Echocardiogram Findings in Stroke Patients with Normal Sinus Rhythm

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Abstract

Background: Cerebral infarction is a common problem in medicine. Approximately 15-20% of cerebral infarctions are caused by an embolism from a cardiac source. However, there are no randomized controlled trials or studies that show cost-benefits of transthoracic echocardiogram as a screening test for an embolic stroke event caused from cardiac pathology in patients with normal sinus rhythm. The objective of this study was to determine the incidence and predictors of intracardiac thrombus in Thai patients with stroke from a transthoracic echocardiogram.

Methods: We reviewed transthoracic echocardiogram between January 2007 to January 2009 from 236 patients who had suffered a recent stroke. We excluded patients with a previous history of atrial fibrillation, structural heart disease or prosthetic heart valve to find the incidence of intracardiac thrombus in patients with sinus rhythm and normal physical examination.

Results: Transthoracic echocardiogram detected one incidence of intracardiac thrombus in 236 patients (0.4%, at 95% CI 0.1-2.6%).

Conclusions: The incidence of intracardiac thrombus detected by the transthoracic echocardiography is low in patients with sinus rhythm and normal physical examination. The small group of positive events resulted in insignificant predictors to determine strong relative risks for candidate patients in this group. Future research with a larger population is needed to evaluate the appropriate conditions to request transthoracic echocardiograms.

Key words: Echocardiogram, Stroke, Sinus rhythm

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Introduction

Cerebral infarction is a common problem in medicine. Approximately 15-20% of cerebral infarctions are caused by a cardiac source of embolism (1). Transthoracic echocardiography (TTE) is a non invasive imaging method to screen for a cardiac source of emboli in patients with atrial fibrillation (AF) both in valvular and non-valvular heart disease patients (2-5). However, there are few data regarding TTE findings in patients who had embolic stroke with normal sinus rhythm.

There are many studies showing a cardiac source for embolic stroke in patients with arrhythmia (esp. AF) or structural heart disease or prosthesis heart valve (2-8). But in clinical practice, patients who have many types of valve abnormalities, including aortic stenosis, mitral annular calcification and mitral valve prolapse, are not indicated for anticoagulation if they are in sinus rhythm (9). Nonetheless, there are no randomized controlled trials that show a cost-benefit of transthoracic echocardiogram as a screening test for an embolic stroke event caused from cardiac pathology in patients with normal sinus rhythm.

This study was aimed to ascertain the number of Thai patients with diagnosis of embolic stroke that had transthoracic echocardiography that was able to detect one positive feature of a cardiac source of the embolic stroke in patients with normal sinus rhythm and normal physical cardiac examination in order to determine future cost-benefits for this investigation.

Methods

The study was approved by the local Ethics Committee of Siriraj Hospital, Mahidol University.

We used the formula \( N = \frac{Z^2 \times P \times (1-P)}{D^2} \) for sample size determination, and the calculated population...
was 246 patients [N = population; Z = Value (Normal distribution table): 95% CI, Z 1.96; P = Incidence rate (incidence rate of cardiac source embolic in stroke patient= 20%); D = Allowable error rate (allowable error = 5%)].

We reviewed transthoracic echocardiogram from a total of 236 patients with recent stroke who were scheduled for transthoracic echocardiography at Siriraj Hospital between January 2007 and January 2009. The diagnoses of these events were made by the referring physicians. Clinical data, including demographic data (age, sex, height, weight), underlying diseases (diabetes mellitus, dyslipidemia, hypertension), cardiac rhythm, and physical examination data were obtained by chart review. Inclusion and exclusion criteria are shown in Table 1. TTE results were reviewed from a computerized database.

Echocardiographic examinations were performed with commercially available systems (Hewlett-Packard Sonos 7500) equipped with 2.0 to 4.0-MHz phased-array transthoracic transducers. Transthoracic studies were performed from all standard echocardiographic windows. Global left ventricular systolic function was assessed semiquantitatively from the parasternal and apical views and graded as normal or mild, moderate, or severe impairment. The mitral and aortic valves were assessed by color, pulsed, and continuous-wave Doppler. Mitral and aortic regurgitation, if present, were graded as trivial, mild, moderate, or severe. Left atrial (LA) dimension and left ventricular (LV) wall thickness were measured according to standard M-mode criteria (10). All patients were examined by transthoracic doppler echocardiography and reviewed by staff cardiologists with advanced training in echocardiography. All measurements were averaged from at least three consecutive beats to reduce intraobserver variation.

Table 1. Inclusion and exclusion criteria.

<table>
<thead>
<tr>
<th>Inclusion criteria</th>
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<tr>
<td>Patients with ≥ 15 years</td>
<td>Arrhythmias</td>
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<tr>
<td>Embolic stroke</td>
<td>Structural heart disease from physical cardiac examination</td>
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<tr>
<td>Sinus rhythm</td>
<td>Previous history of structural heart disease or prosthesis heart valve</td>
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<td>Normal physical cardiac examination</td>
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Table 2. Patient’s baseline clinical characteristics

<table>
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<th>Mean ± SD or number (%) (n = 236)</th>
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<tr>
<td>Age</td>
<td>62 ± 16 [17-92]</td>
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<tr>
<td>Sex: male</td>
<td>120 (51.1%)</td>
</tr>
<tr>
<td>Height</td>
<td>160 ± 8 [140-180]</td>
</tr>
<tr>
<td>Weight</td>
<td>62 ± 13 [33-120]</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>51(21.7%)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>141(60.3%)</td>
</tr>
<tr>
<td>Dyslipidemia</td>
<td>93(39.6%)</td>
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The presence of the following potential sources of embolism was specifically examined: (1) LA or LV thrombus; (2) atheroma in LA or LV; (3) Interatrial septal abnormaly (patent foramen ovale, atrial septal defect, and atrial septal aneurysm); and (4) Intracardiac masses (esp. atrial myxoma).

Results are expressed as mean ± SD for continuous data. Frequencies and percentage are used for categorical data and a 95% confidence interval was used for the incidence rate from echocardiographic findings.

Results
A total of 236 patients were studied. Baseline characteristics are shown in Table 2. There were 119 men and 117 women with a mean age of 62 ± 16 years. Fifty one patients (21.7%) had diabetes mellitus (DM), one hundred and forty one patients had hypertension (60.3%), and ninety three patients had dyslipidemia (39.6%).

From TTE findings there was only one patient [0.4% (95%CI 0.1-2.4%)] who had LA thrombus and this patient was a 79 year old male without other underlying diseases (Figure 1).

There were no other potential sources of cardiac emboli from this study (atheroma, interatrial septal anormaly, intracardiac masses).

Due to the small number of the incidence rate of intracardiac thrombus events we could not identify clinical risk predictors for this event.

Discussion
From this study there was only one patient (0.4%) that had a potential source of cardiac emboli from TTE. This result was similar to a previous study from the Cleveland Clinic (7) that had a low incidence of intracardiac source of emboli in patients with sinus rhythm. In their study 824 patients were investigated by both TTE and TEE after stroke and other suspected embolic events and patients were divided into group A sinus rhythm with a normal transthoracic echocardiogram and group B, all other patients. There were only 3 (1%) that had spontaneous contrast, 11 (4.6%) had complex atheroma, and no one had LA thrombus after TEE in group A and 211 (36%) patients had spontaneous contrast, 54 (9.2%) had atrial thrombus and 100 (17%) had complex atheroma in group B.

Our study showed a low yield of intracardiac thrombus in patients with normal cardiac exam and EKG similar to the study from Ahmed, Waseem (11) that used the database from the TOAST study for identifying abnormal TTE findings in 1271 patients with or without previous cardiac disease and with or without cardiac

Figure 1. Results of transthoracic echo findings.
abnormalities from physical exam or EKG that showed no thrombus in patients with normal cardiac exam and EKG. Moreover, another study from the University of Virginia (12), 1010 patients after stroke or TIA, showed a low incidental rate of intracardiac source of emboli from TTE findings.

Study limitations

This study had a small sample size and could not evaluate risk predictors of intracardiac thrombus due to the limitation of the study duration. We cannot exclude paroxysmal AF patients because this was an observational retrospective study. In this study nearly all the patients were elderly (mean age 62 years) that had high potential of intracardiac thrombus as source of emboli (7, 13-14), thus this study cannot represent sources of intracardiac emboli from younger patients that had a higher prevalence from interatrial septal anomaly (7).

Conclusion

Transthoracic echocardiography is often requested in patients with stroke or TIA but the yield is low in finding a cardiac source emboli and even a more extremely low yield in patients with sinus rhythm no previous structural heart disease, normal physical cardiac exam and EKG. The practice of routine transthoracic echocardiography in stroke patients with sinus rhythm and no previous structural heart disease should be re-examined; the role of TEE also needs further exploration.

Conflict of Interest

None

References

12. Cardiac Echo Found Unhelpful in Stroke, TIA. Published in Journal Watch Cardiology March 1, 1995.
อุบัติการณ์มีลิ่มเลือดในหัวใจจากการตรวจคลื่นเสียงสะท้อนหัวใจของผู้ป่วยสมองขาดเลือดโดยมีคลื่นไฟฟ้าหัวใจปกติ

อนวชิร เก้าเอี้ยน, เฉลิม อัมราทมิทธุ

บทคัดย่อ
วัตถุประสงค์: ภาวะสมองขาดเลือดเฉียบพลัน (cerebra infarction) เป็นปัญหาที่พบได้บ่อยของโรคทางอายุรกรรม และประมาณร้อยละ 20 ของการสมองขาดเลือดเฉียบพลันเป็นผลจากลิ่มเลือดอุดตันในสมองที่มีสำหรับจากหัวใจแต่ในปัจจุบันยังมีข้อมูลน้อยมากในเรื่องผลกระทบจากการตรวจคลื่นเสียงสะท้อนหัวใจในผู้ป่วยที่มีลิ่มเลือดอุดตันในสมองในการพยากรณ์เปลี่ยนหัวใจปกติ (sinus rhythm) เมื่อจากการตรวจคลื่นเสียงสะท้อนหัวใจทำได้ง่ายและมีการตรวจเป็นปริมาณมากขึ้นในผู้ป่วยที่มีสมองขาดจากการขาดเลือดเพื่อหาลิ่มเลือดในหัวใจโดยการตรวจหัวใจผ่านทางผนังทรวงอกและไม่มีความผิดปกติของหัวใจมาก่อน ภาวะสมองขาดเลือดเฉียบพลันของการมีลิ่มเลือดภายในหัวใจและภาวะความเสี่ยงที่เกี่ยวข้อง ซึ่งผู้ป่วยในภาวะนี้จะเป็นประโยชน์ในการพิจารณาความเหมาะสมในการตรวจคลื่นเสียงสะท้อนหัวใจผ่านทางผนังทรวงอกของผู้ป่วยอย่างไรก็ตาม

วิธีการศึกษา: มีผู้ป่วยที่เข้าร่วมการศึกษานี้ทั้งหมด 236 คน โดยผู้ป่วยทั้งหมดได้รับการวินิจฉัยว่ามีลิ่มเลือดในสมองโดยผ่านทางการตรวจด้วย CT-Scan และมีคลื่นไฟฟ้าหัวใจ และภาวะความเสี่ยงที่เกี่ยวข้อง ซึ่งผู้ป่วยในภาวะนี้จะเป็นประโยชน์ในการพิจารณาความเหมาะสมในการตรวจคลื่นเสียงสะท้อนหัวใจผ่านทางผนังทรวงอกของผู้ป่วยในระหว่างเดือนมกราคม 2007-มกราคม 2009

ผลการศึกษา: พบอุบัติการณ์ของการมีลิ่มเลือดในหัวใจ 1 คน จาก 236 คน คิดเป็นร้อยละ 0.4 (95% CI 0.1-2.6%)