

AbstractID: 10609 Title: Dosimetric Plan Index (DPI): A New Quantitative Tool for Evaluation of Prostate IMRT Treatment Plans

Purpose: This study is to present a new quantitative analysis tool for evaluation of prostate IMRT (intensity modulated radiation therapy) plans.

Methods and Materials: Based on retrospective analysis of 33 prostate patients (18 with intact prostate and 15 with prostatectomy) for a total of 84 acceptable treatment plans, we developed a new concept, dosimetric plan index (DPI), which integrates the measures of dose conformity, target coverage and OAR (organ at risk) overdose. DPI is defined as:

$$DPI = 1 - \frac{\sqrt{3}}{3} \sqrt{(1 - CI)^2 + (1 - TC)^2 + (1 - DGI)^2},$$
 where CI (conformity index) is defined as the ratio of the volume of a PTV

(planned target volume) inside the prescribed IDL (isodose line) to the volume enclosed by the IDL; TC (target coverage index) is defined as the ratio of the volume of a PTV inside the prescribed IDL to the volume of the PTV; DGI (dose gradient index of an OAR) is defined as $e^{-d/\lambda_{OAR}}$, d is the distance between 95% and 50% IDL, λ_{OAR} is the nominal distance that can be commonly achieved in a specified disease site, and it equals to 1 cm for prostate IMRT plans with rectum as an OAR.

Results: The target volume and the volume of rectum enclosed by 50% IDL vary dramatically for different acceptable plans. The mean COSI (critical organ scoring index) of these plans is 0.66 ± 0.18 for intact prostate plans and 0.54 ± 0.14 for post-prostatectomy plans. However, those plans share a common merit that their DPIs are in a much narrower range, 0.63 ± 0.02 for intact prostate plans and 0.59 ± 0.02 for post-prostatectomy plans.

Conclusion: The DPI is a new comprehensive treatment plan scoring tool, accounting for the information derived both from DVH (dose volume histogram) and isodose distribution. It can assist physician/planner to evaluate and optimize treatment plans for target coverage and normal tissue sparing.