



Dual-energy computed tomography for pre-surgical identification of adenocarcinoma subtypes

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As new targeted treatments for lung cancer are being developed which potentially are used prior to treatment, pre-treatment diagnosis of lung cancer subtypes becomes increasingly important. Currently, the only reliable method is to perform a biopsy using percutaneous needle biopsy, bronchoscopy, or surgery. This paper suggests a new non-invasive alternative—dual energy computed tomography (DECT).

DECT is a new type CT imaging method recently, which uses two sets of different X-ray energy spectra to provide different attenuation values for the same tissue. DECT can generate multiple quantitative parameters, such as monochromatic CT number and the spectral curve, iodine concentration, water concentration, and effective atomic number (Effective-Z), based on virtual monochromatic and material-decomposition images.

In this article, the authors found that DECT quantitative parameters together with the clinical information (age, sex, and smoker or never smoker) allowed for differentiation of the three most common genetic (EGFR, ALK, KRAS) subtypes of solid lung adenocarcinoma in univariate analysis (1). In multivariate logistic analysis, smoking status (OR =2.9, P=0.019) and CT number at 70 keV (OR =1.036, P=0.006) were significant predictive factors for EGFR mutation. Age and Effective-Z were significant predictive factors for ALK rearrangement (P=0.008) and KRAS mutation (OR =1.047, P=0.032) (OR =0.933, P=0.008), respectively (1).

Although these results are obtained at a single institution on 1,010 patients, they are very encouraging and should stimulate further investigation of DECT as well as further development of other quantitative pre-treatment

assessments (2-4). While tissue sampling is currently used for identification for sensitivity of lung cancer to targeted treatments, it is not being routinely performed prior to surgery and becomes questionable for small tumors or ones on which non-surgical biopsy is difficult because of location which are increasing being identified in programs of lung cancer screening. For large tumors, these non-invasive techniques may show tumor heterogeneity which is important in treatment planning (5).

Multi-disciplinary team is playing a critical role in the accurate diagnosis and treatment of lung cancer nowadays. By learning about driver gene mutations and studying their correlation with features on CT scan, radiologists may contribute to appropriate patient management by pointing out the possibility of a mutated status and increase the value of their participation in multi-disciplinary meetings. Besides the diagnosis, imaging is also the major tool in the response assessment of lung cancer. Classical tumor response criteria, such as Response Evaluation Criteria in Solid Tumors (RECIST) (6), are based on the morphological change of the tumor and maybe have limitations for new therapy.

Advanced imaging techniques, such as DECT, magnetic resonance imaging (MRI) and positron emission tomography (PET), can provide various functional or molecular parameters. Active investigations of radiologists are needed to find identify potential imaging biomarkers and to assess the treatment response more timely and precisely.

Lung cancer was the leading cause of cancer death around the world (7,8). Adenocarcinoma is the most common

histopathological pattern of lung cancer and continuing rise in incidence (9-11). Lung adenocarcinoma are highly heterogeneous as can be seen in this report. The identification of specific driver oncogene mutations can guide the selection of appropriate target drugs, which create a personalized therapy era for lung cancer.

In conclusion, the emerging development of molecular targeting therapy brings a big challenge to the radiologists. This report provides exciting new methods and should stimulate future research of the usefulness of emerging imaging modalities for pre- and post-treatment assessment of lung cancer.

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Footnote

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Ethical Statement: The author is accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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