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Transcranial Doppler is Complementary to Echocardiography for Detection and Risk Stratification of Patent Foramen Ovale.

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Author information

Abstract

BACKGROUND:

In patients with patent foramen ovale (PFO), strategies are needed to identify patients at higher risk, who might benefit from PFO closure.

METHODS:

We studied the frequency of detection of a right-to-left shunt (RLS) using transesophageal echocardiography (TEE) among patients with cryptogenic stroke and transcranial Doppler (TCD) to detect RLS, and analyzed the prediction of recurrent stroke according to TCD shunt grade, by detection of RLS on TEE, and by atrial septal aneurysm or mobility.

RESULTS:

Among 334 patients with TCD, 69.8% were female, with a mean (SD) age of 53 (14) years, with a median follow-up of 420 days. There were 284 cases with TCD and TEE; 54 (19%) had atrial septal aneurysm or mobility. Echocardiography failed to show a RLS in 43 (15.1%) of the patients who had TCD and TEE, even in some patients with high-grade shunts on TCD: 18 (42%) were grade 3 or higher on TCD. Survival free of stroke or transient ischemic attack was predicted significantly by TCD shunt grade < 2 ($P = 0.028$), shunt grade < 3 ($P = 0.03$), and shunt grade < 4 ($P < 0.0001$); this was attenuated by adjustment for risk factors in Cox regression ($P = 0.08$). Neither RLS on TEE ($P = 0.47$), or atrial septal aneurysm or mobility ($P = 0.08$), predicted events.

CONCLUSIONS:

Our findings suggest that TCD might be more sensitive than TEE for detection of RLS, which misses some cases with substantial RLS, and might be valuable for prediction of recurrent stroke or transient ischemic attack in patients with PFO. TCD complements TEE for management of suspected paradoxical embolism.

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Power m-mode transcranial Doppler for diagnosis of patent foramen ovale and assessing transcatheter closure.

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Abstract

BACKGROUND AND PURPOSE:

Transcatheter closure of patent foramen ovale (PFO) can benefit from a less invasive diagnostic method than transesophageal echocardiography (TEE). Thirty-three gate power m-mode transcranial Doppler (pmTCD) was evaluated for its accuracy in diagnosis of PFO and utility in evaluating residual intracardiac right-to-left shunt (RLS) following transcatheter closure.

METHODS:

The sensitivity of pmTCD and single-gate TCD (sgTCD) to detect contrast bubble emboli through RLS was compared during transcatheter PFO closure. During 100 preclosure diagnostic evaluations and in 81 postclosure assessments, embolic tracks on pmTCD were counted following intravenous contrast injections and were graded using a 6-level logarithmic scale. The accuracy of TEE and pmTCD was separately compared to PFO anatomical findings during transcatheter closures.

RESULTS:

There were significantly more microemboli detectable on pmTCD (322 +/- 166; 95% confidence interval [CI], 388-257) than on sgTCD (186 +/- 109; 95% CI, 229-143; P < .001). McNemar change tests suggest that the diagnostic capabilities of pmTCD and TEE for detecting PFO are comparable and correspond to the anatomical findings determined during cardiac catheterization (P = .69 and .45, respectively). During 6-month postclosure evaluation (mean = 185 days), 66% of the patients demonstrated successful closure without significant RLS (ie, grades 0, I, or II), and 34% were found to have incomplete closure with significant RLS (ie, grades III, IV, or V).

CONCLUSIONS:

pmTCD provides greater sensitivity to contrast bubble emboli than does sgTCD. Among candidates for transcatheter closure, pmTCD provides an improved noninvasive method for diagnosing PFO and evaluating transcatheter closure.

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Cryptogenic stroke and patent foramen ovale: clinical clues to paradoxical embolism.

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Author information

Abstract

BACKGROUND:

Patent foramen ovale (PFO) is an independent risk factor for cerebral infarction. Since ~25% of the population have a PFO, the simple association of PFO with stroke is not enough to establish the diagnosis of paradoxical embolism. We evaluated possible clinical clues to the diagnosis of paradoxical embolism.

METHODS:

Among patients with cryptogenic ischemic stroke (CS) who were investigated for a right-to-left shunt (RLS), we compared clinical, coagulation and biochemical parameters in patients with PFO versus without PFO.

RESULTS:

Among 1689 new patients referred for TIA/non-disabling stroke between 2001 and 2007, 175 with cryptogenic stroke (CS) were investigated for RLS by transcranial Doppler (TCD) bubble studies; 89 (5.5%) with positive TCD had a PFO confirmed by TEE. In multivariate logistic regression, a history of DVT or pulmonary embolism (OR, 4.39; 95% CI, 1.23-15.69; p=0.023), prolonged travel (OR, 8.77; 95% CI, 1.775-43.3; p=0.008) , migraine (OR, 2.30: 95% CI, 1.07-4.92; p=0.031), a Valsalva maneuver preceding the onset of focal neurological symptoms (OR, 3.33; 95% CI, 1.15-9.64; p=0.026) and waking up with stroke/TIA (OR, 4.53, 95% CI, 1.26-16.2; p=0.018) were independently associated with PFO-associated cerebrovascular events. Patients with PFO had higher plasma total homocysteine levels than patients without PFO (8.9+/-3 versus 7.9+/-2.6 micromol/L respectively; p=0.021).

CONCLUSIONS:

A history of DVT or pulmonary embolism, migraine, recent prolonged travel, sleep apnea, waking up with TIA or stroke or a Valsalva maneuver preceding the event are clinical clues to the diagnosis of paradoxical embolism among patients with CS.