[2] Department of Radiation Oncology, Dar Al Fouad Hospital, Egypt
[3] Department of Clinical Oncology, Azhar University, Egypt
[4]Department of Clinical Oncology, Fayoum University, Egypt
hussein.metwally@hotmail.com

Abstract:
The hypo-fractionated short course radiotherapy has been considered as preoperative treatment in patients with locally advanced rectal cancer (LARC).

The aim of this study is to compare the dosimetric differences between volumetric modulated arc therapy (VMAT), 7 fields intensity modulated radiotherapy (IMRT), regarding the target coverage and preservation of organs at risk (OARs) in patients with locally advanced rectal cancer planned for neoadjuvant short course radiotherapy.

Methods:
Thirty LARC patients were retrospectively evaluated in this study. For each patient dual Arc VMAT and 7 fields IMRT plans were generated. In all patients, the target consisted of clinical target volume (CTV) including pelvic LNs and the whole rectum with the mesorectum. Planning target volume (PTV) was created from the CTV with a margin of 5mm in all directions. The dose prescription was 25 Gy in 5 fractions in 5 successive days. OARs were delineated: bladder, small bowel, bilateral femoral heads and pelvic bone marrow (PBM). Conformity index (CI) and homogeneity index (HI) for both plans were compared. The dose-volume histogram (DVH) of PTV and OARs for both techniques was compared.

Results:
No significant difference between RA and IMRT plans in PTV25Gy coverage. ($p = 0.72764$). Both CI and HI are better with VMAT than IMRT. The maximum and minimum bladder doses are less with VMAT compared to IMRT. The mean dose to femurs, bowel and pelvic bone marrow were significantly less with VMAT.

Conclusion:
In preoperative hypofractionated radiotherapy of LARC, VMAT technique can offer better conformity and homogeneity than IMRT with

better OARs preservation. Further randomized clinical trials are needed to translate this dosimetric data into significant clinical benefit.