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COMMENTARY

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See related article on page 413

Upping the ante (with machine-learning) for patients with UTUC

The diagnostic workup and risk-adapted management for patients with suspected upper tract urothelial cell carcinoma (UTUC) remains a challenge. Given the limitations of endoscopic visualization of tumors, and scant amounts of tissue obtained on biopsy, a great deal of the preoperative assessment of patients with UTUC relies on cross-sectional imaging. The ability to use radiologic features to accurately predict disease extent would be a critical step forward in both the diagnostic and prognostic assessment of these patients.

In this month's *CUAJ*, Chung et al assess the relationship between several preoperative radiologic variables and the pathologic outcomes of tumor grade, stage, and presence of lymphovascular invasion.[1] Although none of the radiologic variables were predictive of the pathologic outcomes of interest on the multivariate analyses, this paper highlights several important future areas for research in UTUC.

First, the small number of patients with UTUC treated at any given hospital or even within an entire province limits the ability to conduct high-powered research at an institutional level. As seen with the Canadian initiatives of national kidney and bladder cancer databases (Canadian Kidney Cancer information system [CKCis] and Canadian Bladder Cancer information system [CBCis]), by pooling data and collecting a standardized set of variables, a robust tool to enhance the power of retrospective studies can be achieved. The role for collaboration is even more critical in rare diseases, where the ability to study outcomes of interest is often limited by the number of outcomes and the diversity of cases available.

Second, standardized radiologic reporting would also allow human and machine data extractors to identify and collect data of interest in a more streamlined and complete way. In the current study by Chung et al, 8% of eligible patients (10 of 122) were excluded due to missing data or missing reports altogether. A more standardized approach to radiology reporting may help prevent this attrition.

Highlighting the limitations of our ability to accurately diagnose and risk-stratify patients with suspected UTUC naturally leads to the discussion of where the field is heading. Machine-learning in the form of radiomics has the potential to drastically improve the assessment of preoperative imaging for patients with UTUC. Radiomics uses computer-based programs to analyze medical images. This allows for significantly more detail to be extracted and computed from an image than can be detected by the human eye. This is an exciting area of research that will hopefully help with the diagnostic, prognostic, and therapeutic dilemmas these patients face. Radiomics may also negate the importance of standardized radiologic reporting, as the machine-learning program will extract and analyze imaging data on a more detailed level than would be written in a radiology report.

Additionally, further research into the role of genomics and circulating tumor DNA for patients with UTUC may help to predict which patients benefit most from perioperative systemic therapy and/or lymph node dissections. In the end, the gold standard, will always be to provide a personalized approach to the care of an individual patient based on their tumor characteristic, biology, personal preferences, and values.

It is an exciting time for researchers looking to improve the care of patients with UTUC. The upcoming years will hopefully lead to several advances in our ability to analyze preoperative imaging and genomic markers, allowing for a more personalized approach to patient care.

COMPETING INTERESTS: The author does not report any competing personal or financial interests related to this work.

REFERENCE

1. Chung D, Ramjiawan R, Bal DS, et al. Radiographic predictors of muscle-invasive upper tract urothelial cancer: A Canadian cohort. *Can Urol Assoc J* 2024;18(12):413-8. http://dx.doi.org/10.5489/cuaj.8817

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