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EDITORIAL – THORACIC ONCOLOGY

Radiomics to the Rescue

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In this issue of Annals of Surgical Oncology, Xie et al.[1] present a compelling use of radiomics for the diagnosis of lymph node metastasis among patients with esophageal cancer in their manuscript "Prediction of Individual Lymph Node Metastatic Status in Esophageal Squamous Cell Carcinoma Using Routine CT Imaging: Comparison of Size-Based Measurements and Radiomics-Based Models". This manuscript is compelling for several reasons. First, this is a large study of consecutively enrolled esophageal squamous cell cancer patients that challenges existing definitions of enlarged lymph nodes based on size criteria. The existing criterion for abnormal lymph node size has been established at 1 cm, but Xie et al. suggest that a value of 6.9 mm has improved discrimination of metastasis. This finding is similar to other studies, which have rejected the convention of a 1-cm normal.[2] Secondly, this manuscript challenges the very foundation of size-based criteria for detection of lymph node metastasis in this population. Their radiomics-based models showed excellent discriminatory ability with optimal results for the 2D model, which showed receiver operating characteristic curve AUC values of 0·841–0·891, accuracy of 84.2–94.7%, sensitivity of 65.7–83.3%, and specificity of 84.4–96.7%.

The importance of lymph node metastasis and esophageal cancer needs no introduction; it is fundamental to patient outcomes and selection of patients for multimodality care. The Xie et al. study provides valuable insight into the care of these patients at several levels. First, PET/CT is unavailable to much of the world. As the complexity of healthcare increases, so too does its cost. Although Western countries rely heavily on this technology, implementation of PET/CT for screening of metastasis is unrealistic in most areas of the world. As esophageal cancer is truly a worldwide disease, our paradigms for care must account for those without access to PET technology. Even beyond this, however, PET/CT can have suboptimal discrimination of metastatic disease in patients with squamous cell esophageal cancer. A systematic review and meta-analysis published in 2018 suggested that PET/CT may have "moderate to low sensitivity… For detection of regional lymph node metastasis and esophageal cancer" of 49–78%.[3] Although there are certainly benefits to PET/CT screening for metastasis, we should demand better for our patients.

In my opinion, the problem of this study like this is, of course, our willingness to follow the data. Providers and patients have expressed reluctance about the use of radiomics and other models in clinical practice.[4,5] Radiomics has been used in multiple thoracic surgical venues to improve upon conventional criteria for radiographic assessment. Radiomics has been used to distinguish adenocarcinoma from granuloma[6] and invasiveness among early stage adenocarcinomas.[7] So too in esophageal squamous cell cancer, radiomics has been shown to out-perform conventional CT size criteria.[8] So why then do existing criteria for radiographic assessment of lymph nodes still rely on outdated measurements? RECIST criteria guidelines suggest that "normal lymph node is defined as having a short axis of less than 10 mm"[9] when studies have suggested that a 1-cm size criterion has been inaccurate for more than 30 years.[10] The responsibility is ours to put these data into action. I see no better way to improve the long-term survival of our patients than to improve staging accuracy and, therefore, stage-based treatment.

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Certainly, artificial intelligence (AI)-based and radiomics-based models can feel like a "black box", whereby providers lose a granular understanding of which factors are driving clinical decision making. Nonetheless, I believe that these advanced techniques only stand to improve patient care. Not only have these models demonstrated superior accuracy, but they can also address endemic problems such as inter-observer reliability and implicit bias. Make no mistake, these "black box" models will permeate every facet of medicine. Recently, the Biden administration announced the creation of an institute called Advanced Research Projects Agency for Health (ARPA-H). Modeled on the Department of Defense's DARPA program, ARPA-H is investing up to $6.5 billion to support "bold, ambitious" ideas such as AI-based methods to improve healthcare.[11] Private sector investment in AI-based healthcare is also skyrocketing. For example, Alphabet, Google's parent company, and other large technology firms have made significant investment in healthcare with hopes that AI-based models will improve predictive analytics and precision medicine.[12] Although there are real concerns about transparency, safety, and conflicts of interest in AI-based healthcare, we as providers must be open and willing to use these advanced techniques when they offer real improvements to our patients. The opportunities for improving healthcare for patients and providers are clear to me.

DISCLOSURES The author declares no conflicts of interest.

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