清華大學、陽明交通大學
統計學研究所
專題演講

題　目：A Novel Approach for Predicting Atrial Fibrillation Recurrence after Ablation Using Deep Convolutional Neural Networks by Assessing Left Atrial Curved M-mode Speckle-tracking Images

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地　點：清大綜合三館 837 室

Abstract

The curved M-mode images of global strain (GS) and strain rate (GSR) provide sufficiently detailed spatiotemporal information of deformation mechanics. This study investigated whether a deep convolutional neural network (CNN) could accurately classify these images in patients with atrial fibrillation (AF) who underwent radiofrequency catheter ablation (RFCA) with different outcomes.

We retrospectively evaluated 606 consecutive patients who underwent RFCA for drug-refractory AF. Patients were divided into AF-free (n = 443) and AF-recurrent (n = 163) groups. Transthoracic echocardiography was performed within 24 hours after RFCA. The left atrial curved M-mode speckle-tracking images were acquired from randomly selected 163 patients in AF-free group and 163 patients in AF-recurrent group as the dataset for deep CNN modeling. We used the ReLu activation function and repeatedly performed CNN model for 32 times to evaluate the stability of hyperparameters. Logistic regression models using left atrial dimension, emptying fraction, and peak systolic GS as predictor variables were applied for comparisons. There were distinct features for images from apical 2-chamber (2-C) and 4-chamber (4-C) views, leading to different performance of CNNs among different settings, in which the “4-C GS+4-C GSR” setting provided the highest performance index values. All four predictor variables used for logistic regression modeling were significant; however, none of them, individually or in any combined form, could outperform the optimal CNN model.

The novel approach using deep CNNs for learning features of left atrial curved M-mode speckle-tracking images seems to be optimal for classifying outcome status after AF ablation.

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