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Abstract

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Target Contour Consistency during MR-Guided On-Line Adaptive Stereotactic Body Radiotherapy (SBRT)

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Abstract

Objectives:

Online magnetic resonance-guided adaptive radiation therapy (MRgART) requires expeditious recontouring of target volumes based on the anatomy of the day. Contouring of the gross tumor volume (GTV) is frequently performed by covering radiation oncologists who may be less familiar with the case than the attending radiation oncologist. Thus, the objective of our work is to determine consistency in GTV contouring between attending and covering radiation oncologists and to analyze the effect of different resources to support accurate GTV delineation.

Methods:

Between 2021-2023, 72 patients underwent 337 fractions of MR-guided SBRT at our institution of which 286 (84.9%) fractions were adapted. GTV volumes were analyzed for the effect of three different types of contour support resources that were developed over time: a) information on number of slices of the original GTV volume; b) adding external contouring software displaying original GTV contours, and c) adding alert if GTV volumes differed >10% from the original GTV. Differences between physicians and contour resources were analyzed for different tumor sites using a two-tailed t-test.

Results:

100 out of 286 (35%) adaptive treatments were supervised by a covering physician. The difference in the mean absolute percent change of GTV volume compared to original GTV volume for the attending (13.6%) vs covering physician (7.8%) across all treatment fractions was statistically significant ($p=0.00014$). Significant differences were observed for pancreas (12.5% vs 5%, $p=0.023$), liver (13.7% vs 4.9%, $p=0.01$) and lymph node GTVs (15.7% vs 3.9%, $p=0.008$) with larger volume differences for attending physicians. No significant differences were observed for tumors of the prostate (3.7% vs 3.6%) and adrenal glands (11.9% vs 17.7%). While GTV volume differences between attending and covering physicians were significant after implementing display of original GTV contour ($p=0.004$), but in overall, no major differences between the three contour support techniques were observed.

Conclusion(s):

Our results show larger GTV changes by attending radiation oncologists during plan adaptation for most tumor sites with little impact from contour support resources. Observed differences might be related to higher contouring confidence of attending physicians who are more familiar with the case. Further investigation, including dose coverage analysis, is warranted.