Long-term impact of residual shunt after patent foramen oval closure on stroke recurrence

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Background

Residual shunt after patent foramen ovale (PFO) closure identified by transesophageal echocardiography or transcranial Doppler (TCD) has been reported. However the long-term impact of residual shunt on stroke recurrence is not established.

We aimed to identify and quantify the residual shunt at long-term by TCD and to evaluate its association with stroke recurrence.

Methods

- Observational retrospective study.
- Inclusion criteria:** patients with cryptogenic transient ischemic attack (TIA) or ischemic stroke (IS) observed on the stroke unit or outpatient clinic submitted to percutaneous closure of the PFO from 2000 to 2016.
- Exclusion criteria:** Patients without TCD after PFO closure or clinical follow-up
- The following data was retrieved from clinical files and complemented by information from the Cardiology department:
 - Demographic, TIA/IS date and characteristics, procedural-related, long-term TCD results after PFO closure.(patients submitted to PFO closure are followed in outpatient clinic and a TCD is performed at least one year after the procedure)
- Residual shunt was graded (before and after Valsalva maneuver) according the Consensus Criteria (Serena et al. 1998):
 - mild 1-10 microbubble (µB)
 - moderate 11-24 µB
 - severe ≥ 25 µB, “shower” or “curtain” pattern
- Stroke recurrence was defined by new episode of stroke or TIA with or without correspondent lesion on MRI

Results

Demographics	• mean 45 (23-69, SD=10.2) years-old; 27 (55%) men; IS: n=38 (78%); TIA: n=11 (22%); recurrent stroke: n=7
PFO characteristics	• mean PFO diameter (measured during procedure): 9.14 mm (4-20, SD=2.86) • atrial septal aneurysm: n=27 (55%)
Occluder device	• diameter: 35 mm n=3 (6%); 25 mm n=42 (86%); 18 mm n=4 (8%). Device type was Amplatzer in 36 (76%)
TCD after PFO closure	• median time of TCD after PFO closure = 5 years (IQR 1.9-8.3)
Residual shunt	• Residual shunt was found in 32 (65%; 95%CI 51-80) patients. It was severe in 7 patients. • Atrial septal aneurysm, PFO size and occluder device type or size had no influence in residual shunt on TCD

Residual shunt in TCD

Residual shunt quantification in TCD after Valsalva maneuver

Stroke recurrence	• One patient had multiple stroke recurrences (2, 3 and 5 years after PFO closure). This patient had mild residual shunt (1µB only after Valsalva maneuver) and additional studies identified vasculitis as the stroke etiology
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Discussion

- Residual shunt was present in 65% of our patients and it was mild in most of them.
- We found higher percentage of residual shunt comparing to previous TCD studies (18-46%).
- In our study only one patient had a stroke recurrence not related to the PFO.
- Although the sample of patients was small, our results suggest that presence of residual shunt in TCD does not have clinical implications.