
We appreciate Drs Luermans and Bhindi and colleagues’ thoughtful comments on our recent publication. We agree that transesophageal compared with transthoracic echocardiography is more sensitive and specific for the diagnosis of patent foramen ovale (PFO) as well as associated anatomic abnormalities such as atrial septal aneurysm (ASA). Although ASA has been shown to be associated with cryptogenic stroke, it remains unclear if this is more common in migraineurs. In our study, there was no difference in the prevalence of PFO with hypermobile septum (defined as atrial septal motion <10 mm from baseline) or with ASA (>10 mm) in cases with migraine compared with controls (9.0% versus 7.6% and 0 versus 0.7%, \( P = 0.83 \), respectively). The prevalence of atrial septal abnormalities seen in our study is consistent with past reports. Numerous studies have also shown excellent accuracy in detecting PFO with the combination of transthoracic echocardiography and transcranial Doppler compared with transesophageal echocardiography. The combined use of these modalities to diagnose PFO in our study resulted in higher specificity, increasing the likelihood of finding a true association with migraine, if one existed.

We excluded subjects with some preexisting conditions (eg, history of cerebrovascular disease or paradoxical embolism) so as to define a series of cases without other likely consequences of a preexisting PFO, to obtain a valid estimate of the prevalence of PFO in the source population determined by the selected cases. For example, PFO is known to be associated with cerebrovascular disease and thus including patients with prior stroke as cases may result in finding a “false” or misleading association between migraine and PFO. These excluded conditions are also uncommon, with an estimated absolute rate of ischemic stroke of 19 per 100 000 women with migraine per year. Concerning our sample size calculations, the prevalence of PFO varies from 10% to 30%, depending on the diagnostic method and the study population. Prior echocardiography-based population studies have suggested PFO prevalence of 15%. Therefore used an estimate of 15% as the prevalence of PFO for sample size calculation, as well as the assumption that matching on confounders typically leads to an increase in power. The widths of reported confidence intervals reflect the precision of our analysis. Although it is plausible that a weak association between PFO and migraine exists, our confidence intervals for the effect of PFO [0.62, 1.74] is plausible that a weak association between PFO and migraine. These estimated odds ratio 1.04, \( P = 0.89 \). Regarding patients with migraine with aura, we agree that our power within this smaller subset was limited; however, there was no difference in PFO prevalence in those with migraine with aura or those without (odds ratio 1.03, \( P = 0.93 \)).

Our study provides evidence against a pathophysiologic association between PFO and migraine and, above all, argues against closure of PFO for migraine.

Disclosures
Dr Mauri has received honoraria from the Cordis Cardiac & Vascular Institute and Medtronic Vascular; Drs Wu, Bajwa, and Selim have received research grants from Cierra, Inc; Ms. Dineen was an employee of Cierra, Inc during the study’s conduct but not during its analysis; Dr Kuntz is a current employee of Medtronic Inc, but was not during the study’s inception or conduct.

References
Response to Letters Regarding Article, "Lack of Association Between Migraine Headache and Patent Foramen Ovale: Results of a Case-Control Study"


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