

**Review Article**

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# Comparison of Echocardiograph Findings in Reference to Transient Ischemic Attack

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## Introduction

Echocardiography is routinely used to identify a cardiac source of embolism (CSE) causing a transient ischemic event (TIA). To find potential origins of cardiogenic embolism, transthoracic echocardiography (TTE) is frequently performed on patients who have had an ischemic stroke or a TIA [1-3]. We aimed to evaluate the diagnostic yield of TTE and transesophageal echocardiography (TEE) in patients with ischemic stroke and transient ischemic attack with established reasons for direct oral anticoagulants before the index event [4] (Table 1).

## Methods

A transducer is an instrument that is moved over the chest during a TTE. An ultrasound image is produced by the transducer's sound waves as they reflect off the various heart chambers [5]. A flexible probe with a transducer built into it is inserted into the esophagus during a TEE. All patients underwent TTE, which was done by skilled sonographers (W.R.P.A., E.R.H., and J.J.B.) by a predetermined protocol, followed immediately by TEE. Patients were scanned for TTE while resting in the left lateral decubitus position using commercially available equipment (Vingmed system FiVe/Seven, General Electric-Vingmed). The parasternal (standard long- and short-axis images) and apical views (standard long-axis, 2- and 4-chamber images) images were acquired using a 3.5-MHz transducer at a depth of 16 cm. The typical 2-dimensional and color Doppler data that was sent to the QRS complex was stored in cine loop format [6,7]. A standard diagnostic procedure that included a 12-lead electrocardiogram (ECG), a 72-hour Holter-ECG, duplex sonography of the head and neck arteries, and a blood test was performed on all study participants. A standard blood test that checks HbA1c, lipid state, infection markers, and creatinine.

A body mass index of more than 35 kg/m<sup>2</sup> was an exclusion criterion, as obese patients have less ability to undergo echocardiography, which lowers the diagnostic value of TTE. Another exclusion criterion was the presence of a mechanical heart valve. Before enrollment, the trial was registered with and authorized by our local ethics committee, and all participants provided their informed consent [8-10]. The variables under investigation included the presence of aortic arch atheroma, ventricular septal defect, left atrial thrombus, and patent foramen ovale with or without left to right shunt. The "gold standard" for demonstrating cardiac and ascending aortic anomalies with echocardiography is TEE. A 5.0-MHz multiplane transducer was used for TEE. Patients who were awake during the treatment were not sedated; instead, the local pharyngeal anesthetic was provided using a lidocaine spray. The left atrial appendage, interatrial septum, mitral valve apparatus, and thoracic aorta were highlighted during the TEE procedure, which was carried out by a conventional protocol that allowed for optimal viewing of all cardiac structures [11,12]. Atrial septal defects were evaluated by intravenous sterile isotonic saline administration. A second Valsalva maneuver and echo contrast with air (9:1) were utilized to assess if a patent foramen ovale was present [13].

## Results

A second Valsalva maneuver and echo contrast with air (9:1) were utilized to assess if a patent foramen ovale was present. The patients also had TEE, which revealed a potential source of cardiogenic embolism and led to a modification in either their assessment or their course of treatment. 39 patients in total (17%) were under the age of 45. None of the 8% (3/39) who had a possible cardiac cause identified by TTE had a significant risk factor. Thirteen out of 39 (33%) patients were found to have a possible cardiac cause of TEE, confirming the three patients originally detected on TTE. Of these 13 patients, 38% (5/13) had a

**Table 1:** Transthoracic vs. Transesophageal Echocardiography.

Feature	Transesophageal	Transthoracic
Intubation	Intubation with sedation ideal	Not required
Safety in esophageal disease	Compatible with CPR during cardiac arrest	Thoracic surface must be accessible
Views/Resolution	Risk of esophageal perforation	Safe
Evaluation of heart and great vessels	Rapid	Rapid



significant risk factor. The TEE results were the sole basis for the need for anticoagulant medication in each of these 5 individuals. The bilateral carotid ultrasonography Doppler examination was normal with normal flows in all patients. TEE discovered an atypical lesion, that TTE had missed in 28 out of 68 individuals. There were 3 left atrial thrombi, 1 ventricular septal defect, 23 diffuse (>5mm) atherosclerotic atheromas in the aortic arch, 5 patent foramen ovale (PFO) lesions, 1 atrial septal defect, and 1 ventricular septal defect. Following the publication of these findings, all 28 patients were treated with Coumadin rather than aspirin. Patients with PFO were instructed to either surgery or use a patch in the catheterization lab to seal the shunt. 44.4% of patients with an abnormal TTE and 28.6% of patients with a normal TTE saw management changes because of TEE findings. The prevalence of management-changing echocardiographic abnormalities was not correlated with patient age, history of coronary heart disease, carotid stenosis, or stroke topology. Five patients had multiple findings. Aortic arch atheromas and PFO were present in 3 men; a left atrial thrombus and aortic arch atheromas were seen in 1 man and 1 woman. Complex aortic arch atherosclerosis and patent foramen ovale were the two CSEs found on echocardiography most frequently. A history of coronary artery disease ( $p = 0.001$ ), the lack of a recent stroke or transient ischemic attack ( $p = 0.007$ ), and the presence of acute infarction on magnetic resonance imaging (MRI) ( $p = 0.001$ ) were all predictive factors for CSE on echocardiography. The yield of echocardiography was 29% in patients with a history of coronary artery disease and an acute infarction on MRI, compared to 14% in patients with only one of these factors and 5% in patients with neither ( $p = 0.0001$ ) [14].

## Conclusion

Our research has shown that TEE is a valuable tool that should be regularly utilized to rule out potential cardiac and/or aortic arch causes of acute ischemic stroke. We might have overlooked nearly half of the patients who required a different medical treatment that could have saved their lives if we had just used the TTE procedure instead of TEE. In patients with acute ischemic stroke, TTE and TEE help locate probable causes of cardiogenic embolism that could change the course of treatment. It was impossible to pinpoint specific clinical criteria, such as stroke topology, that might increase the yield of these tests when utilized in ordinary clinical practice.

Patients with acute ischemic stroke can benefit from TTE and TEE for locating potentially life-changing sources of cardiogenic embolism. In a sizable percentage of TIA patients, echocardiography shows a pertinent CSE. However, echocardiography-based modifications to antithrombotic treatment are uncommon. The identification of PFO is a significant finding with clinical implications for changing therapy. TTE, however, is not inferior to TEE for the detection of PFO, suggesting that it is a good screening method for PFO, particularly in young patients.

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