1299 RADIOMICS FEATURES TO PREDICT TUMOR RESPONSE AND BIOMARKER STATUS IN NON-SMALL CELL LUNG CANCER (NSCLC) PATIENTS TREATED WITH IMMUNOTHERAPY

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Background Accurately predicting response to immunotherapy in non-small cell lung cancer (NSCLC) patients is important in establishing a precision treatment strategy. This study aims to investigate chest CT-based radiomic features using artificial intelligence (AI) algorithms to predict tumor response and biomarkers in patients with NSCLC.

Methods Clinicopathologic data from 132 patients with stage III-IV NSCLC treated with immunotherapy were collected, and the tumor response was evaluated based on RECIST 1.1 and immune-related RECIST (irRECIST). Patients were classified into two groups: durable responders (which include complete response [CR], partial response [PR], or stable disease [SD]) and non-responders (progressive disease [PD]). Segmentation was performed by three physicians using LIFEx software (IMIV/CEA, Orsay, France). 3D-radiomic features were collected for the tumor and peritumoral region from contrast enhanced CT scans. The lesion size was measured as a volume-of-Interest (VOI). Linear mixed-effects (LME) regression model was used to evaluate the association between radiomic features and the size of the VOI, with radiation-related and immunotherapy-related pneumonitis status specific variables for slope and intercept. The chemotherapy containing regimen was considered as a random factor. The corresponding p-values were used to assess differences in LME regression slope and/or intercept between all groups.

Results Among 132 patients, 61 (46.2%) were male and 71 (53.8%) were female (median age 66.5 years [range, 29–89]). Association between some CT-based radiomic features and the tumor size demonstrates statistically significant between responders and non-responders per RECIST 1.1 and irRECIST criteria. Significant difference in the intercept (-1.09E8, 95% CI[-1.5E8, -0.7E8], p<0.001) and the slope (31.1E6, 95%CI [20.1E6, 41.4E6], p<0.001) of MORPHOLOGICAL Integrated Intensity computed for primary tumors was found with irRECIST criteria (intercept difference -6.6E7 95%CI[-11.6E7, -1.5E7], p<0.01 and slope difference (15.8E6, 95%CI[36.3E6, 28E6], p<0.01). The same radiomics feature was statistically significant between responders and non-responders per RECIST 1.1 criteria with the intercept (-1.17E8, 95%CI[-1.55E8, -0.8E8], p<0.001) and the slope (32.8E6, 95%CI [23.7E6, 41.9E6], p<0.001) with the intercept difference (-6.1E7 95%CI[-10.9E7, -1.3E7], p<0.013) and slope difference (14.7E6, 95%CI[32.3E6, 26.2E6], p<0.02). For the peritumoral space, Gray Level Size Zone Matrix (GLSZM) Large Zone Low Grey Level Emphasis, demonstrated significant difference in the intercept (-0.73, 95%CI [-1.63, 0.16], p<0.1) and the slope (0.31, 95%CI [0.9, 0.53], p<0.005) and irRECIST associated difference in the intercept was 1.9 (95%CI [0.84, 2.97], p<0.01) and slope difference was -0.5 (95%CI[-0.76, -0.25], p<0.001).

Conclusions CT-based radiomic features may help predict potential responders to immunotherapy in NSCLC patients.

Ethics Approval Northwestern IRB approved: STU00207117

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