

AbstractID: 8772 Title: Use of deformable image registration in generating composite plans over multi treatment modalities and multi-stage planning

Purpose: Currently there are no commercially available tools to generate composite plans when the individual plans were generated on different image sets. Without a composite plan, some of the important dosimetrical parameters, such as the overall tumor coverage, the volume irradiated of critical structures are difficult to obtain for the overall treatment evaluation. This paper introduces a method to generate composite plans over multi radiotherapy treatment modalities, and multi-stage plans using deformable image registration.

Method and Materials: Two cases were studied. Case 1 was a prostate cancer with external beam IMRT and interstitial seed implant. Case 2 was a lung cancer with two treatment plans based on two separate CT image sets. . Thin-plate spline (TPS) and optical flow method (OFM) were used to generate deformation image maps. The deformations were verified by mapping the deformed image set back to the original image set and comparing. The deformation matrices were then applied to the dose matrices and doses were summed. In the case of the prostate cancer a local biological effective dose (BED) correction was applied prior to the deformation and sum.

Results: The mapping of the deformed image set back to the original showed agreement within a voxel in over 99% of the volume. Composite plans and DVH were generated for both the cases. The use of local BED showed significant changes in doses to normal tissues.

Conclusion: The generated composite plans using deformable image registration are informative and valuable in overall treatment plan evaluation. The use of local BED calculations must be included when combining treatment modalities such as Brachytherapy and external beam.

Conflict of Interest (only if applicable): None