

Investigation of plan quality metrics for multiple-metastases using single-isocenter radiosurgery technique with the Millennium MLC

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INTRODUCTION

- There has been increased interest on linac-based radiosurgery treating single isocenter multiple brain metastases
- Few publications have investigated the effect of increasing the number of targets over the plan quality and published works have focused only on a limited number of virtual plans.

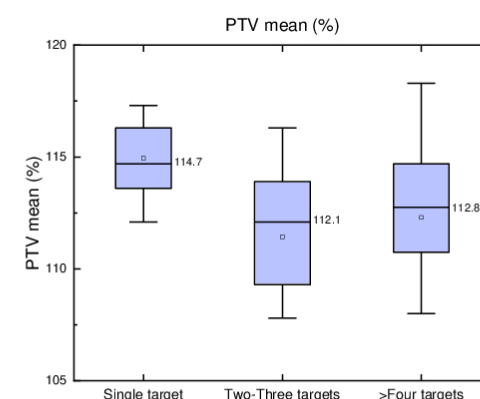
AIM

- To investigate the effect of number of targets over the **plan quality** metrics for **multiple brain metastases single-isocenter** clinical plans using a newly developed auto planning module (**HyperArc**) .

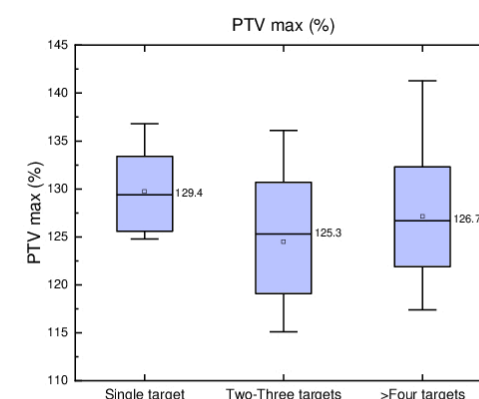
METHOD

- A retrospective investigation of the plan quality of 60 SRS clinical plans treated with HyperArc was performed.
- The clinical plans investigated were delivered in a single fraction with prescriptions ranging from 19 Gy to 25 Gy and equivalent sphere diameters of less than 2cm.
- Plans were divided in three groups according with the number of treated metastases per isocenter: one (28 patients, 28 lesions), two to three (17 patients, 37 lesions) and more than four (15 patients, 72 lesions).
- The plan quality metrics investigated were the PTV_Mean, PTV_Max, RTOG CI, Paddick CI, GI and ICRU HI.
- Plans were scored according with RTOG-9508 guidelines

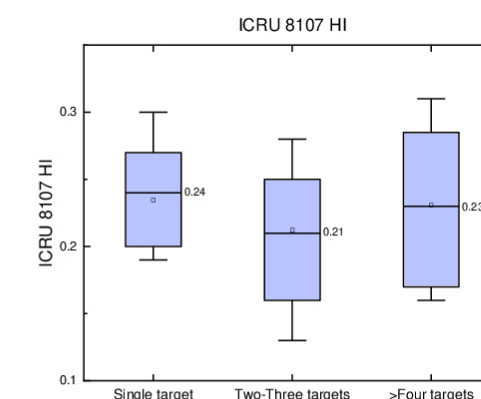
RESULTS



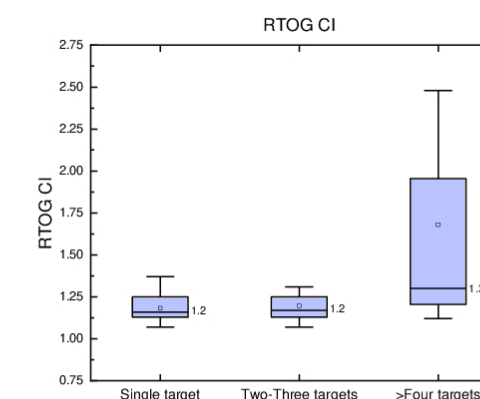
PTV_Mean was $114.9 \pm 2.1\%$, 111.4 ± 3.9 and $112 \pm 5.8\%$ for the three groups. None of the differences was statistically significant.



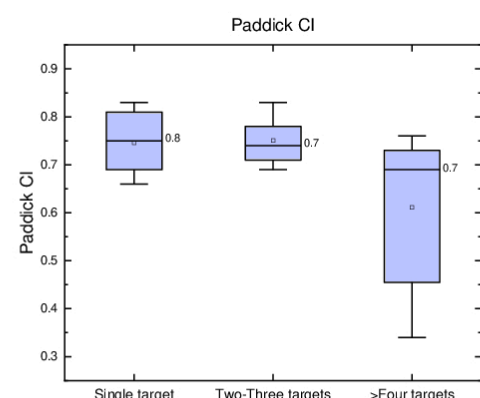
PTV_Max was $129.7 \pm 4.9\%$, $124.5 \pm 8.0\%$ and $127 \pm 10.2\%$. None of the differences was statistically significant.



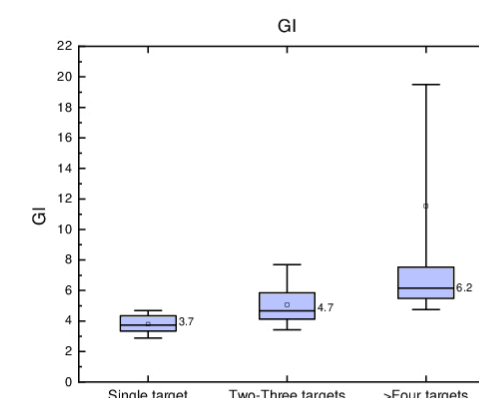
Values of the ICRU HI did not show significant differences among the groups: 0.23 ± 0.04 , 0.21 ± 0.06 and 0.23 ± 0.07 .



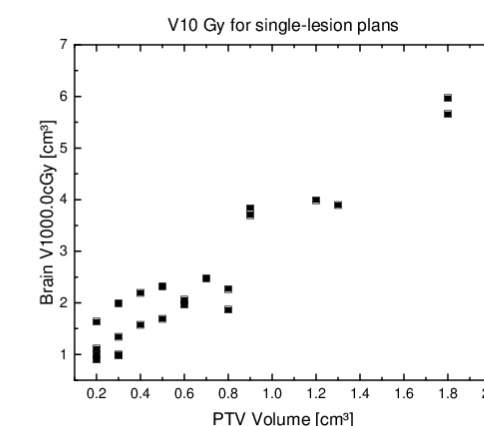
RTOG CI values were 1.18 ± 0.15 , 1.20 ± 0.11 and 1.54 ± 0.52 . Significant differences between the third group and the other two were observed.



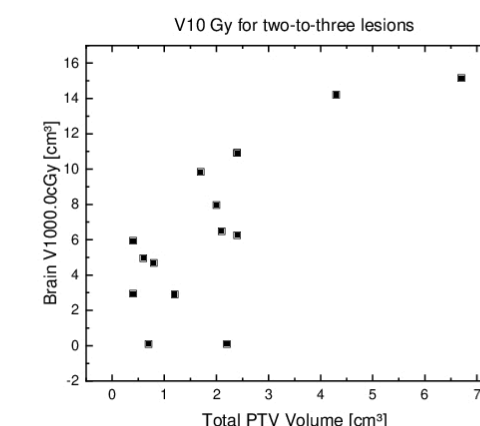
Paddick CI values were 0.75 ± 0.07 , 0.75 ± 0.06 and 0.62 ± 0.16 . Group three was statistically significant.



Significant differences among all groups were observed for the GI values: 3.8 ± 0.6 , 5.1 ± 1.49 and 11.9 ± 25 .



Brain_V1000cGy increases with the total PTV volume for single- and multiple-lesion treatments.



CONCLUSIONS

- Results of this work show that HyperArc plans treatin one up to three lesions can achieve per-protocol scores as evaluated using RTOG-9508 guidelines.
- RTOG-9508 acceptable variation scores are observed in some of the plans treating four or more lesions.

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