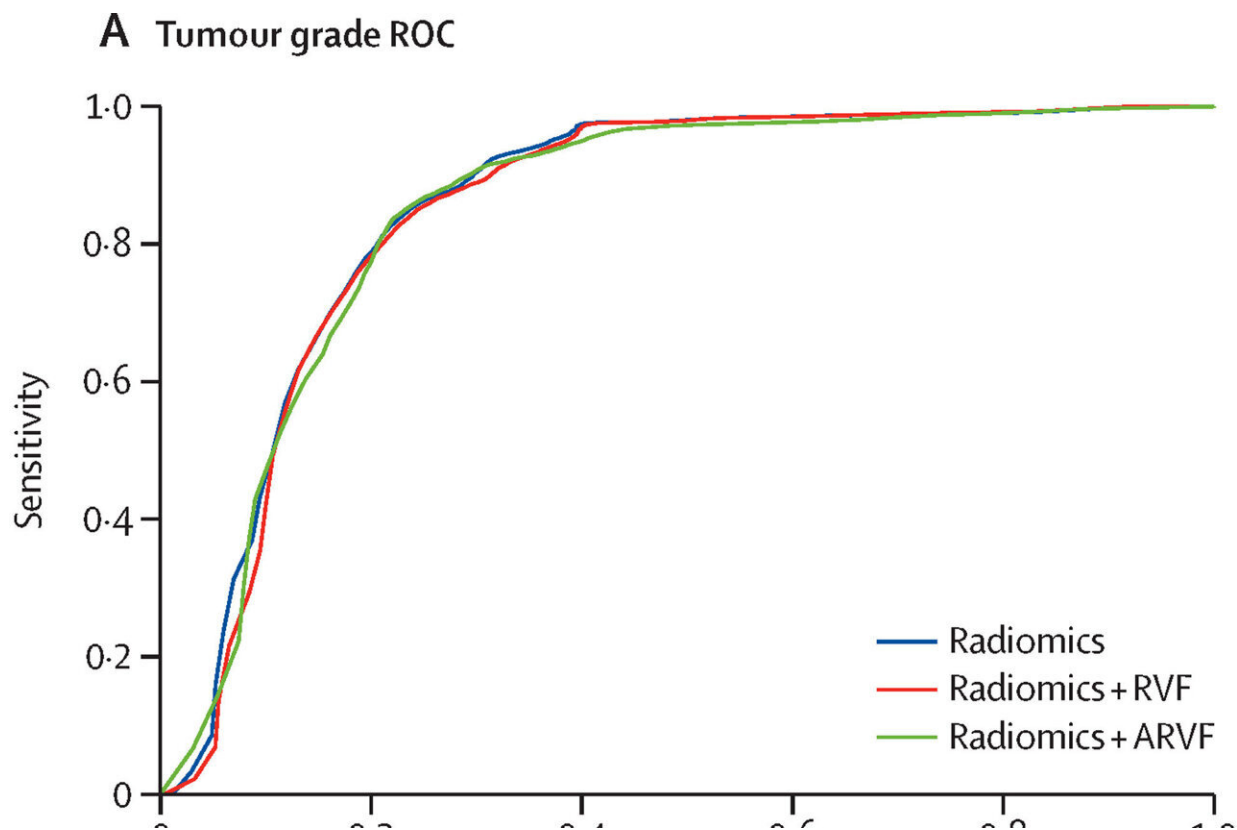


AI twice as accurate as biopsy at grading aggressiveness of some sarcomas

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The performance and feature selection for the final tumor grade prediction model developed from the discovery dataset (A) ROC of the three feature combinations tested with radiomics (blue), radiomics plus RVF (red), and radiomics plus ARVF (green). Radiomics had the highest area under the ROC. (B) The selection frequency of features across cross-validation splits for the radiomics feature set, as a function of the threshold used in the hierarchical correlation feature reduction step (0-93). ARVF=approximate radiomic volume fraction. ROC=receiver operating characteristic. RVF=radiomic volume

fraction. Credit: *The Lancet Oncology* (2023). DOI: 10.1016/S1470-2045(23)00462-X

Artificial intelligence (AI) could be around twice as accurate as a biopsy at grading the aggressiveness of some sarcomas, according to new research from The Royal Marsden NHS Foundation Trust and The Institute of Cancer Research, London.

Results from the study, which have been published in [The Lancet Oncology](#), suggest that a new AI algorithm could help tailor the treatment of some [sarcoma](#) patients more accurately and effectively than a biopsy, an invasive procedure which is currently standard practice. The research also suggests that the technology could help clinicians diagnose subtypes of the rare [disease](#), speeding up diagnosis as a result.

Researchers believe the technique could be eventually applied to other [cancer types](#) too, potentially benefitting thousands of patients every year.

Soft tissue sarcoma is a type of cancer that develops in the body's connective tissues, including fat, muscles, nerves and blood and lymph vessels. It is a rare cancer, with around 4,295 people in England diagnosed each year and more than 50 different types. This study focused on retroperitoneal sarcoma, a [soft tissue sarcoma](#) which develops in the back of the abdomen and, due to its location and rarity, is currently hard to diagnose and treat.

AI algorithm

Researchers used the CT scans of 170 patients treated at The Royal Marsden with the two most common forms of retroperitoneal sarcoma—leiomyosarcoma and liposarcoma—to create an AI algorithm,

which was then tested on nearly 90 patients from centers across Europe and the U.S. They used a technique called radiomics to analyze the CT scan data, which can extract information about the patient's disease from medical images, including data which can't be distinguished by the human eye.

The model accurately graded the risk—or how aggressive a tumor is likely to be—of 82% of the tumors analyzed, while only 44% were correctly graded using a biopsy.

The model also accurately predicted the disease type of 84% of the sarcomas tested—meaning it can effectively differentiate between leiomyosarcoma and liposarcoma—compared with radiologists who were not able to diagnose 35% of the cases.

By giving clinicians a more accurate and effective way of grading tumors, researchers hope this technology will improve the management of the disease and outcomes. For example, as high-grade tumors can indicate aggressive disease, this tool could help ensure high-risk patients are identified and get amplified treatment, while low-risk patients could be spared unnecessary treatments, follow-up scans and hospital visits. It could also speed up diagnosis of the disease by supporting clinicians—who may never have previously seen a retroperitoneal sarcoma due to its rarity—in more accurately identifying the subtype.

First author Dr. Amani Arthur, Clinical Research Fellow at The Institute of Cancer Research, London, and Registrar at The Royal Marsden NHS Foundation Trust, said, "There is an urgent need to improve the diagnosis and treatment of patients with retroperitoneal sarcoma, who currently have poor outcomes. The disease is very rare—clinicians may only see one or two cases in their career—which means diagnosis can be slow. This type of sarcoma is also difficult to treat as it can grow to large sizes and, due to the tumor's location in the abdomen, involve complex

surgery.

"Through this early research, we've developed an innovative AI tool using imaging data that could help us more accurately and quickly identify the type and grade of retroperitoneal sarcomas than current methods. This could improve patient outcomes by helping to speed up diagnosis of the disease, and better tailor treatment by reliably identifying the risk of each patient's disease.

"In the next phase of the study, we will test this model in clinic on patients with potential retroperitoneal sarcomas to see if it can accurately characterize their disease and measure the performance of the technology over time."

Study lead Professor Christina Messiou, Consultant Radiologist at The Royal Marsden NHS Foundation Trust and Professor in Imaging for Personalized Oncology at The Institute of Cancer Research, London, said, "This is the largest and most robust study to date that has successfully developed and tested an AI model aimed at improving the diagnosis and grading of retroperitoneal sarcoma using data from CT scans. Due to the rarity of the disease, this was a global effort and I'm immensely proud and thankful to the team.

"We're incredibly excited by the potential of this state-of-the-art technology, which could lead to patients having better outcomes through faster diagnosis and more effectively personalized treatment. As patients with retroperitoneal sarcoma are routinely scanned with CT, we hope this tool will eventually be used globally, ensuring that not just specialist centers—who see sarcoma patients every day—can reliably identify and grade the disease.

"In the future, this approach may help characterize other types of cancer, not just retroperitoneal sarcoma. Our novel approach used features

specific to this disease, but by refining the algorithm, this technology could one day improve the outcomes of thousands of patients each year."

Dr. Paul Huang, Group Leader in Molecular and Systems Oncology at The Institute of Cancer Research, London, said, "It's exciting to see AI—which is trained to spot incredibly subtle signs that a cancer is aggressive from a simple CT-scan—enable rapid diagnosis and classification of this rare type of sarcoma. Sarcomas represent a biologically complex group of cancers—encompassing many distinct types—and telling them apart with the human eye poses a formidable challenge, particularly outside of specialist centers.

"This kind of technology has the potential to transform the lives of people with sarcoma—enabling personalized treatment plans tailored to the specific biology of their [cancer](#). It's great to see such promising findings."

More information: Amani Arthur et al, A CT-based radiomics classification model for the prediction of histological type and tumour grade in retroperitoneal sarcoma (RADSARC-R): a retrospective multicohort analysis, *The Lancet Oncology* (2023). [DOI: 10.1016/S1470-2045\(23\)00462-X](#)

Provided by Institute of Cancer Research

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