Team improves radiation therapy for head and neck patients

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Radiation therapy is one of the most common treatments used to fight cancer, with an estimated 500,000 people each year receiving radiation therapy either alone or in combination with other treatments. Patients are often treated with a "one-size-fits-all" approach of a particular radiation dose and schedule according to tumor type, location, and the stage of growth. However, different patients with similar tumor types, location, and stage may have different results after radiation therapy - with improvement seen in one patient, but not in the other. Physician scientists at Moffitt Cancer Center hope to change this approach to radiation therapy. Their discoveries are primed to place Moffitt at the forefront of a new era in personalized radiation therapy for head and neck cancer patients, as described in their recent article in the May issue of *The Lancet Oncology*.

"Just as every person is different, every person's cancer might be very different and therefore require a very different course of radiotherapy. Yet, clinicians have been unable to make the distinction required to biologically personalize radiotherapy treatment," explained Louis B. Harrison, MD, chair of the Radiation Oncology Department at Moffitt

Moffitt researchers have developed a test called the radiosensitivity index that determines how sensitive a patient's tumor is to radiation therapy. The radiosensitivity index is based on the expression of different genes in a patient's tumor and has been validated in 9 different patient groups across different tumor types. The researchers are able to use the radiosensitivity index within a mathematical framework to select

the optimum radiotherapy dose for each patient based on their individual tumor biology. The researchers are in the process of developing the first clinical trial to test their genomic-adjusted radiation dose in patients with squamous cell carcinoma of the oropharynx.

"We propose to explore how we can move away from a one-size-fits-all approach to radiotherapy treatment for [patients](#) with head and neck cancer, and to develop evidence with which to guide personalization and biological adaptation of radiotherapy to improve outcomes and reduce toxicity," said Jimmy J. Caudell, MD, PhD, associate member and section head of Head and Neck Radiation Oncology at Moffitt.

Researchers are also making advances in the field of radiomics - the use of MRI, CT and PET scans to characterize tumors by imaging features not fully captured by the naked eye. Radiomics models might inform physicians not just about anatomy, but cellular and gene features which may impact treatment and prognosis. "Biopsies are limited by the fact that they are acquired at a single timepoint and from a single anatomical location. Radiomics might be able to provide enough information for a virtual 3D biopsy where the entire tumor can be sampled non-invasively and repeatedly," said Harrison.

The researchers also believe that integrated mathematical oncology offers a unique approach to develop more personalized radiation therapy. Integrated mathematical oncology uses experimental and clinical data to build models to predict a patient's response to radiation treatment. This allows scientists to conduct experiments that would be impossible with common laboratory techniques.

The researchers hope that the advances being made in precision medicine at Moffitt will continue to innovate the field and bring clinicians closer to a personalized treatment approach with [radiation therapy](#), while simultaneously improving patient outcomes and reducing

treatment complications.

Provided by H. Lee Moffitt Cancer Center & Research Institute

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