AbstractID: 8799 Title: Dynamic jaw for helical TomoTherapy delivery

Purpose:
To implement dynamic jaw for helical TomoTherapy[SM] delivery and to investigate its impact on dose distribution.

Method and Materials:
A dynamic jaw technique called running start and stop near tumor-normal tissue boundary is to achieve conformal dose distribution at the beginning and end of a tumor region along couch motion direction. Due to finite jaw width and finite maximum jaw speed, two strategies, conformal tumor coverage and conformal organ-at-risk (OAR) avoidance, are implemented. Motion of the jaws follows a chosen strategy given information of longitudinal lengths of tumor regions and OARs, couch speed and the maximum jaw speed. A conceptual simulation was made to demonstrate benefit gained with the strategies. Multiple tumor sites and OARs with different longitudinal lengths are simulated. Longitudinal dose distributions with running start and stop are compared with that of a fixed jaw width.

Results:
For single tumor site or multiple tumor sites with OAR between them wider than the preselected stationary jaw width plus a small margin determined by the maximum jaw speed, both strategies produce the same longitudinal conformal dose distribution and OAR avoidance. In cases of an OAR between two tumor regions narrower than the stationary jaw width, conformal tumor coverage strategy provides longitudinal conformal dose distribution for tumor regions and the OAR between tumors also receives some lower amount of dose. On the other hand, conformal OAR avoidance strategy provides longitudinal conformal avoidance while dose at the beginning of the adjacent tumor region is lower than that delivered with the fixed jaw width using the same sinogram.

Conclusion:
Dynamic jaw can produce longitudinal conformal dose distribution at the beginning and end of tumor regions. Conformal tumor coverage and OAR avoidance can be both achieved if the OAR between tumors is wider than the stationary jaw width plus a small margin.