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## Predicting Advanced Gastric Cancer with Spectral CT Radiomics



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Gastric cancer remains one of the leading causes of cancer-related deaths worldwide. For patients with locally advanced disease, particularly those classified as pathological T4 (pT4), accurate preoperative staging is vital to guide optimal treatment strategies. Current imaging methods, including conventional CT and endoscopic ultrasound, often fall short in reliably identifying pT4 tumours due to limited resolution and subjective interpretation. In this context, the integration of radiomics and dual-layer spectral CT (DLCT) has emerged as a promising avenue. By combining quantitative imaging data with clinical features, a recent study aimed to construct and validate a clinical-radiomic model capable of accurately predicting pT4 in patients with gastric cancer.

### Developing the Combined Model

This retrospective study analysed data from 148 gastric cancer patients who underwent DLCT scans before surgery. Participants were split into training and test cohorts. The development of the model involved extracting radiomic features from both conventional CT images and spectral base images (SBI), including virtual monoenergetic, iodine density and effective atomic number datasets. Clinical variables such as tumour thickness and CA 19–9 serum levels were also included.

**Must read:** [Automated Gastric Cancer Classification with nnU-Net and Radiomics](#)

Three separate models were constructed: one based solely on clinical features, another on conventional CT-derived radiomics and a third using SBI-derived features. Logistic regression and advanced feature selection techniques, including LASSO regression and stepwise regression, were employed to refine predictors. These individual models were then integrated into a single clinical-radiomic combined model, which was visualised through a nomogram to estimate the probability of pT4 presence.

### Superior Predictive Accuracy

Performance evaluation of the models demonstrated that the combined model significantly outperformed the individual clinical and radiomic models. In the training cohort, it achieved an area under the curve (AUC) of 0.906, while in the test cohort, the AUC was 0.873. These results surpassed those from subjective image readings by experienced radiologists, as well as the separate conventional and SBI models.

The SBI model alone exhibited better accuracy than the model based solely on conventional CT radiomics, highlighting the value of spectral data. Moreover, the combined model demonstrated a strong calibration with predicted probabilities closely matching actual outcomes. Decision curve analysis further affirmed the clinical utility of the combined model, showing it yielded higher net benefits across a range of decision thresholds compared to traditional approaches.

### Clinical Implications and Future Potential

The ability to predict pT4 staging preoperatively with high accuracy is crucial for informing surgical decisions and the use of neoadjuvant therapies. The combined clinical-radiomic model developed in this study addresses a key gap in current diagnostic capabilities by integrating diverse datasets into a unified predictive tool. Its nomogram format also ensures that it remains user-friendly and accessible for clinicians.

Importantly, this study highlights the potential of DLCT to contribute uniquely valuable imaging biomarkers, particularly from the arterial phase, which was found to have greater diagnostic weight. Radiomics derived from SBI at low energy levels, such as 40 keV, improved tumour visualisation, enhancing the precision of tumour delineation. The clinical variable of tumour thickness and elevated CA 19–9 levels were also

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reaffirmed as important indicators of advanced disease.

Despite these promising findings, limitations must be acknowledged. The study's single-centre and retrospective design may restrict generalisability. Additionally, tumour segmentation was performed in 2D rather than using full volumetric data, potentially omitting useful spatial information. Future research should focus on external validation and exploring the individual contributions of various spectral parameters.

By combining clinical indicators with DLCT-based radiomics, the study presented a robust and practical model for accurately predicting pT4 staging in gastric cancer. The approach significantly improves upon traditional imaging and subjective interpretations, offering a valuable tool for treatment planning. Further validation in larger, multi-centre cohorts could support its integration into routine clinical workflows, enhancing personalised care for patients with advanced gastric cancer.

**Source:** [Academic Radiology](#)

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