Supplementary Methods 1: Standardization of DECT Image Detail Acquisition Parameters

Laryngeal DECT scans were performed using a Definition Flash VA44A Siemens Healthineers, Germany) at our hospital. Routine non-contrasted scan and dual energy dual phase enhanced was performed according to imaging checklist from European Laryngological Society. Routine non-contrasted scan and dual energy dual phase enhanced scan were performed with an iodinated non-ionic contrast agent (iopromide, Bayer，Healthcare，Germany). In general, the target volume of contrast was adapted to the body weight with injection protocol of 1.2 mL/kg. First, the scanning range was from aortic arch to skull base during a single breath-hold in the craniocaudal direction. Next, the arterial phase (AP) and venous phase (VP) contrast CT images imaging was performed 5-25s after injection of contrast agent at a rate of 3 mL/s, subsequence 30mL saline flush at rate of 2 mL/s. Scanning parameters: A ball tube voltage 80 kV, reference tube current 230 mAs; B ball tube voltage Sn 140 kV, reference tube current 230 mAs pitch 0.8. A standardized laryngeal DECT scan was performed in 2D mode with an acquisition of 3 different positions (axial, coronal and sagittal) covering the laryngeal field. The other scanning parameters were as follows: A ball tube 140kV, B ball tube 100kV, ratio of two ball tube was 1:3, rotating speed 120r /min, slice, 3.0 mm; pitch 0.6, detector collimation, 64.0mm × 0.6mm, scanning layer thickness and layer spacing are both 5 mm, standard reconstruction layer spacing is 1 .5mm. Finally, the CT images were transferred to a workstation (Syngo Dual Energy, version VB10B; Siemens Healthcare) for postprocessing and data analysis. The laryngeal contrasted enhancement images were evaluated by two experienced radiologists, and difference was solved by consensus. The scanning parameters were consistent with our recently published influential studies[1, 2].

Supplementary Methods 2: Standardization of radiomic feature extraction from DECT

Manual tumor segmentation was performed on Syngo.via Frontier Radiomics software on DECT image download from picture archiving and communication system (PACS). All original images were segmented through the workstation (Syngo.viaVB10, Siemens Healthiness, Germany) slice-by-slice for each volume along the visible borders of the lesion. The 3D segmentation of the tumor provides the region-of-interest (ROI) for the feature step of extraction. The radiomics features were extracted from the tumor ROI via standard morphology binary dilation by two radiologists. To ensure the tumor boundary inside the glottic region, all 3D segmentations of the tumor were finally reviewed by the senior radiologist. Python Radiomics package was utilized to extract radiomics features on ROI of the different phases. Extraction of all radiomics features from DECT as following:1) 18 intensity features: these features were the first-order statistics calculated from the tumor intensities such as entropy, reflecting the signal intensity of different tumors, 2) Texture features (n = 836): these features represented the shape (18) information of tumors and the relationship between each tumor voxel and its surrounding environments, which can quantify intra-tumor heterogeneity in Early Glottic Cancer patients. The wavelet transformation enabled us to quantify high-dimensional multi-frequency tumor information.

Supplementary Methods 3: Radiomic selection progress and risk score model building

Radiomic signatures that are significantly related to PFS were built from the 2 radiologists respectively as follows: (1) Correlation analysis was conducted through the non-parametric Spearman's rank correlation coefficient test and variance of the Z-score-transformation. (2) intraclass/interclass correlation coefficients (ICCs) were calculated and stable features with ICCs > 0.85 were selected to ensure the reproducibility of radiomic features. (3) Next step, we established a univariate Cox proportional hazard model (Cox model) for each emitter feature in the training cohort, features with a P value of less than 0.05 are considered as important factors affecting the EGC prognosis and selected as candidate features (Table S2). (4) LASSO regression was utilized to obtain the radiomic features (5 optimal radiomics feature was shown in Table S3). Following we established a prognostic of radiomic risk score formula to evaluate patients' prognosis. (5) Meanwhile 10-fold cross-validation method was applied in the training set to avoid over-fitting. We further evaluated the prognostic value of radiomic score in the validation cohort.

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