# Advanced Imaging of Intrathoracic Malignancies

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Intrathoracic malignancies such as lung cancer, esophageal cancer, and malignant pleural mesothelioma have traditionally been evaluated with imaging modalities such as computed tomography (CT) that rely on anatomic information to determine disease extent and therapeutic response. However, significant limitations of anatomic imaging have been described, including difficulty in differentiating between treatment-related changes and residual/recurrent disease, and suboptimal correlation between size measurements as determined by the Response Evaluation Criteria in Solid Tumors (RECIST) or World Health Organization (WHO) guidelines and actual histopathologic response. Therefore, more advanced imaging techniques are necessary, such as FDG positron emission tomography (PET)/CT using quantitative measurements such as metabolic tumor volume (MTV) and total lesion glycolysis (TLG). Furthermore, there is an expanded role for CT in the evaluation of patients with intrathoracic malignancies using quantitative imaging features in addition to the standard qualitative characteristics. An emerging technique referred to as texture analysis, in which objective measurements of heterogeneity based on the distribution of grey levels, and a host of other characteristics reflecting variations in tumor morphology, heterogeneity, and texture, are being investigated. In lung cancer specifically, quantitative imaging features have been used to distinguish between tumor subtypes, determine clinical stage of disease, and evaluate tumor metabolism, hypoxia, and angiogenesis. The term “radiomics” has been used to describe this extraction of advanced quantitative imaging features thought to be related to the underlying genotype and phenotype of tumors. As the utilization of novel treatment regimens including immunotherapies increases, advanced imaging techniques and methods of analysis will be needed to assess patient response.

This presentation will review the current status of these imaging modalities in clinical use and the improvements in the management of oncologic patients that can be attained. In addition, our ongoing multidisciplinary research efforts and the expected future applications in diagnosing, staging and determining therapeutic response will be presented.