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Novel Alternate (Alt) Response Criteria for early outcome prediction in Pancreatic (P) Neuroendocrine Tumors (NETs): Utilizing banked imaging and radiomics

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BACKGROUND

Evaluating treatment (Tx) Response in NETs using CT/MRI scans can be difficult. Previous studies, including the E2211, have shown improved progression-free survival (PFS) but no significant difference in Rp as measured by RECIST 1.1 (R1.1) criteria. Therefore, it is difficult to determine Tx effectiveness with short-term imaging, further complicated by differences in imaging protocols and inter-reader variability. Incorporating tumor density, using smaller threshold changes in tumor size, and novel quantitative features may be more sensitive and precise than R1.1 (e.g. CHOI in GIST) but have not been studied for NETs.

METHODS

Banked CT images from the E2211 trial were repurposed to study novel criteria. Three radiologists provided a R1.1 assessment. Density and radiomic features were calculated from a 2D region of interest in the portal venous phase (as per CHOI Criteria Patients were classified as responders (PR), stable disease (SD), or progressive disease (PD) based on R1.1 and CHOI and compared with PFS to determine the best predictor. Radiomic features were analyzed using pyradiomics. Wilcoxon tests were used to compare scan quality by center type, agreement was measured using Cohen's Kappa, and predictive value was quantified using the c-statistic and AUC for time-varying outcomes.

RESULTS

67 patients had their scans repurposed for the study. Inter-reader agreement for overall imaging studies was fair, with only 5 of 9 PD cases noted by reviewer 1 being agreed upon by reviewer 2 (proportional agreement for PD = 0.56) and a Kappa of 0.6 (95% CI 0.41 – 0.79). The CHOI Criteria showed improved prediction of PFS compared to R1.1 (12-month AUC 0.75 for CHOI vs 0.69 for R1.1, c-statistic 0.66 vs 0.64, p=0.22), and was able to predict improved PFS for PR versus SD at the first interval scan. This was not seen with R1.1 (table). Radiomics and texture analysis found that adding the radiomic feature of Zone Entropy improved predictive ability of CHOI criteria for PNET disease evaluation.

CONCLUSIONS

This study using repurposed banked imaging from an NCTN trial found that there was significant variability in image interpretation, and that the R1.1 Criteria was poorly correlated with Rp in PNETs. The CHOI Criteria emerged as a better alternative as it may have a better correlation with PFS and ability to predict outcomes at the point of first disease assessment. Importantly, CHOI Criteria can be easily applied in clinical practice to inform treatment decisions. Further research is needed to confirm these findings and define its therapeutic importance.

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