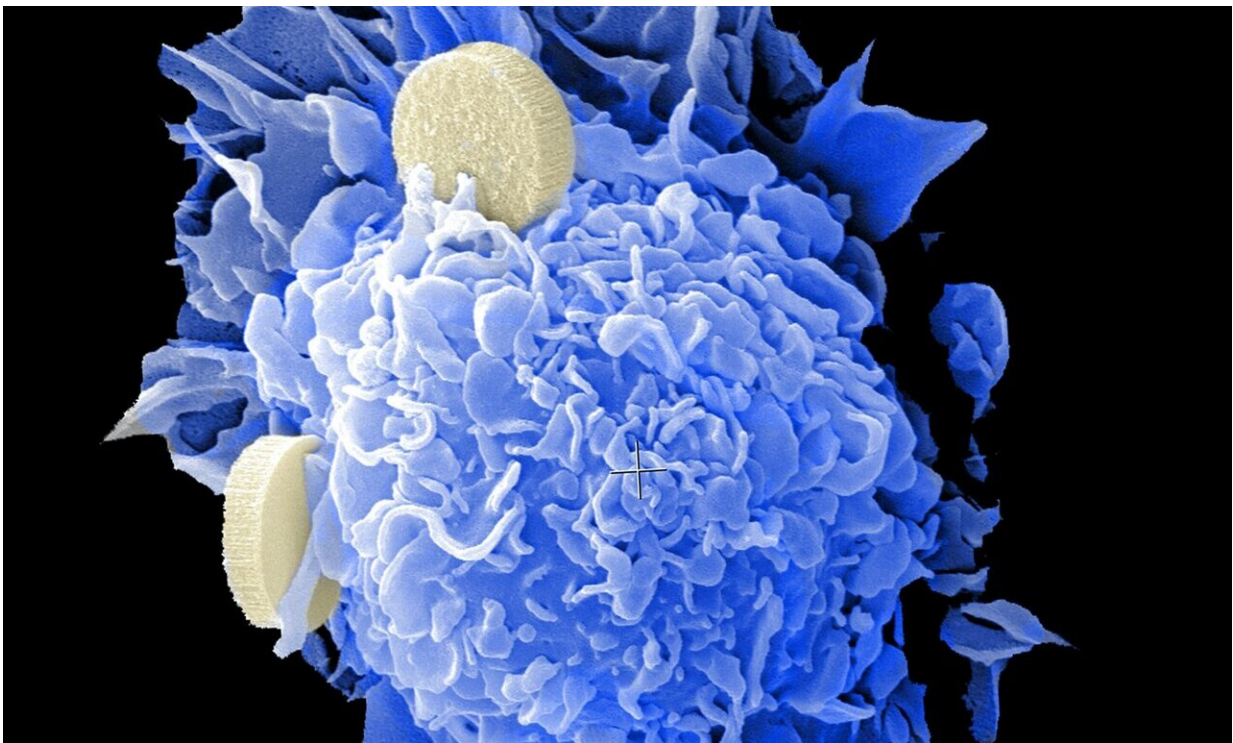# Artificial intelligence tool predicts treatment response and survival in small cell lung cancer patients

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Credit: Unsplash/CC0 Public Domain

Researchers at the Center for Computational Imaging and Personalized Diagnostics (CCIPD) at Case Western Reserve University have used artificial intelligence (AI) to identify patterns on computed tomography

(CT) scans that offer new promise for treating patients with small cell lung cancer.

Small cell lung cancer (SCLC) represents about 13% of all lung cancers, but grows faster and is more likely to spread than non-small cell lung cancer, according to the American Cancer Society.

And while a lot of AI research has been performed on non-small cell lung cancer, little work has been done on SCLC, said CCIPD Director Anant Madabhushi, the Donnell Institute Professor of Biomedical Engineering at Case Western Reserve.

Small cell lung cancer patients can be challenging to treat, Madabhushi said. His lab worked with oncologists at University Hospitals in Cleveland to help ascertain which SCLC patients would respond to treatment.

The researchers identified a set of radiomic patterns from CT scans taken before treatment that allow them to predict a patient's response to chemotherapy. They also examined the association between AI-derived image features with longer-term outcomes.

Specifically, the researchers noted that computationally extracted textural patterns of the tumor itself—as well as the region surrounding it—were found to be different in SCLC patients who responded well to a certain chemotherapy, compared to those who did not.

Further, patterns were revealed by the AI that corresponded to patients who ended up living longer after treatment compared to those who did not.

Finally, the AI revealed that there was notably more heterogeneity, or variability, in the scanned images of patients who did not respond to

chemo and had poorer chances of survival, Madabhushi said.

What's next: Possible human trials

These findings from a [retrospective study](link) now sets the stage for prospective AI driven clinical trials for treatment management of SCLC patients, Madabhushi said.

Results from the research were published in *Frontiers in Oncology* in October.

Their findings are significant because chemotherapy remains the backbone of systemic treatment, the researchers said.

"Even though most patients respond to initial treatment, relapse is common and a subset of patients are chemo-resistant," said Prantesh Jain, co-lead author of the study while with the Department of Hematology and Oncology at University Hospitals. He's now an assistant professor of oncology at Roswell Park Comprehensive Cancer Center in Buffalo.

"Currently," Jain said, "there are no clinically validated predictive biomarkers to select a subpopulation of patients with primary chemoresistance or early recurrence."

Broader AI initiative

The study is part of broader research conducted at CCIPD to develop and apply novel AI and machine-learning approaches to diagnose and predict therapy responses for various diseases and indications of cancer, including breast, prostate, head and neck, brain, colorectal, gynecologic and skin cancer.

"Our efforts are aimed at reducing unnecessary chemotherapeutic treatments and thus reducing patient suffering," said the study's co-lead author Mohammadhadi Khorrami, a CCIPD researcher and Ph.D. student in biomedical engineering at Case Western Reserve.

"By knowing which patients will benefit from therapy, we can decrease ineffective treatments and increase more aggressive therapy in patients who have suboptimal or no response to the first-line therapy."

More information: Prantesh Jain et al, Novel Non-Invasive Radiomic Signature on CT Scans Predicts Response to Platinum-Based Chemotherapy and Is Prognostic of Overall Survival in Small Cell Lung Cancer, *Frontiers in Oncology* (2021). DOI: 10.3389/fonc.2021.744724

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