AI applied to prediagnostic CTs may help diagnose pancreatic cancer at earlier, more treatable stage

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A study published in *Gastroenterology* finds that radiomics-based machine learning models may detect pancreatic cancer on prediagnostic

CT scans substantially earlier than current methods for clinical diagnosis.

"Pancreatic cancer is a deadly disease and a leading cause of cancer-related death," says Ajit Goenka, M.D., a Mayo Clinic diagnostic radiologist and the study's senior author.

Dr. Goenka says that while early detection enhances the chances for successful treatment, standard imaging cannot detect early pancreatic cancer.

"Up to 40% of small pancreas cancers may not show up on standard imaging. As a result, the majority of patients present with advanced and noncurable disease," says Dr. Goenka.

For this reason, Dr. Goenka and his colleagues looked to incorporate artificial intelligence (AI) into radiological screening to detect pancreatic cancer at an earlier, more curable state. "We found that AI models can detect cancer from a normal-appearing pancreas on CTs several months prior to cancer symptoms, even when the disease was beyond the scope of perception of radiologists."

For the study, researchers computationally extracted the imaging signature of early cancer from CTs. Prediagnostic CTs are CTs that were done for unrelated indications between three months and three years prior to cancer occurrence.

Next, they used an age-matched group of control subjects who did not develop pancreatic cancer during three years of follow-up. Expert radiologists then segmented the pancreas on CTs from both groups and computationally extracted and quantified the metrics of pancreas tissue heterogeneity.

Next, researchers built advanced machine learning models that could

predict the future risk of pancreatic cancer at a median time of 386 days, a range of 97 to 1,092 days, prior to clinical diagnosis with accuracies that ranged from 94% to 98%.

"In comparison, radiologists were unable to reliably differentiate between patients who went on to develop cancer versus those who had normal pancreas," says Sovan Mukherjee, Ph.D., a senior data science analyst in Dr. Goenka's team and the study's first author. "We also tested our AI models against variations in image noise, scanner models, image acquisition protocols and postprocessing parameters, and found them to be unaffected by these variations."

Dr. Goenka says this level of testing is necessary for the potential deployment of this technology in clinical practice. Finally, researchers validated the high specificity—96.2%—of the AI model on an open-source CT data set to further increase the reliability of the AI methodology.

"Our study demonstrates that artificial intelligence can identify those asymptomatic people who may harbor an occult cancer at a stage when surgical cure may be possible," says Dr. Goenka. "These findings may help overcome one of the key barriers to improving survival for patients with pancreatic cancer."

More information: Sovanlal Mukherjee et al, Radiomics-Based Machine Learning Models Can Detect Pancreatic Cancer on Prediagnostic CTs at a Substantial Lead Time Prior to Clinical Diagnosis, *Gastroenterology* (2022). DOI: 10.1053/j.gastro.2022.06.066

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