

130P-Deep learningmagnetic resonance imaging radiomics for predicting disease-free survival in patients with early-stage invasive breast cancer



Zifan He, MD¹;Wei Ren, MD¹; Yunfang Yu, MD¹; Yujie Tan, MD¹; Yongjian Chen, MD²; Jingwen Liu, MD¹; Anlin Li, MD³; Jiafan Ma, MD¹;Nian Lu, MD⁴;Chenchen Li, MD¹; Xiaohong Li, MD⁵; QiyunOu,MD¹; Kai Chen, MD¹; Qiugen Hu, MD⁵; Jie Ouyang, MD⁶; Fengxi Su, MD, PhD¹; ChuanmiaoXie, MD, PhD⁴; Herui Yao, MD, PhD¹

1 Guangdong Provincial Key Laboratory of Malignant Tumor Epigenetics and Gene Regulation,Breast Tumor Centre,Department of Medical Oncology, Phase I Clinical Trial Centre, Sun Yat-sen Memorial Hospital, Sun Yat-sen University, Guangzhou, China. 2 Department of Medical Oncology, The Third Affiliated Hospital of Sun Yat-sen University, Guangzhou, China. 3 Guangdong Medical University, Zhanjiang, China. 4 Imaging Diagnostic and Interventional Center, Sun Yat-sen University Cancer Center, State Key Laboratory of Oncology in South China, Collaborative Innovation Center for Cancer Medicine, Guangzhou, China. 5 Department of Radiology, Shunde Hospital, Southern Medical University, Foshan, China. 6 Department of Breast Surgery, Tungwah Hospital, Sun Yat-sen University, Dongguan, China.

Background

There are no satisfying ways to distinguish high- from low-risk patients with early-stage breast cancer. We aimed to develop a MRI radiomic-based signature for predicting prognosis and discriminating of high-risk relapse patients based on deep learning approach.

Methods & Materials

A total of 452 patients with early-stage breast cancer from Sun Yat-sen Memorial Hospital (SYSMH) were randomly assigned (3:1) into the training and the internal validation cohorts, and the training cohort was then used to optimize the model parameters. The performance of thesignature for disease-free survival (DFS) prediction was validated in SYSMH internal validation cohort (n=113) and two independent external validation cohorts: Sun Yat-sen University Cancer Center (SYSUCC) (n=325), and Tungwah Hospital of Sun Yat-Sen University and Shunde Hospital of Southern Medical University (DHSDH) (n=163). The concordance index (C-index) and receiver operating characteristic (ROC) curves were used to evaluate the performance of the signature.

Results

In the SYSMH internal validation cohort, the radiomic signature based on T1+C and T2WI sequences (MRRS) showed a higher prediction quality, with C-index of 0.935, 1-, 2-, 3-year AUCs of 0.981, 0.962, and 0.996 compared with the signature based on T1+C or T2WI single sequence. The prognostic value of MRRS was well validated that it could discriminate high- from low-risk patients in the SYSUCC external validation (C-index: 0.828; 1-, 2-, 3-year AUCs: 0.944, 0.926, and 0.806) and DHSDH external validation (C-index: 0.870; 1-, 2-, 3-year AUCs: 0.921, 0.925, and 0.960) cohorts.MRRS was also found to be significantly associated with DFS inthe SYSMH internal validation cohort (HR 0.009, 95% CI 0.001-0.077, $P < 0.001$), the SYSUCC external validationcohort (HR 0.129, 95% CI 0.043-0.384, $P < 0.001$), a DHSDH external validation cohort (HR 0.033, 95% CI 0.010-0.111, $P < 0.001$).

Conclusion

Our study offers a noninvasive imaging biomarker for DFS prediction and the MRRS shows the potential to be served as a convenient tool for identifying high-risk relapse individuals in patients with early-stage invasive breast cancer.

Conflicts of Interest: The authors have no conflicts of interest to declare.