

Rapid Arc versus a new Sectorial Sliding window IMRT template in radiotherapy brain treatments: lens sparing

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Introduction and Objectives

The ICRP Publication 118 introduced new threshold doses for tissue reactions and other non cancer effects on lenses: the new threshold doses resulted less than previous scientific evidence. In brain radiotherapy treatment volumes lenses are often involved and the risk of radiation induced cataract becomes relevant. Our study compares the results in terms of lens absorbed doses obtained with Rapid Arc (RA) treatments and a new SSW IMRT template applied on the same patients.

Methods

Ten patients with glioblastoma brain tumors (PTV medium volume of about 90cc) localized in different areas, were treated with RA treatments and with the new SSW IMRT, that consists of five fields spreading over a < 150-degree sector, depending on Planned Target Volume (PTV) localization.

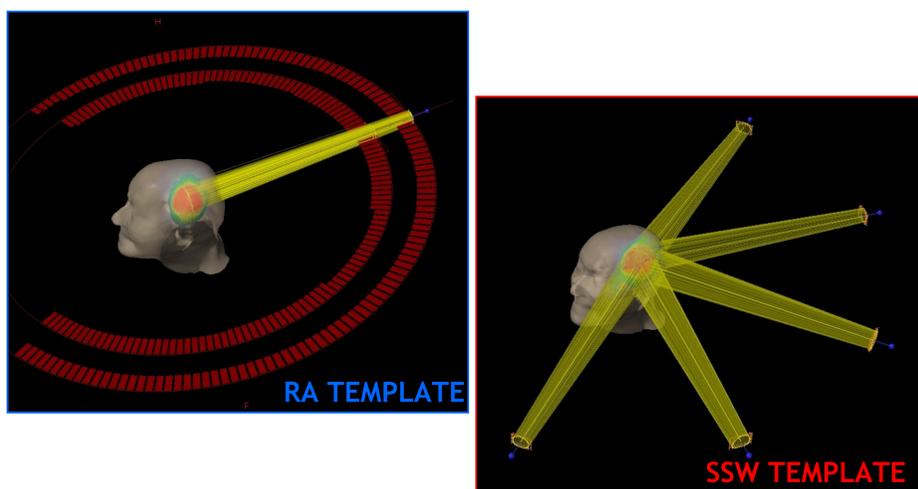


Figure 1: On the left side the RA geometry and on the right side the new Sectorial Sliding Windows IMRT template 5 fields geometry.

The dose prescription for all patients was 60Gy in 2Gy daily fractions and on each patient were used the same optimization objectives for both radiotherapy techniques. The target coverage was at least 97% of prescription dose to 95 % of volume in plans elaborated with the two techniques.

Results and Conclusions

All the patients treated with SSW IMRT technique received a lower maximum omolateral lens dose (range from 0.4 to 2.4 Gy; mean value 1.7 Gy) compared to doses obtained with Rapid Arc plans (range from 0.5 to 4.4 Gy; mean value 2.4 Gy). Relatively to controlateral dose lens, we obtained a medium value of maximum dose of 1.5 Gy (range 0.4 - 2.2 Gy) for SSW IMRT plans and 2.2 Gy (range 0.5 - 4.6 Gy) for Rapid Arc plans.

RA TEMPLATE

SSW TEMPLATE

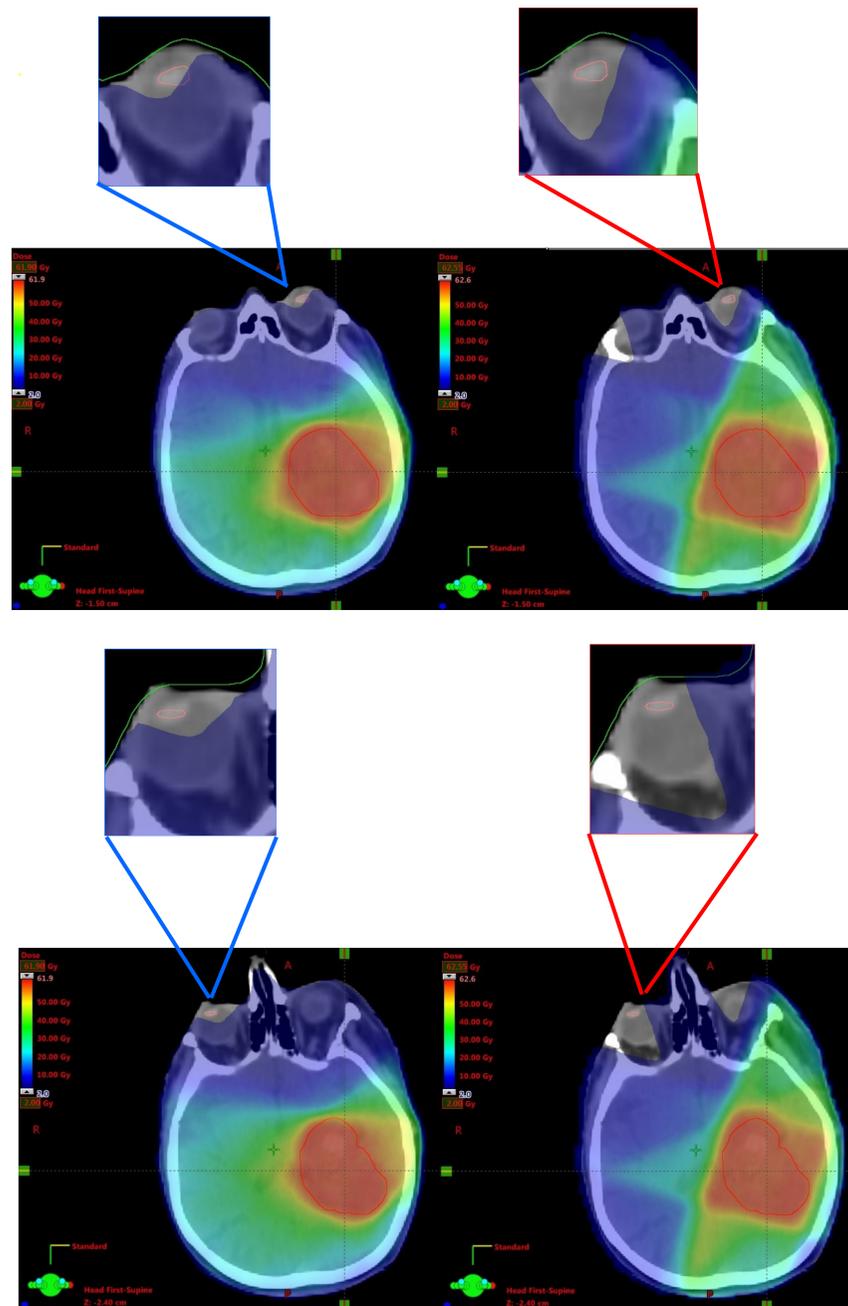


Figure 2: 2Gy isodose distribution for omolateral (upper) and controlateral (lower) lens. On the left side the distribution obtained with RA geometry and on the right side the distribution obtained with the new SSW template.

Patients treated with the new SSW IMRT template showed a lens dose sparing of about the 28% compared to doses they would have received with Rapid Arc plans. The doses to other OAR involved as chiasm, optical nerve and brainstem, are widely lower than the corresponding constraints.

The new SSW IMRT template can be applied to treat target with different volume, shape and anatomical position. Furthermore, the lens maximum dose reduction could potentially reduce the risk of cataract.

References/Bibliography

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