P014 Why volumetric modulated arc therapy is better than three dimensions conformal radiotherapy in prostate cancer? Dosimetric analysis from a tertiary care hospital in Saudi Arabia

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Introduction & Objectives: Current protocols for prostate cancer EBRT commonly use two main techniques for treatment planning, i.e., three dimensions conformal radiation therapy (3D-CRT) and intensity-modulated radiation therapy (IMRT) including volumetric modulated arc therapy (VMAT). The goal of this study is to compare target volumes and organ at risk (OARs) doses for VMAT versus 3D-CRT plans.

Materials & Methods: Our Study included 40 patients were having localized prostate cancer treated at King Fahad Medical City Riyadh between September 2015 and December 2017. Patients were treated with radical definitive external beam radiation therapy (EBRT) using volumetric modulated arc therapy (VMAT) technique with a prescribed dose of 78Gy/39 fractions. There was no treatment to the regional lymph node. All patients' treatments were re-planned with six fields 3D-CRT. Treatments were delivered using Trilogy VARIAN Linear Accelerator. Treatment plans were done by Eclipse Varian treatment planning system (TPS) version 10, dose calculations were performed using Analytical Anisotropic Algorithm (AAA) for both VMAT and 3D-CRT techniques. Plans were evaluated using the conformity index (CI) and homogeneity index (HI) for target volumes. Mean, maximum and OARs dose volumes were compared between both techniques based on QUANTAC normal tissue tolerance doses. Data were analyzed by SPSS 23.

Results: In comparison to 3D-CRT plans, Planning Target Volume (PTV) in VMAT plans received a higher maximum (p=0.000). There was a significant difference in HI for PTV between both techniques where it is better in 3D-CRT compared to VMAT (p=0.010), while there is better CI in VMAT (p=0.002). As expected, 3D-CRT plans required fewer monitor units (MU) than VMAT plans to deliver the same prescribed dose (p=0.000). VMAT technique resulted in delivery of lower OARs mean doses (rectum, penile bulb, bone marrow, and femoral heads) than 3D-CRT technique ($p<0.05$) except for small bowel (p=0.234) and bladder (p=0.509) for which there was no significant difference and testis mean dose was lower in 3D than VMAT (p0.000). VMAT delivered significantly higher maximum doses than 3D-CRT to the bladder and rectum while 3D-CRT delivered higher maximum doses to the femoral heads, small bowel. Otherwise, we could not find any significant difference in maximum doses for OARs (penile bulb, testis and bone marrow) between both techniques. VMAT plans resulted in the delivery of significantly lower OARs dose volumes for approximately all dosimetric endpoints except small bowel (V45) and bone marrow (V5), for which there is no significant difference.

Conclusions: VMAT produced dose distributions more favorable than could be achieved with 3D-CRT but still 3-D CRT can achieve QUANTAC goals with good PTV coverage. VMAT required more MUs than 3 D-CRT.