

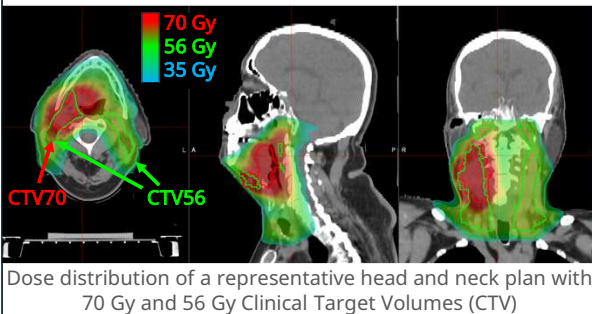
Re-evaluating PTV Margin Requirements In Head And Neck Radiotherapy With Daily Image Guidance: Effects On Target Coverage And OAR Dose

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Motivation

- **Planning target volume (PTV) margins** account for setup uncertainty and interfraction anatomical variation in head and neck radiotherapy.
- The standard **5 mm CTV56 PTV margin** provides target coverage but increases irradiation of normal tissues, contributing to treatment-related toxicities
- **Previous clinical studies have demonstrated that reducing PTV margins to 3 mm with daily image guidance maintains locoregional control** while reducing treatment-related toxicity*
- Limited evidence exists evaluating cumulative dose delivered using **deformable dose accumulation** to confirm that reduced margins maintain target coverage throughout treatment while **improving organ-at-risk (OAR) sparing**
- This study investigates whether reducing the CTV56 PTV margin from **5 mm to 3 mm** maintains **target coverage** while **reducing dose to surrounding OARs** using weekly CBCT-based deformable dose accumulation



Methods

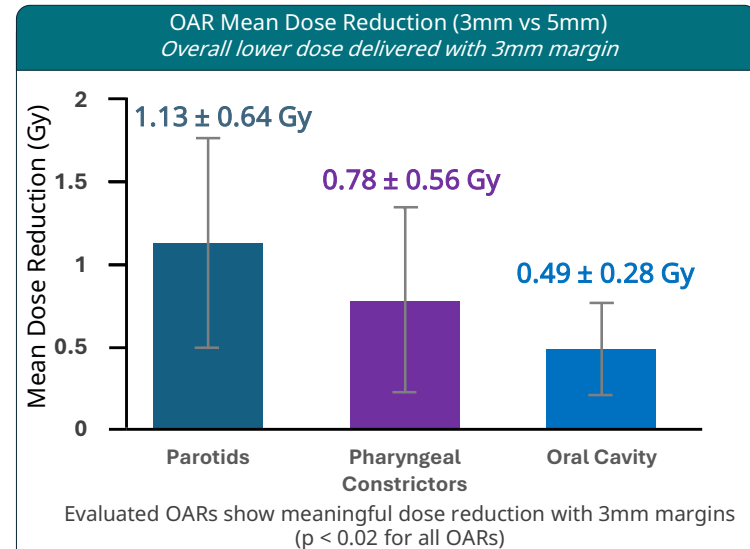
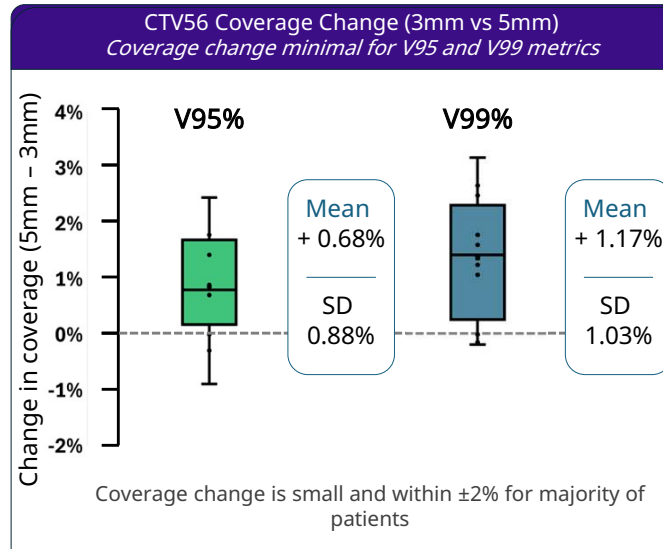
- Retrospective analysis of **10 head and neck cancer patients**
- Clinical plans used a **5 mm PTV margin** for nodal CTV56 structures and a **3 mm PTV margin** for CTV70
- Each patient was **replanned with a 3 mm nodal PTV56 margin**, while maintaining the original prescription dose and planning objectives
- **Weekly CBCT images** were used to recalculate delivered dose throughout treatment to account for **patient weight changes**
- **Deformable image registration** was performed to accumulate dose over the full **7-week treatment course**
- DVH metrics were evaluated for CTV56 cumulative coverage
- Mean doses to the **parotid glands, pharyngeal constrictors, and oral cavity** was assessed and statistical analysis was performed to **compare the 3 mm and 5 mm nodal margin metrics**

IGRT + Weekly CBCT



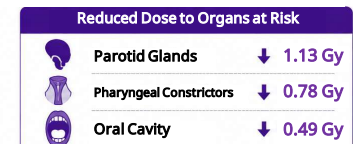
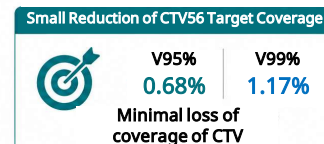
Deformable dose accumulation over 7 weeks

Results



Conclusions

Reducing the CTV56 PTV margin from **5 mm to 3 mm** showed minimal change in **target coverage** while **reducing dose to the parotid glands, pharyngeal constrictors, and oral cavity**



These results suggest that **nodal margin reduction is feasible** with modern **image guidance** and may **reduce treatment-related toxicity** with **minimal reduction in nodal coverage**

References

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- *Navran A, et al. Reducing margins in head and neck radiotherapy with daily image guidance decreases toxicity without compromising oncological outcomes. Radiother Oncol. 2019.
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