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Preoperative machine learning model to predict postoperative survival for pancreatic cancer

Woohyung LEE[1], Ki Byung SONG[1], Dae Wook HWANG[1], Jae Hoon LEE[1], Song Cheol KIM*[1]

[1]Division of Hepatobiliary and Pancreatic Surgery, Department of Surgery, University of Ulsan College of Medicine, Asan Medical Center, Republic of Korea

Background : Pancreatic ductal adenocarcinoma (PDAC) has a poor prognosis even after curative resection. A deep learning-based stratification of postoperative survival in the preoperative setting may aid the treatment decisions for improving prognosis. This study was aimed to develop a deep learning model based on preoperative data for predicting postoperative survival.

Methods : The patients who underwent surgery for PDAC between January 2014 and May 2015. Clinical data-based machine learning models and computed tomography (CT) data-based deep learning models were developed separately, and ensemble learning was utilized to combine two models. The primary outcomes were prediction of 2-year overall survival (OS) and 1-year recurrence-free survival (RFS).

Results : The median OS and RFS were 23 and 10 months in training dataset (n = 229), and 22 and 11 months in test dataset (n = 53). The AUC of the ensemble model for predicting 2-year OS and 1-year RFS in the test dataset was 0.76 and 0.74, respectively. The performance of the ensemble model was comparable to that of the AJCC in predicting 2-year OS (AUC, 0.67; P = 0.35) and superior to the AJCC in predicting 1-year RFS (AUC, 0.54; P = 0.049).

Conclusions : Our model based on routine preoperative variables showed good performance for predicting prognosis after surgery.

Corresponding Author : **Song Cheol KIM** (drksc@amc.seoul.kr)