The application of 4S atrial fibrillation scheme in predicting atrial arrhythmia recurrence after catheter ablation

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Background: Atrial fibrillation (AF) is the most common chronic cardiac arrhythmia. Recently, there is a new scoring system - 4S (Stroke Risk; Symptoms; Severity of Burden; Substrate), proposed in 2020 European Society of Cardiology AF guideline to identify the characteristics of AF patients in details and provide precise guidance for the AF management.

Purpose: We aimed to report the disease severity of AF patients who received first time catheter ablation (CA) using 4S-AF scoring system, and further discover the value of 4S-AF scheme in the prediction of atrial arrhythmia recurrence after CA.

Methods: We conducted a retrospective study of 350 AF patients between 2015 and 2017 referred for first time CA. The components of 4S-AF scheme including the following: (1) ischemic stroke risk (score 0 or 1), (2) symptoms (score 0 to 2), (3) severity of AF burden (score 0 to 2), (4) substrate (cardiovascular risk factors-score 0 to 2; left atrial enlargement-score 0 to 2). The 4S-AF score ranges from 0 to 9, and the study population was stratified into three groups as mild (score 0 to 2), moderate (score 3 to 4) and severe (score 5 to 9) disease. The 3-year risk of recurrence of atrial arrhythmias was studied using the Cox regression analysis. Atrial arrhythmias at follow-up were reported with a time-to-event analysis, and survival curves were created utilizing the Kaplan-Meier method with differences between groups compared with the log-rank test.

Results: The mean age of patients was 56 ± 11 years, 260 (74%) were men, and 82 (23%) had non-paroxysmal AF. Over the 3-year follow-up, 168 (47%) patients experienced recurrence. The recurrence rates were 32%, 47% and 62% for mild, moderate, and severe disease groups, respectively (Figure A). Non-paroxysmal AF (hazard ratios [HR]: 2.1, 95% confidence interval [CI]:1.5-2.9, p<0.001), larger left atrial dimensions (HR: 1.0, 95% CI:1.0-1.1, p=0.03) and a higher 4S-AF score (HR: 1.2, 95% CI:1.1-1.3, p=0.001) were significantly associated with a higher risk of recurrence of atrial arrhythmia. After the multivariate adjustment, a higher 4S-AF score (HR: 1.1, 95% CI:1.0-1.2, p=0.006) remained as the independent predictor of recurrence. The recurrence-free survival curves after CA are shown in Figure B. The severe disease group was associated with a 1.9-fold higher risk of atrial arrhythmia recurrence compared to mild disease group (HR 1.9, 95% CI:1.3-2.9, p =0.002).

Conclusions: The disease severity of AF patients characterized using 4S-AF scheme could predict the risk of atrial arrhythmia recurrence after CA.