Utility of routine transesophageal echocardiography in patients with stroke or transient ischemic attack

Brian G. Schwartz, MD^a, Chris T. Alexander, MD^b, Paul A. Grayburn, MD^{a,c,d}, and Jeffrey M. Schussler, MD^{c,d,e}

^aThe Baylor Scott & White Heart Hospital, Plano, Texas; ^bDepartment of Internal Medicine, Baylor University Medical Center, Dallas, Texas; ^cDivision of Cardiology, Baylor University Medical Center, Dallas, Texas; ^dThe Baylor Scott & White Heart and Vascular Hospital, Dallas, Texas; ^eTexas A&M College of Medicine, Dallas, Texas

ABSTRACT

In several series of patients with presumed stroke, transesophageal echocardiography (TEE) has seemed advantageous over transthoracic echocardiography (TTE) in that it improves detection of cardiac sources and can lead to changes in the methods of treatment. We hypothesized that the real-world application of TEE in our institution produced results at variance from those previously reported. Our study of 219 patients, referred for TEE for an indication of stroke or transient ischemic attack, found few relevant findings that would have indicated a new diagnosis or required a change in treatment. These results suggest that for most patients in whom TEE is ordered, either a TTE or no cardiac testing would suffice.

KEYWORDS Patent foramen ovale; transesophageal echocardiography; transient ischemic attack; transthoracic echocardiography

In many institutions, transesophageal echocardiogram (TEE) is performed routinely for the workup of patients with a stroke or transient ischemic attack (TIA). This practice, in part, is derived from the American Heart Association/American Stroke Association's scientific statement giving this a class IIa recommendation. It reads: "Echocardiography (at least TTE) is reasonable in the evaluation of patients with suspected TIAs, especially in patients in whom no cause has been identified by other elements of the workup. TEE is useful in identifying PFO [patent foramen ovale], aortic arch atherosclerosis, and valvular disease and is reasonable when identification of these conditions will alter management."¹ One key phrase in this statement is whether it "will alter management." We proposed that the vast majority of TEEs performed for cerebral vascular accident (CVA) do not reveal results that alter management.

METHODS

We retrospectively evaluated consecutive inpatients for 1 year who had a TEE performed for the indication of stroke or TIA. Doppler color flow imaging and agitated saline contrast administration were performed in every case.

TEE findings defined as pertinent included the presence of a PFO, atrial septal aneurysm, left atrial appendage

thrombus, left ventricular thrombus, aortic plaque, or valvular or cardiac masses. Severe aortic atherosclerosis was defined as >4 cm thick plaque in the aorta. An atrial septal aneurysm was defined as a mobile protrusion of the atrial septum >10 to 15 mm beyond the plane of the atrial septum.

A history of atrial fibrillation or atrial flutter was determined either by documented electrocardiogram or telemetry monitoring or by noted past medical history in the chart. In addition, determination was made as to whether the TEE findings changed medical management based on chart review of the physician progress notes. Further data collection included whether each patient received brain imaging studies prior to the TEE, specifically a head computed tomography scan and/or head magnetic resonance imaging.

RESULTS

During a 1-year period, 219 inpatients received TEE for stroke or TIA. Baseline characteristics of the studied patients are shown in *Table 1*. There were 116 men and 103 women. Their ages ranged from 17 to 89 years. Results of our findings are shown in *Table 2*. The most common pertinent abnormal findings were PFO, atrial septal aneurysm, and

Corresponding author: Jeffrey M. Schussler, MD, Division of Cardiology, Department of Internal Medicine, Baylor University Medical Center, 621 N. Hall Street, Suite 400, Dallas, TX 75226 (e-mail: Jeffrey.Schussler@Baylorhealth.edu; Twitter: @Updock)
Received October 22, 2017; Revised April 24, 2018; Accepted April 30, 2018.

Table 1. Baseline patient characteristics of 219 patients who received transesophageal echocardiography for stroke or transient ischemic attack

Variable	Result
Age (years)	17–89 (mean 61)
Men	116 (53%)
Women	103 (47%)
Stroke	190 (87%)
Transient ischemic attack	29 (13%)
Atrial fibrillation/flutter	8 (4%)
Prior transesophageal echocardiography	3 (1%)

severe atherosclerosis of the aorta. Seven intracardiac thrombi were noted but no other intracardiac masses.

Only 9 out of 219 patients had a change in management based on TEE results. Five patients were started on warfarin for a PFO with atrial septal aneurysm, a finding that could easily be seen on TTE with concurrent bubble study. One patient was started on warfarin with left atrial appendage thrombus (not in atrial fibrillation). One patient was started on warfarin for mitral stenosis, a finding that was seen on TTE. Among two patients in whom anticoagulation was started after the initial presentation of stroke, it was stopped after no clot was seen on TEE.

DISCUSSION

The findings in our study show a very low number of patients with stroke or TIA who had changes in management based on TEE findings. None of our patients had any unexpected endocarditic lesions or intracardiac masses (other than thrombus) seen on TEE. Nearly all of the patients (95.9%) had no changes in their management based on the findings of their TEE. Only three patients had a left atrial appendage thrombus and would have been on anticoagulation after TEE findings. However, two out of those three had atrial fibrillation on electrocardiogram and therefore already had an indication for anticoagulation aside from finding a left atrial appendage thrombus.

TTE can be used to identify many cardioembolic sources if the patient has a body habitus suitable for adequate images. Sources include some cardiac tumors, some valvular masses (i.e., vegetations or thrombus), left ventricular thrombus, mitral stenosis, and PFO/atrial septal defect. Studies have shown that TTE using second harmonic imaging and agitated saline contrast bubbles is as sensitive as TEE in detecting PFO with right to left shunt.^{2–4} The CLOSURE I trial showed no benefit to closing PFO in patients with a first diagnosis of stroke or TIA.^{5,6} The RESPECT trial, which did not meet primary endpoints, did suggest that longer term results (using Amplatzer PFO closure devices) were on par with or slightly better than medications.⁷

TEE is more sensitive than TTE for endocarditis vegetations, with reported sensitivities of 90% to 97% versus 58% to 68%.^{8,9} However, clinical suspicion should dictate

Table 2. Findings of transesophageal echocardiography among 219 patients

Finding	N (%)	CVA confirmed by imaging prior to TEE	
		Yes	No
Total PFOs	44 (20%)	32 (14.5%)	12 (5.4%)
Atrial septal aneurysm with PFO	10 (4.5%)	8 (3.6%)	2 (0.9%)
Atrial septal aneurysm without PFO	6 (2.7%)	3 (1.4%)	3 (1.4%)
Mitral stenosis	2 (0.9%)	1 (0.5%)	1 (0.5%)
LAA thrombus; patient in AF/AFI	2 (0.9%)	1 (0.5%)	1 (0.5%)
LAA thrombus; patient not in AF/AFI	1 (0.5%)	1 (0.5%)	0
Left atrial thrombus	0	0	0
Left ventricular thrombus	0	0	0
Infective endocarditis vegetations	0	0	0
Intracardiac tumors/masses	0	0	0
Prosthetic heart valves	0	0	0
Severe atherosclerosis of the aorta	13 (5.9%)	11 (5%)	2 (0.9%)
Aortic thrombus	0	0	0

AF indicates atrial fibrillation; AFI, atrial flutter; CVA, cerebral vascular accident; LAA, left atrial appendage; PFO, patent foramen ovale.

whether a TEE should be ordered in lieu of a TTE as dictated by the American Heart Association endocarditis guidelines.¹⁰ In this patient population, where stroke is the main finding, endocarditis does not appear to be a likely source of emboli.

It is true that though TTE can rarely identify aortic plaque, TEE is quite sensitive in detecting aortic atheroma.¹¹ However, according to the landmark SPARCL trial, patients with a history of stroke or TIA and a low-density lipoprotein cholesterol between 100 and 190 mg/dL should be on statin therapy. This therapy is required regardless of the presence of severe atherosclerosis in the aorta, so identifying plaque is rarely essential. Recent stroke guidelines reflect this and recommend an optional low-density lipoprotein target of ≤ 70 mg/dL.¹² After taking away the findings that can be seen adequately on TTE and the findings that will not change management, one is left with left atrial thrombus as one of the few reasons to order a TEE over a TTE.

There was an increased yield of the TEE for potential cardioembolic findings in those with confirmed CVA by imaging versus no confirmed CVA. It is not uncommon for a TEE to be ordered on admission at the same time as brain imaging but before results of brain imaging are reported. It might make more sense to perform the brain imaging first and perform a TEE only if concerning findings are seen in the brain.

Clearly, in most settings where anticoagulation over antiplatelet treatment is required, such as atrial fibrillation, or is contraindicated due to high bleeding risks, TEE is unnecessary and may even muddy the waters in regards to a management plan. Although TEE is considered fairly safe, there are still risks and costs associated with it that may be largely unreviewed in the stroke population, including transient drops in blood pressure, changes in intracranial pressure, and aspiration associated with dysphagia.

In conclusion, in an unselected patient population with a diagnosis of TIA or stroke, TEE provided minimal overall change to patients' medical management. Though TEE can identify more potential sources of cardioembolism than TTE, given its higher cost, resource utilization, and risk, this procedure should be reserved for patients with stroke who have no obvious cause and in whom it would effectively change treatment. Given recent Food and Drug Administration approval for PFO closure,¹³ we are not sure whether liberal use of closure devices would

have changed or altered management of the cohort of patients we reviewed.

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