

Patent foramen ovale and juvenile stroke: a case report

C. Paci
R. Gobbato
T. Carboni
S. Sanguigni
G. D'Andreamatteo
S. Sobrini
V. Urbano
A. Brandimarti
L. Curatola

Department of Neurology, "Madonna del Soccorso Hospital", San Benedetto del Tronto (AP), Italy
E-mail: cpaci@libero.it

Introduction

Ischaemic stroke is among the world's leading causes of mortality and morbidity. After cardiovascular diseases, it is the second or third cause of death in industrialised countries. Generally, it affects individuals with particular risk factors (arterial hypertension, atrial fibrillation, heart disease, diabetes, hypercholesterolaemia, smoking, etc.) with a mean age of around 60 years (1). Men are more frequently affected than women.

Case report

The aim of this study is to describe a case of acute cerebral ischaemia in a young woman with minimal vascular risk factors. The 39-year-old woman (a smoker) presented at the Emergency Room with acute-onset soporific state and right facio-brachio-crural hemiparesis.

In view of the young age of the patient, different differential diagnoses were proposed: encephalitis, meningitis, brain haemorrhage, functional disorder, cerebral ischaemia, venous sinus thrombosis.

The patient urgently underwent a cranial CT scan without contrast, ECG, and routine laboratory workup. The findings were unremarkable except for the presence of possible hyperdensity of the M2 and M3 segments of the left middle cerebral artery (MCA) on the cranial CT scan. Furthermore, an urgent TCCD revealed turbulence in this portion of the left MCA.

Over the following days, the patient underwent angio-MRI of the brain, follow-up TCCD looking for evidence of patent foramen (PFO) (Fig. 1), EEG and an echocardiogram. The conclusion reached was "cerebral ischaemia in the left MCA territory and presence of PFO".

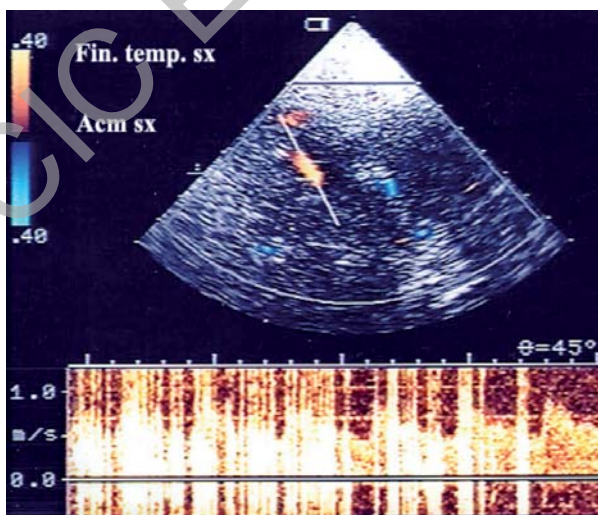


Fig. 1

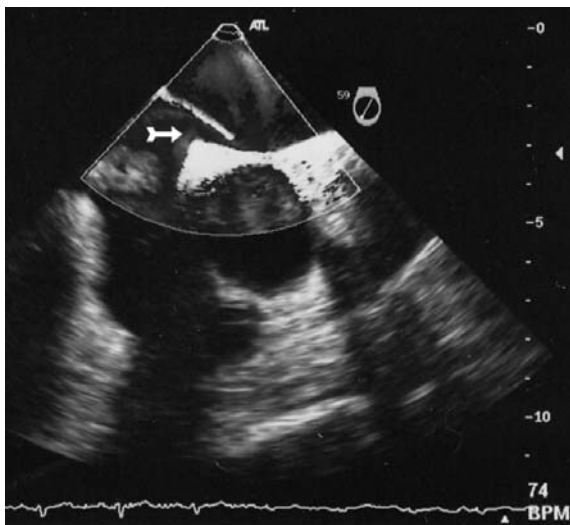


Fig. 2

The case we have described is, in view of the patient's age, gender and risk factors, a rare one, and it suggests that in similar cases PFO should always be sought.

Discussion

PFO is a condition resulting from incomplete fusion of the "septum primum" with the "septum secundum" (Fig. 2, arrow).

Recent prevalence studies suggest that this remnant of foetal circulation is present in around 20-30% of the overall adult population, making it the most frequent abnormality of foetal origin. In normal conditions, the increased pressure that develops in the left atrium guarantees functional closure of this flap-like opening in the septum. If, on the other hand, the pressure gradient between the two atria is reversed, the septum primum moves into the anterior portion of the foramen ovale, resulting in communication between the two atria and a right-left shunt. In affected individuals, the PFO allows right-to-left shunting in situations in which right atrial pressure is greater than left atrial pressure, e.g. during the Valsalva manoeuvre.

Stroke (2-4) and migraine (particularly migraine with aura) (5,6) are the syndromes most likely to be associated with the presence of PFO. Less frequent, but certainly not less important from a clinical point of view, are myocardial infarction due to peripheral embolism, peripheral limb embolism, and scuba divers' embolism (7). The methods currently used to detect PFO are mainly transoesophageal echocardiography (TEE) with injection of contrast medium, transcranial Doppler (TCD) and, more recently, transcranial colour-coded duplex sonography (TCCD), a method in which Doppler detection is associated with B-mode sonography (8). The literature data confirm that the ultrasound method has the same sensitivity and specificity as the cardiological one.

Microembolic signals are defined by the following features:

- random occurrence
- short duration (<0.1 sec)
- high intensity (>3/10 db from background)
- unidirectional increase of the power in the Doppler spectrum
- characteristic sound

During the 4th Meeting of the European Society of Neurosonology and Cerebral Hemodynamics (ESNCH) parameters for the correct and standardised use of TCCD in detecting PFO were established (9).

Clearly, the presence of symptomatic PFO with associated stroke should prompt consideration of the possibility of closing the right-left shunt in order to remove the possible emboligenic source (10).

References

1. Sacco RL, Adams R, Albers G et al.; American Heart Association; American Stroke Association Council on Stroke; Council on Cardiovascular Radiology and Intervention; American Academy of Neurology. Guidelines for prevention of stroke in patients with ischemic stroke or transient ischemic attack: a statement for healthcare professionals from

the American Heart Association/American Stroke Association Council on Stroke: co-sponsored by the Council on Cardiovascular Radiology and Intervention: the American Academy of Neurology affirms the value of this guideline. *Stroke* 2006;37:577-617

2. Cabanes L, Mas JL, Cohen A et al. Atrial septal aneurysm and patent foramen ovale as risk factors for cryptogenic stroke in patients less than 55 years of age. A study using transesophageal echocardiography. *Stroke* 1993;24:1865-1873
3. Anzola GP, Zavarise P, Morandi E, Rozzini L, Parrinello G. Transcranial Doppler and risk of recurrence in patients with stroke and patent foramen ovale. *Eur J Neurol* 2003;10:129-135
4. Mas JL, Zuber M. Recurrent cerebrovascular events in patients with patent foramen ovale, atrial septal aneurysm, or both and cryptogenic stroke or transient ischemic attack. French Study Group on Patent Foramen Ovale and Atrial Septal Aneurysm. *Am Heart J* 1995;130:1083-1088
5. Tembl J, Lago A, Sevilla T, Solis P, Vilchez J. Migraine, patent foramen ovale and migraine triggers. *J Headache Pain* 2007;8:7-12
6. Schwaag S, Nabavi DG, Frese A, Husstedt IW, Evers S. The association between migraine and juvenile stroke: a case-control study. *Headache* 2003;43:90-95
7. Cartoni D, De Castro S, Valente G et al. Identification of professional scuba divers with patent foramen ovale at risk for decompression illness. *Am J Cardiol* 2004;94:270-273
8. Blersch WK, Draganski BM, Holmer SR et al. Transcranial duplex sonography in the detection of patent foramen ovale. *Radiology* 2002;225:693-699
9. Jauss M, Zanette E. Detection of right-to-left shunt with ultrasound contrast agent and transcranial Doppler sonography. *Cerebrovasc Dis* 2000;10:490-496
10. Anzola GP, Morandi E, Casilli F, Onorato E. Does transcatheter closure of patent foramen ovale really "shut the door?" A prospective study with transcranial Doppler. *Stroke* 2004;35:2140-2144