

Evaluation of the IDENTIFY™ Optical Surface Guidance System for Craniospinal Irradiation Patient Positioning

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Introduction

- Craniospinal irradiation (CSI) patient positioning has three steps: Lasers & tattoos, kV orthogonal imaging, and cone beam CT (CBCT). This ensures accurate treatment of the brain and spine.

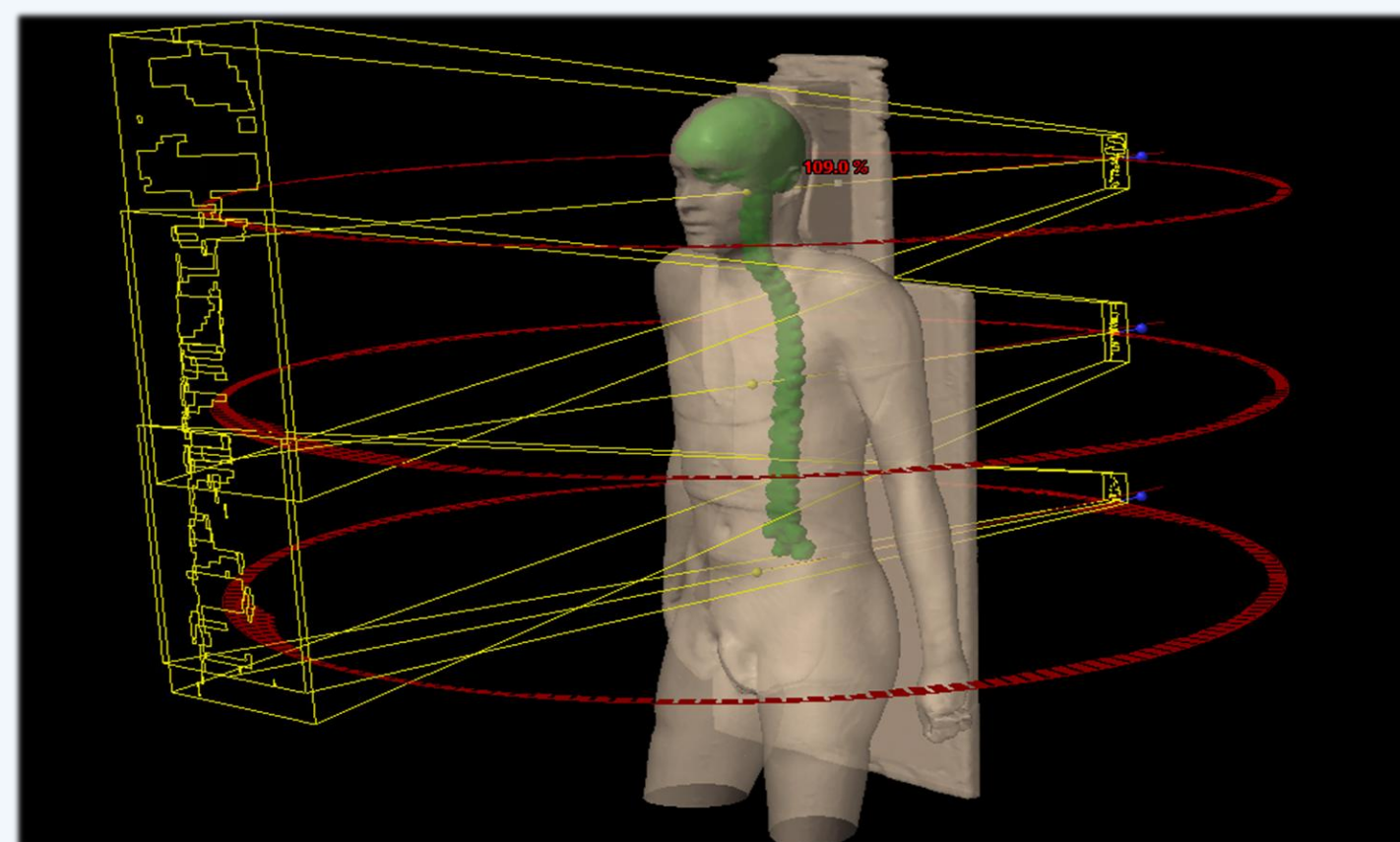


Figure 1. A multi-isocenter treatment plan for CSI. Patients are positioned headfirst supine, PTV in green.

Can IDENTIFY™ be used for CSI patient positioning to reduce time and kV orthogonal imaging?

Methods

Phantom Study

- An articulating anthropomorphic phantom was used as a surrogate CSI patient.
- In 15 trials, the phantom was positioned on the treatment couch with intentional translational and angular offsets relative to its CT simulation.
- In each trial, the six degree-of-freedom (DoF) position of the phantom's isocenters were recorded using both kV imaging and IDENTIFY™¹.

Patient Study

- CSI patients were positioned with assistance from IDENTIFY™, followed by kV orthogonal imaging, CBCT, and treatment.
- During imaging, patient position at the upper and lower isocenters was recorded using both kV images and IDENTIFY™.
- The number of images and total imaging and treatment time were recorded and compared to 20 retrospective patients positioned without IDENTIFY™.
- To date, position data from 30 fractions (3 patients, 10 fractions each) have been analyzed; analysis and collection is ongoing.

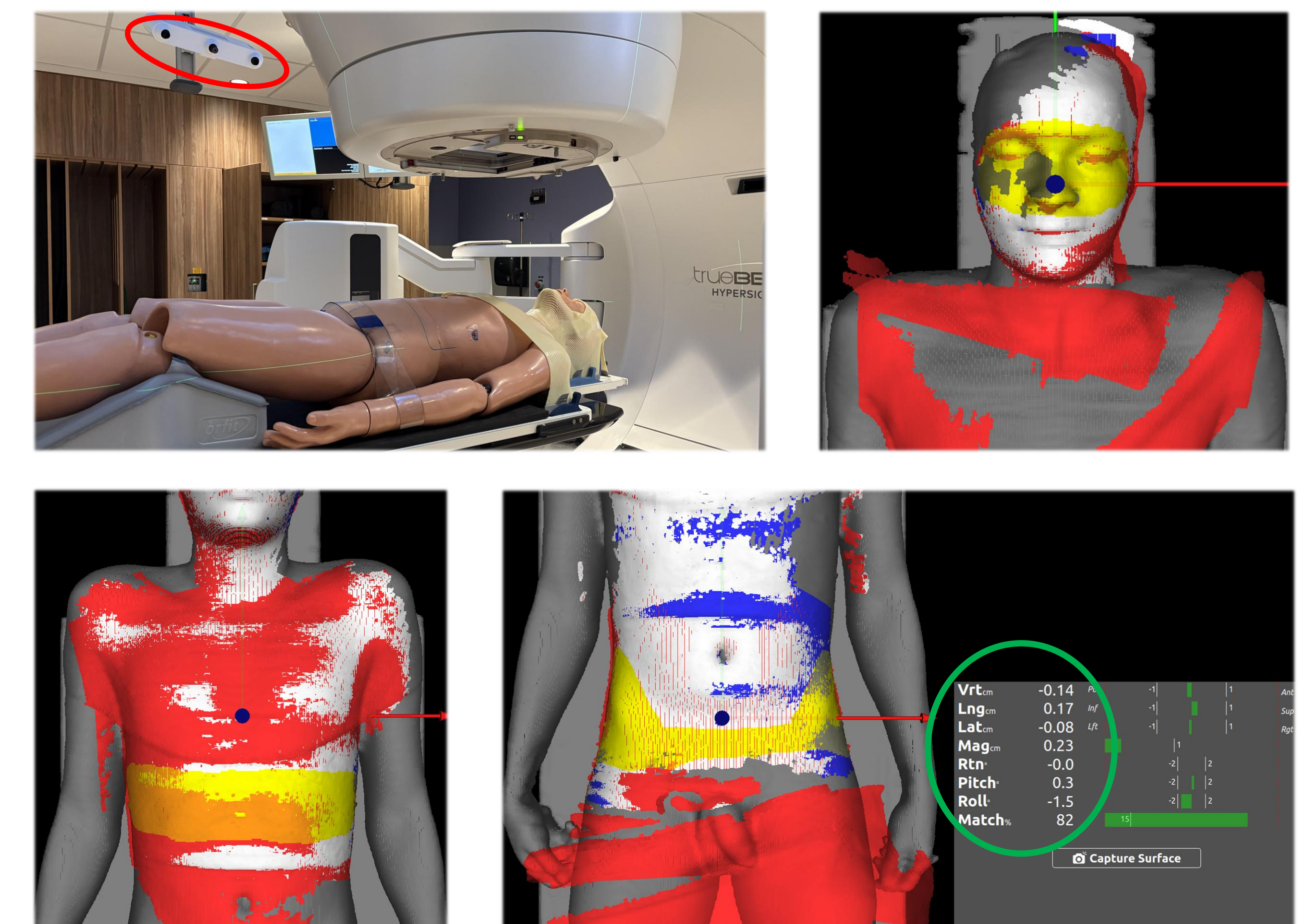


Figure 2. Phantom setup (top left) with stereoscopic IDENTIFY™ camera pod (red oval). Real-time IDENTIFY™ output (top right, bottom left & right) for CSI, numerical position data (green oval) evaluated from (yellow) region of interest.

Results

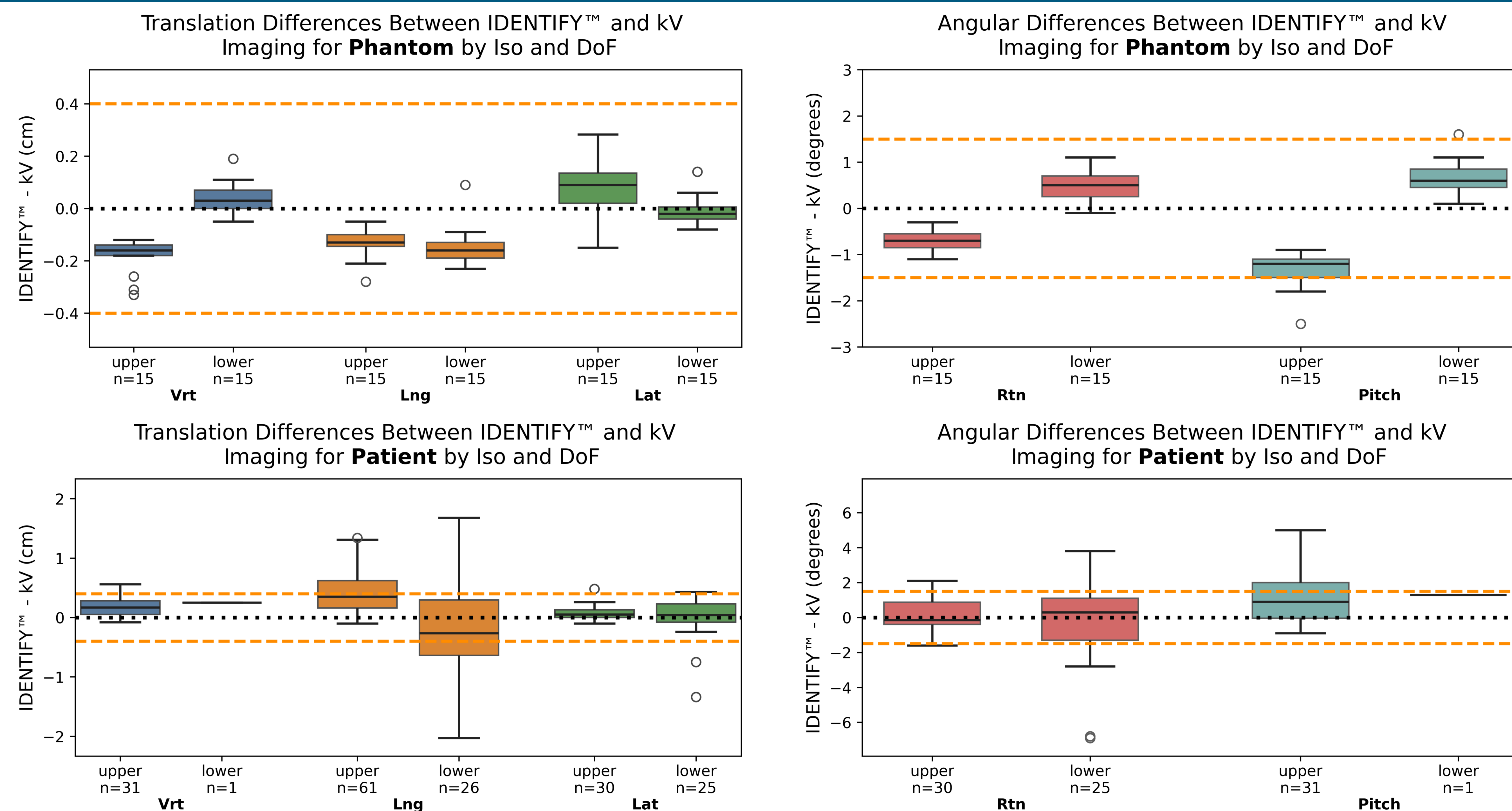


Figure 3. Translation and angular differences between IDENTIFY™ and kV for phantom and patient data, grouped by isocenter and degree of freedom. Boxes show the interquartile range, the solid black line the median, whiskers extend to 1.5× the interquartile range, and hollow circles indicate outliers. The black dotted line denotes zero difference, and orange dashed lines indicate institutional alignment tolerances for reference. Sample size (*n*) varies according to the availability of anterior-posterior and/or left-right kV images at each isocenter.

Discussion

- IDENTIFY™ was consistent with kV orthogonal imaging in both the phantom and patient studies within institutional tolerances.
- Compared with 20 retrospective patients, these three patients showed an average reduction of 8.8 minutes and 3.6 fewer kV images per fraction.
- Data collection and analysis are ongoing to determine whether IDENTIFY™ can fully replace kV orthogonal imaging for CSI positioning.

Conclusion

A preliminary IDENTIFY™ assisted CSI patient positioning workflow saved time and reduced kV imaging.



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References

1. Varian Medical System, Palo Alto, CA