JULY 12–16 2020 VIRTUAL JOINT AAPM | COMP MEETING
EASTERN TIME [GMT-4]

Evaluation of an Artificial Intelligence (AI) Based Auto Contouring Workflow Box for Head and Neck Radiotherapy

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INTRODUCTION

AI based CT image contouring can achieve near-expert level contouring for organs at risk since it is based on a large training dataset and can minimize inter-institutional and inter-user contouring variations. Mirada workflow box (MWB)[1] is an AI based auto contouring tool that has multiple available models for various treatment sites. In this study, we evaluated the contouring quality and efficiency with the current Head and Neck (H&N) model from Mirada workflow box.

AIM

To evaluate the quality and efficiency of the Head and Neck (H&N) model for an AI based auto contouring tool.

METHOD

A total of 22 patients treated in 2019 at a local community hospital were included in this study. Planning CT images were sent directly to the AI based contouring tool, Mirada workflow box (MWB), to create auto contours which were automatically transferred to the treatment planning system. Organ at risks (OARs) evaluated in this study include brainstem, mandible, left parotid, right parotid, and spinal cord. These OARs were also contoured manually, either from scratch or through modification of the MWB contour by experienced dosimetrists. 3D Dice Similarity coefficients (DSC)[2] were calculated for each organ between the manual and auto contours. Auto contour time efficiencies were also evaluated.

RESULTS

Calculated DSC scores for each organ are listed in Table 1. The mandible achieved highest DSC, likely due to high contrast on CT (see Fig 1(a)). Spinal cord achieves the lowest DSC due to contouring range (slice) differences between MWB and the planning expert (see Fig 1(b)). The H&N model of MWB is AI based which was built upon data from 698 H&N patients and can generate up to 22 structures for a typical H&N patient within 5 minutes. For mandible and spinal cord OARs, contour modification can usually be performed within 3 minutes, while it may take 5-10 minutes on average for parotid and brainstem contour modification.

DSC	brainstem	mandible	Left parotid	Right parotid	Spinal cord
Mean	0.73	0.86	0.75	0.69	0.61
Std	0.09	0.09	0.13	0.14	0.11

Table 1: DSC (Mean and Standard Deviation) for each structure

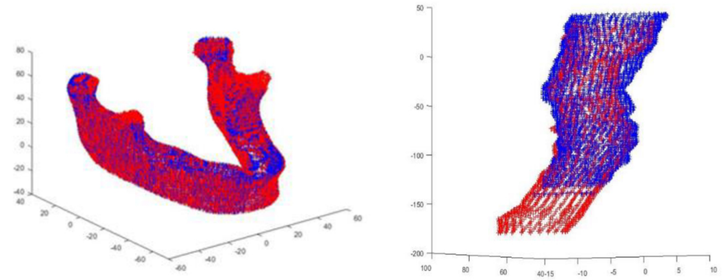

Fig 1: Contour comparison between manual (red) and auto contours (blue). (a) mandible (b) spinal cord 00

CONCLUSIONS

The H&N model of Mirada Workflow Box archives good agreement with expert contours for OARs, especially structures with high image contrast such as the mandible. Future work includes revising the model by including institutional data and evaluating both quality and contouring efficiency improvements.

REFERENCES

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ACKNOWLEDGEMENTS

Thanks for the Northwestern Lake forest RadOnc team and the support of Doug Philips from Mirada.

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