



Left atrial appendage dysfunction in acute embolic stroke young patients with sinus rhythm: Correlation with Tissue Doppler mitral annular systolic velocity



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KEYWORDS

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Abstract *Background:* Trans-esophageal echocardiogram (TEE) is a gold standard test for diagnosis of left atrial (LA) appendage function.

Aim: To evaluate left atrial appendage (LAA) dysfunction using mitral annular systolic velocity measured by tissue Doppler imaging "Sm" in acute embolic stroke young patients with sinus rhythm.

Methods: Transthoracic (TTE) and transesophageal echocardiography (TEE) were performed in 70 consecutive patients with sinus rhythm without obvious left ventricular dysfunction within 2 weeks after embolic stroke. Two groups were identified: LAA dysfunction [LAA emptying peak flow velocity (LAA-eV) <0.55 m/s, n = 28, age 52 ± 11 years] and without LAA dysfunction (LAA-eV ≥ 0.55 m/s, n = 42, age 54 ± 10 years) on TEE. Tissue Doppler mitral annular systolic velocity "Sm" was obtained in apical four chambers view on TTE and D-dimer level estimated for all patients.

Results: Sm was significantly lower in patients with than in those without LAA dysfunction (P < 0.0001). There was a significant correlation between Sm, LAVI, LAEF%, E/A ratio and LAA-eV in all selected patients groups. The optimum cut-off value of Sm for predicting LAA dysfunction was below or equal 8 cm/s (sensitivity 89.6% and specificity 94.2%).

Abbreviations: Sm, mitral annular systolic velocity; LAA, left atrial appendage; LAA-ev, left atrial appendage emptying velocity; TTE, transthoracic echocardiography; TEE, trans-esophageal echocardiography; LAD, left atrial dimension; LVDd, left ventricular end-diastolic dimension; LVEF, left ventricular ejection fraction; E/E', the ratio of the early transmitral flow velocity and the early mitral annular velocity; LAVI, left atrial volume index; LAEF, left atrial emptying fraction; TDI, tissue Doppler imaging.

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Conclusion: Tissue Doppler mitral annular systolic velocity is an independent non-invasive easy predictor of LAA dysfunction and significantly correlated with LAA-eV ($p < 0.0001$) in acute embolic stroke young patients with sinus rhythm.
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Introduction

Cardio-embolic stroke is an important clinical issue, because it is the most common cause of death in patients with acute ischemic stroke.^{1,2} Previous clinical reports have prescribed Atrial fibrillation "AF" as independent risk factor for ischemic stroke, increasing the risk by fivefold.^{3,4} In a large cohort of patients with paroxysmal AF on aspirin therapy had a stroke rate similar to sustained AF as well as similar stroke risk factors.⁵

The left atrial appendage (LAA) was reported to be a major source of thrombo-embolism in stroke patients with atrial fibrillation.^{6–8} Many clinical reports have indicated that left atrial mechanical remodeling is associated with thrombus formation in the LAA.^{9–11} The presence of spontaneous echocardiographic contrast or reduced LAA peak flow velocity, as measured by transesophageal echocardiography (TEE), was reported to be useful for detecting LAA dysfunction, which causes thrombus formation in the LAA.^{12,13}

LAA dysfunction may play a role as an underlying cause of cardiogenic brain embolism not only in chronic AF but also in paroxysmal AF.¹⁴ Independent of the basic rhythm there is a close relationship between LAA-eV and qualitative parameters of elevated thromboembolic risk, and LAA-eV could be a quantitative parameter for risk stratification. LAA-eV ≥ 0.55 m/sec is associated with low risk of LAA thrombosis and spontaneous echo contrast.^{15,16}

While transthoracic echocardiography (TTE) is widely used as a screening tool because it is a non-invasive procedure, it is thought to be difficult to detect LAA thrombus and evaluate LAA dysfunction by TTE. Recently pulsed wave tissue Doppler has become a reproducible and readily available technique for measuring atrial function parameters.^{17,18} The LAA has a close anatomic and functional relation with lateral mitral annulus and thus annular velocities obtained by TDI may reflect the LAA function.¹⁹ The aim of the present study is to evaluate LAA dysfunction using tissue Doppler mitral annular systolic velocity in acute embolic stroke young patients with sinus rhythm.

Patients

After ethical committee approval and all patients consent for the study.

The study enrolled 70 patients with sinus rhythm selected from 180 acute stroke patients (confirmed by computed tomography as recent infarction) admitted in neurology department, Tanta university hospital from October 2011 to April 2013 and referred to cardiology department for cardiac evaluation and to exclude cardiac source of embolization. Patients examined within 2 weeks of infarction onset. They were divided into 2 groups according to LAA-eV value detected by TEE.

Exclusion criteria

- Patients with documented AF either permanent or paroxysmal AF documented by ECG or Holter monitoring.
- Patients with a contraindication to perform TEE such as dysphagia and esophageal stricture
- Patients refusal.
- Patients with low EF%, severe MR and severe diastolic dysfunction ($E/E' \geq 15$).

Methods

All patients are subjected to

- I. Detailed history: History of previous attacks of stroke or TIA, hypertension, DM, hyperlipidemia, rheumatic heart disease and the presence of any condition that makes TEE contraindicated. Drug history including ACE inhibitors, anti-arrhythmic drugs and oral anticoagulation.
- II. All patients were underwent full clinical evaluation before trans-esophageal echocardiographic evaluation.
- III. 12 leads ECG to detect and 24 h Holter monitoring to detect atrial flutter, fibrillation and ischemia.

Laboratory investigations

Including Prothrombin time (PT), International Normalized Ratio (INR) and D-Dimer measured quantitatively using immunoturbidimetric method by SYSMEX CA-1500 automated coagulometer before TEE examination.²⁰

IV. Transthoracic Echocardiography:

Echocardiograms using 2D-echo and conventional Doppler performed before TEE to detect EF%, E/A ratio, wall motion abnormalities, valvular lesions, diastolic function, presence or absence of thrombi in left atrium, measure the size of the left atrium using M-mode study and LA volume.^{21,22} Images were obtained with the patient in the left lateral decubitus position with M3S probe Vivid7, GE Vingmed (Horton, Norway).

V. transesophageal echocardiography procedure:

Using 2D-echo the following data was obtained:

- 1 The presence of thrombi and the degree of spontaneous echo contrast that was graded from 0 to 4 according to the following criteria: 0 = none (absence of echogenicity); 1+ mild (minimum echogenicity located in the

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