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RADIOTHERAPY

# Rotation correction for prostate tumours

New data show that kilovoltage intrafraction monitoring (KIM) can be used to adapt radiation treatment to compensate for rotational and translational movement of prostate tumours.

During radiotherapy sessions prostate tumours are not immobile, but undergo translational and rotational shifts owing to, for example, spontaneous bowel movements. This displacement from the predetermined radiation beam focus can decrease treatment efficacy and increase toxicity in normal tissues.

In their recent study, Chen-Yu Huang and colleagues used KIM to determine six-degrees-of-freedom motion between and during radiation fractions, focussing their analysis on the rotational tumour movement. The team evaluated continuous images acquired during a total of 267 radiation fractions from 10 prostate tumours with gold fiducial markers.

The average rotation angles determined from interfractional and intrafractional images (using the first image of the first treatment as reference) were 0.7° ± 5.5°, 0.8° ± 3.0° and 0.1° ± 2.0° (mean ± SD) around the left-right, superior-inferior and anterior-posterior axes, respectively. Notably, in some instances rotations of >30° were observed and for >35% of the total treatment time the tumours rotated >5° around the left-right axis.

Translational motion patterns (such as persistent, transient, high-frequency or erratic motion) have previously been described and are important for effective real-time adaptation systems. Although intrafractional tumour rotation was generally unpredictable, Huang and co-workers observed rotational analogues of these patterns.

In the future, this approach could enable six-degrees-of-freedom adaptive radiation therapy and possibly reduce treatment margins, using the linear accelerator hardware that is widely used today.

*Clemens Thoma*

**Original article** Huang, C. Y. *et al.* Six degrees-of-freedom prostate and lung tumor motion measurements using kilovoltage intrafraction monitoring. *Int. J. Radiat. Oncol. Biol. Phys.* doi:10.1016/j.ijrobp.2014.09.040