A promising step forward in prostate cancer treatment

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When treating prostate cancer with radiotherapy, knowing the prostate cancer position is critical to accurately targeting the radiation beam to avoid missing the tumour and irradiating healthy tissue. Prostate cancer patients being treated with radiotherapy can now have their prostate position known to within 0.5mm during radiation treatment thanks to a study led by Professor Paul Keall, NHMRC Australia Fellow at the University of Sydney.

In a world-first the new prostate cancer tracking system has been implemented in a 10-patient pilot study at the Royal North Shore Hospital. The technique termed 'KIM' for Kilovoltage Intrafraction Monitoring uses X-rays during the radiation treatment to measure the position of markers implanted into the prostate though a novel two-dimension-to-three dimension calculation method.

The system was originally conceived at Stanford University in 2008 by two of the investigators of this research, Professor Keall and Associate Professor Per Poulsen, and is a collaboration between the University of Sydney, Royal North Shore Hospital and Aarhus University in Denmark. In the current study, prostate cancer motion of over 10mm was seen during treatment.

The overall accuracy of the system was higher than 0.5mm, better than other dedicated commercial prostate monitoring systems that can be purchased but have not been widely implemented in clinical practice. As well as being more accurate, an additional advantage of the KIM system

over the dedicated systems is that it uses readily available radiation therapy equipment, so there is enormous potential for low cost routine use of the system worldwide.

"KIM is exciting for patients because it's going to open up a new area of radiation oncology, real-time tumour tracking," said Dr Thomas Eade, a radiation oncologist at the Royal North Shore Hospital. "But, it could potentially be available to all cancer radiotherapy patients that are treated using standard machines."

Using the KIM system X-rays to measure the prostate motion adds a small amount of additional imaging dose delivered to the patient - approximately one percent of the treatment dose in the current studies, though there is potential for improvement. "KIM was implemented within the constraints of an existing clinical cancer radiotherapy system," said Professor Paul Keall. "We have several ideas to explore to make the system even more accurate with lower imaging dose."

In the future, the research team plan to use the KIM information to pause and adjust the treatment when the prostate cancer position moves beyond the target of the radiation beam. Ultimately, they plan to continuously align the radiation beam with the cancer throughout the treatment.

More information: A paper based on this work has been accepted for publication in the *International Journal of Radiation Oncology, Biology, Physics*.

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