Mechanical Discordance of the Left Atrium and Appendage
A Novel Mechanism of Stroke in Paroxysmal Atrial Fibrillation

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Background and Purpose—Thromboembolism in paroxysmal atrial fibrillation (AF) has often been attributed to occult AF. We hypothesized that the surface ECG may not always reflect left atrial appendage (LAA) mechanical function.

Methods—Transesophageal echocardiographic images from 201 consecutive patients undergoing transesophageal echocardiography by a single operator were reviewed. LAA pulse wave Doppler phenotype, ECG rhythm, and mitral valve motion for rhythm of the body of the left atrium and the electronic medical record were reviewed by 3 blinded, independent observers.

Results—Of 201 patients (63.4±15 years; 61% men) undergoing transesophageal echocardiography, 15 (7.5%) demonstrated LA–LAA discordance including 7 (3.5%) with a sinus rhythm ECG/mitral valve motion and an AF LAA pulse wave Doppler phenotype. Of 24 patients with a clinical history of AF but sinus rhythm ECG, 25% demonstrated a discordant AF LAA pulse wave Doppler phenotype. Compared with concordant AF, the AF discordant group had greater CHADS2-VASc (vascular disease, age, sex category; P=0.008) and lower LAA ejection velocity (P=0.02).

Conclusions—A quarter of patients with paroxysmal AF demonstrate a prothrombotic AF LAA pulse wave Doppler phenotype, despite concurrent sinus rhythm ECG. These findings provide a novel explanation for ongoing thromboembolism in the paroxysmal AF population, despite apparent ECG maintenance of sinus rhythm.

Key Words: atrial fibrillation • echocardiography, transesophageal • stroke • thromboembolism
demonstrated SR discordance (AF ECG/MVM and SR LAA PWD; Figure 2). All patients (n=14) demonstrated concordance of the 12-lead ECG and the TEE ECG/MVM.

Comparison data for patients with AF discordance with other subtypes is presented in the Table. Of 114 (56.7%) patients with a history of AF, 24 (20.1%) were in SR on ECG/MVM at the time of TEE, including 14 (58%) who had documented SR ECG within a week of the TEE. AF discordance was noted in 25% (n=6) of these patients. Compared with the group of patients with SR concordance, the AF discordance

Figure 1. A and B, Patients with sinus rhythm on ECG and mitral valve motion (left) but with atrial fibrillation (AF) pulse wave Doppler phenotype (right) in the left atrial appendage (AF discordance).

Figures 2. A and B, Patients with atrial fibrillation on ECG and mitral valve motion but with sinus rhythm (SR) pulse wave Doppler phenotype in the left atrial appendage (SR discordance).
group had significantly higher prevalence of LAA spontaneous echo contrast, larger LAA area, longer length, lower LAA ejection velocity, and higher CHA2DS2-VASc (CHADS2, vascular disease, age, sex category; Table). LAA thrombus was noted in 6 patients, all of whom had AF concordance.

**Discussion**

In this retrospective study of consecutive patients undergoing TEE by 1 operator, 25% of patients with a history of AF but with SR on their surface ECG/MVM demonstrated a prothrombotic AF LAA PWD phenotype. This discordance might explain the ongoing risk of thromboembolism in patients with AF with apparently sustained SR ECG. Importantly, our study demonstrates that prolonged ECG monitoring would not detect these patients at risk. This reinforces the role of routine anticoagulation in this population and supports the routine assessment of LAA phenotype in all patients undergoing TEE independent of their ECG rhythm and clinical characteristics.

Using LAA PWD, mechanical discordance between the body of the LA and the LAA has been demonstrated postcardioversion, our subjects were not postcardioversion or pulmonary vein isolation. Our study has several limitations. Our population comprises a retrospective, single center experience and heterogeneous group of patients referred for TEE. We also do not have transmitral Doppler spectra to confirm the mechanical LA function phenotype (as this is not obtained during routine TEE) and relied on ECG and MVM data for assessment of function of the body of the LA.

**Conclusions**

A large minority of patients with paroxysmal AF and SR ECG demonstrate a prothrombotic AF PWD LAA phenotype that is not detected on the surface ECG. These data support the use of anticoagulation in patients with AF independent of the surface ECG and serve as a novel mechanistic explanation for the ongoing risk of thromboembolism in patients with paroxysmal AF, despite apparent surface ECG rhythm control.

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**Disclosures**

None.
References


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