Predicting incident atrial fibrillation in patients with embolic stroke of undetermined source

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Introduction: Atrial fibrillation (AF) is an important potential embolic source in patients who have suffered an embolic stroke of undetermined source (ESUS). AF has been detected in over 40% of patients when monitored with an implantable loop recorder (ILR). Recent clinical trials, however, have suggested that empirical anticoagulation of all patients with an ESUS is not an effective approach to reduce stroke risk. Thus predicting which patients are most likely to develop AF is of increased importance. Risk models for predicting incident AF exist but they do not incorporate modern techniques such as advanced echocardiographic parameters to create a comprehensive risk model.

Purpose: We sought to create a multi-parametric risk score for the prediction of incident AF in patients with ESUS.

Methods: This was a single-centre retrospective study. Consecutive adult patients referred for ILR implantation following ESUS, between March 2009 and November 2019, without prevalent AF or atrial flutter, were included. Patients’ notes were reviewed for clinical and anthropometric data. Each patient’s echo was re-reviewed both for conventional measures, and advanced parameters including left atrial strain using speckle-tracking (figure 1) and atrial electromechanical delay utilising the time from onset of the electrocardiographic P-wave to the lateral tissue Doppler A’ wave- “lateral PA”.

Univariate and multivariable analyses were performed, and a subsequent Lasso regression analysis used to develop a risk prediction model. Bootstrapping was used to perform internal validation.

Results: A total of 323 patients with ESUS who underwent a loop recorder implantation were included. Incident AF was detected in 142 patients (47.1%). Increased duration of the time between the electrocardiographic P-wave and the lateral tissue Doppler A’ wave (greater lateral PA), older age, higher diastolic blood pressure, abnormal left atrial reservoir strain were most strongly associated with increased AF risk. These were combined to form the PADS score below. Model discrimination was good, with an area under the curve of 0.72.

Conclusion(s): The PADS score is a novel risk score for the prediction of incident AF in patients who have suffered an ESUS, based on the duration of the P-wave to the lateral tissue Doppler A’ wave, Age, Diastolic blood pressure and left atrial strain reservoir. Further work is required to assess whether the PADS score can be used to risk stratify patients into a high risk group which would derive benefit from immediate anticoagulation, an intermediate risk group who require prolonged continuous monitoring and a low risk group who can continue on conventional management for their stroke.

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\text{Probability of AF} = \frac{e^{-4.06427051 + \ln(1.011) \text{ lateral PA} + \ln(1.035) \text{ age} + \ln(1.027) \text{DBP} + \ln(0.973) \text{LA reservoir strain}}}{1 + e^{-4.06427051 + \ln(1.011) \text{ lateral PA} + \ln(1.035) \text{ age} + \ln(1.027) \text{DBP} + \ln(0.973) \text{LA reservoir strain}}}
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PADS formula

LA strain using speckle strain analysis