
RSNA Press Release

Radiogenomics Paper Receives RSNA Margulis Award

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CHICAGO — The Radiological Society of North America (RSNA) presented its fifth Alexander R. Margulis Award for Scientific Excellence to Neema Jamshidi, M.D., Ph.D., and colleagues, for the article, "The Radiogenomic Risk Score: Construction of a Prognostic Quantitative, Noninvasive Image-based Molecular Assay for Renal Cell Carcinoma," published in the October 2015 issue of *Radiology*.

Named for Alexander R. Margulis, M.D., a distinguished investigator and inspiring visionary in the science of radiology, this annual award recognizes the best original scientific article published in RSNA's peer-reviewed journal *Radiology*.

The developing field of radiogenomics has made gradual but significant advances in associating molecular profiling measurements with noninvasive imaging in oncology. Nevertheless, more work needs to be done in order to capture the full scope of disease phenotypes.

In recent years, researchers have realized that capturing the complex biology of such tumors and their response to therapy would require deeper classification systems – ones that incorporate information from high-throughput molecular profiling data.

Working with a team of researchers, Dr. Jamshidi, a clinical instructor in the Department of Radiological Sciences, David Geffen School of Medicine at UCLA, has developed just such a classification system: a radiogenomic risk score (RRS) that bridges the gap between quantitative tissue-based molecular data, clinical imaging findings and clinical phenotypes for renal cell carcinoma. The methodology applied to develop the RRS could have useful applications for detecting and tracking other types of cancer and potentially other diseases as well.

"Most radiogenomic studies to date have focused on simultaneously identifying imaging to genomic association maps in an untargeted fashion, but we were curious to do something different," Dr. Jamshidi said. "What if we could systematically construct an imaging surrogate that targeted and tracked a specific molecular (in this case transcriptomic) signature, enabling clinical outcomes to be assessed noninvasively and longitudinally? We were able to do that, and it's kind of exciting."

The researchers designed a noninvasive surrogate of the molecular assay (SOMAs) – the RRS – to serve as a surrogate for the previously developed gene expression based supervised principal component (SPC) risk score, a quantitative multigene expression signature that has been shown to predict disease-specific survival in patients with clear cell

renal carcinoma.

To develop the RRS, researchers analyzed gene expression profile data and contrast-enhanced CT images in 70 patients with clear cell renal carcinoma. The RRS imaging predictor was constructed through evaluation of a library of 28 well-measured and variably expressed CT image features and subsequent selection of the top four ranking features associated with the SPC gene expression profile classification using multiple regression-based techniques.

Researchers then independently validated the predictive power of the RRS in an independent cohort of 70 patients with clear cell renal carcinoma and correlated that data with subsequent disease specific survival.

The resulting RRS was shown to correlate with the SPC score in the training group and in the validation group. In addition, the RRS for clear cell renal carcinoma predicted disease-specific survival, independent of disease stage, disease grade and performance status.

The research breaks new ground in key areas, including its potential applications for other types of cancer, according to *Radiology* editor Herbert Y. Kressel, M.D.

"The methodology can potentially be applied to many other tumor types where the relationship of multi-gene expression data to outcome has been established," Dr. Kressel said. "It is hoped that the use of similar tools may provide an effective means to noninvasively characterize tumors, to better understand the biology of tumor response and to potentially reduce the need for repeated tissue sampling while managing these patients."

Instead of focusing on single measurements of features, the research gathers and integrates multidimensional measures to capture complexities of the biologic process and their response to therapy, he added.

Calling the research a "truly collaborative effort," Dr. Jamshidi credits the success of his research to the teamwork of colleagues from multiple institutions over several years.

"The Margulis Award was completely unexpected, but it is extremely gratifying," Dr. Jamshidi said. "It's really a great honor and total surprise. I am so thankful that *Radiology* editors recognized our study, as it took many people multiple years to see the results of our research."

Access the study at [RSNA.org/Radiology](https://www.rsna.org/Radiology)

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