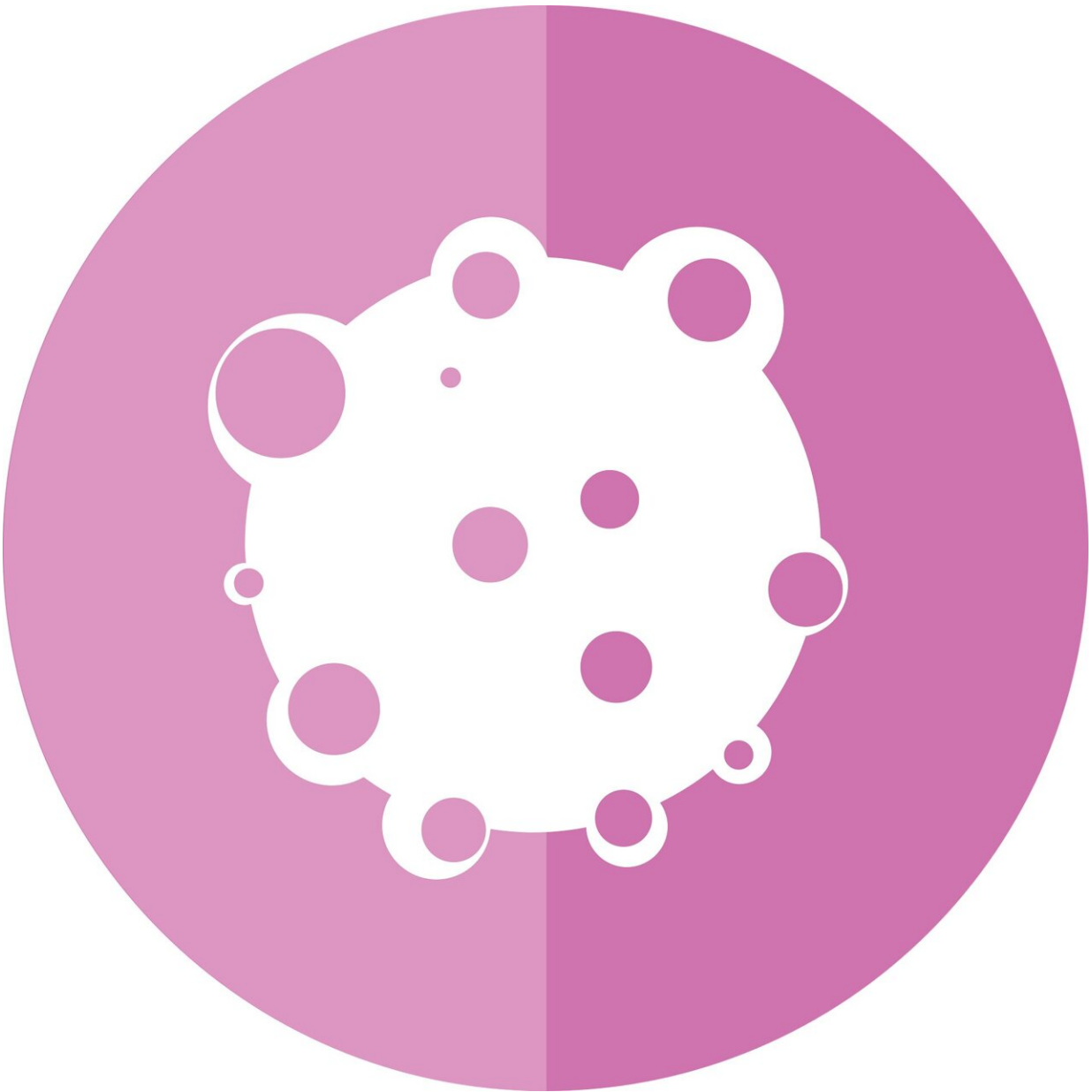


New scan measures tumor oxygen levels in real-time to help guide treatment

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Imaging researchers have taken a major step towards their ultimate goal of identifying cancers that are starved of oxygen so that altered treatment can be used to target them more effectively.

The study led by a team of researchers from the University of Manchester, the Institute of Cancer Research, London, University College London and the University of Leeds, is published in the journal *Radiotherapy and Oncology*.

The breakthrough was achieved by combining two cutting edge technologies: the research team adapted an MRI scanner that also delivers [radiotherapy](#)—called MR-Linac—to be able to also measure [oxygen levels](#) in tumors.

Tumors starved of oxygen are difficult to treat

Researchers have known since the 1950s that when tumors are starved of oxygen they are difficult to treat effectively, a problem which is particularly true when doctors give radiotherapy.

Despite this knowledge, [patients](#) with cancer do not get routine tests to evaluate tumor oxygen levels because no single test has been developed that is precise, accurate, cost effective and readily available.

Mapping oxygen levels in real time

The 11 patients with head and [neck cancer](#) in the study, treated at The Christie Hospital, were successfully scanned on the MR-Linac machine

and, for the first time, maps of oxygen levels were obtained. However, the technology is relevant to most cancers.

The patients first breathed room air through a mask and then pure oxygen to bathe the tumor with the gas.

Parts of the cancer that had good levels of oxygen responded differently to those that were oxygen depleted, so the technique—called 'oxygen-enhanced MRI'—revealed which parts of the tumor were oxygen starved and likely to be resistant to radiotherapy.

Lead author Professor James O'Connor, Professor of Quantitative Biomedical Imaging at The Institute of Cancer Research, London and clinician scientist at The University of Manchester and The Christie Hospital NHS Foundation Trust, said, "Though it's clear more work needs to be done, we're very excited about the potential this technology has to enable daily monitoring of tumor oxygen and we hope to be at a point soon when the technology will guide cancer doctors in how they can best deliver radiotherapy.

"This imaging lets us see inside tumors and helps us understand why some people with [cancer](#) need an extra boost to get effective treatment. This is an important step towards the goal of changing treatment based on imaging biology."

First author Dr. Michael Dubec, from The University of Manchester and The Christie, said, "The MR-Linac is an exciting technology that combines highly precise imaging and radiotherapy delivery that allows for real-time imaging.

"We are tremendously excited about what is the first application in humans of '[oxygen](#)-enhanced MRI,'" developed as a result of a multi-disciplinary team working across the country which has exciting

implications on patient outcomes."

More information: Michael J Dubec et al, First-in-Human Technique Translation of Oxygen-Enhanced MRI to an MR Linac System in Patients with Head and Neck Cancer, *Radiotherapy and Oncology* (2023). [DOI: 10.1016/j.radonc.2023.109592](https://doi.org/10.1016/j.radonc.2023.109592)

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