

NTCP and estimation of secondary cancer risk in Modulated Arc Therapy for prostate carcinoma using in-house software.

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Introduction of the study

This study evaluates the toxicity for organs-at-risk and estimates the secondary cancer risk from Volumetric Modulated Arc Therapy for a cohort of prostate carcinoma patients using in-house software (Coupôle).

Methodology

A cohort of twelve patients was treated with 76 Gy using daily 2Gy fractions. The 18 MV (Elekta) treatment was planned using the Monaco TPS.

Normal tissue complication probability (Lyman-Kutcher-Burman) and secondary cancer probability (linear model rectum: $\alpha_1=0.017, \alpha_2=0.25$ and $(\alpha/\beta)=4.5$; bladder: $\alpha_1=0.006, \alpha_2=0.25$ and $(\alpha/\beta)=7.5$) were calculated for rectum and bladder using in-house software and the NTCP values were compared to those obtained with Biosuite.

Results

The mean NTCP for rectal bleeding (grade \geq 2) was 7.14% (range 4.38-9.72%) obtained with Coupôle versus 7.50% (range 4.2-10.1%) with Biosuite and for fecal incontinence we have obtained 5.43 % (range 3.7-7.3) versus 5.33% (range 3.66-7.15) respectively. The estimated risk for secondary cancer is 1.30% for rectum and it was 0.73% for bladder. Regarding the risk for secondary malignancies, the VMAT plans showed the highest values for both rectum and bladder for certain patients of studied cohort.

Conclusion

Our in-house software Coupôle was validated against Biosuite; twelve prostate treatment plans were evaluated in terms of toxicity and second cancer risk. Evaluation of NTCP and second cancer estimates can improve treatment quality, particularly when complex treatment modalities are involved.

Key words: NTCP, secondary cancer risk, rectum, bladder, VMAT, prostate carcinoma.

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