Background Currently approved biomarkers that predict response to ICIs in mNSCLC are limited to PD-L1 expression levels by immunohistochemistry (IHC) and tumor mutation burden (TMB). However, the predictive performance of PD-L1 IHC and TMB are limited, and rates of testing are suboptimal. Radiomic biomarkers may offer an automated and scalable method to predict ICI response.1,2 We developed and validated multi-modal models predicting responses to ICIs in mNSCLC. In contrast to previously published models, our work focuses on generalizable models using a large multi-institutional “real-world” dataset and combines radiomics features with demographic, molecular, and laboratory values routinely available in patients’ electronic medical records [EMR].

Methods We analyzed radiomic characteristics of 6,028 primary and metastatic lesions from 1,169 mNSCLC patients treated with anti-PD-1/anti-PD-L1 ICIs from 8 institutions across the US and Europe. Data were randomly split into training (N=707 patients, n=3,623 lesions) and validation (N=462 patients, n=2,403 lesions) sets. Baseline and follow-up CT scans were manually annotated by board-certified radiologists using RECIST 1.1 criteria and all lesion volumes were manually segmented. We developed two predictive models using gradient-boosted decision tree algorithms, using 1) only manually curated baseline radiomic features quantifying textural heterogeneity and spicularity; and 2) a multi-modal model with radiomic features combined with known demographic, molecular, and laboratory values routinely available in patients’ electronic medical records [EMR].

Abstract 1296 Table 1 Lung lesion assessment.

<table>
<thead>
<tr>
<th>Biomarker</th>
<th>3-month PFS AUC (95% CI)</th>
<th>6-month PFS AUC (95% CI)</th>
<th>3-month PFS AUC (95% CI)</th>
<th>6-month PFS AUC (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-modal</td>
<td>0.82** (0.79-0.85)</td>
<td>0.72** (0.70-0.74)</td>
<td>0.72** (0.70-0.74)</td>
<td>0.63-0.82</td>
</tr>
<tr>
<td>Radiomics</td>
<td>0.77 (0.74-0.80)</td>
<td>0.74 (0.72-0.76)</td>
<td>0.74 (0.72-0.76)</td>
<td>0.63-0.82</td>
</tr>
<tr>
<td>PD-L1 IHC</td>
<td>0.74 (0.70-0.78)</td>
<td>0.67 (0.65-0.70)</td>
<td>0.67 (0.65-0.70)</td>
<td>0.57-0.78</td>
</tr>
</tbody>
</table>

* indicates statistical significance of comparison to clinical standard (PD-L1 IHC) at the 5%/1% level under the two-tailed Delong test.

Conclusions Radiomics-based multi-modal prediction of ICI response is feasible and accurate and may provide an opportunity for more personalized management, such as risk-based escalation/de-escalation of concurrent chemotherapy in mNSCLC patients. We will evaluate this methodology in prospective studies.

REFERENCES


Ethics Approval Ethics approval for US data:

The study was conducted under IRB-approved procedures using de-identified data for patients diagnosed with Stage-IV NSCLC and treated between Jan. 1, 2017 and December 31, 2021. All records were de-identified per HIPPA guidelines at the institution level. Upon transfer, the data was quarantined and then re-inspected by authorized personnel prior to ingestion to ensure compliance and that no PHI was present in the records.

Ethics approval for EU data:

The study was conducted under IRB-approved procedures using de-identified data for patients diagnosed with Stage-IV NSCLC and treated between Jan. 1, 2017 and December 31, 2021. All records were de-identified per GDPR requirements at the institution level. The patients were also notified that their de-identified data would be part of a study and were given the required time and opportunity to respond if they had any objection. Upon transfer, the data was quarantined and then re-inspected by authorized personnel prior to processing to ensure compliance and that no PHI was present in the records.

Consent N/A